COST ACCOUNTING – II

For B.Com. (General), B.Com. (Accounting & Finance)
as per
Tamil Nadu Sate Council for Higher Education (TANSCHE) Syllabus

Dr. M.P. Gupta
M.Com., Ph.D.
Former Director, Jagran (DG) College, Kanpur
Ex-Dean, Faculty of Commerce, CSJM University, Kanpur
Ex-HOD Commerce, VSSD (PG) College, Kanpur
Uttar Pradesh

Dr. Ajay Gupta
M.Com., Ph.D.
Assistant Professor, Dept. of Commerce
DSN (PG) College, Unnao, (affiliated to CSJM University)
Uttar Pradesh

Sultan Chand & Sons®
Educational Publishers
New Delhi

SULTAN CHAND & SONS®
Educational Publishers
23, Daryaganj, New Delhi-110002
Phones : 011-23281876, 23266105, 41625022 (*Showroom & Shop*)
011-23247051, 40234454 (*Office*)
E-mail : sultanchand74@yahoo.com; info@sultanchandandsons.com
Fax : 011-23266357; Website : www.sultanchandandsons.com

ISBN: 978-81-979992-9-1 (TC-1327)
Price: ₹ 395.00
First Edition: 2025

EVERY GENUINE COPY OF THIS BOOK HAS A HOLOGRAM

In our endeavour to protect you against counterfeit/fake books, we have pasted a copper hologram over the cover of this book. The hologram displays the full visual image, unique 3D multi-level, multi-colour effects of our logo from different angles when tilted or properly illuminated under a single light source, such as 3D depth effect, kinetic effect, pearl effect, gradient effect, trailing effect, emboss effect, glitter effect, randomly sparking tiny dots, micro text, laser numbering, etc.

A fake hologram does not display all these effects.

Always ask the bookseller to put his stamp on the first page of this book.

Author's Acknowledgement : The writing of a Textbook always involves creation of a huge debt towards innumerable authors and publications. We owe our gratitude to all of them. We acknowledge our indebtedness in extensive footnotes throughout the book. If, for any reason, any acknowledgement has been left out we beg to be excused. We assure to carry out correction in the subsequent edition, as and when it is known.

Printed at: Himani Print Solution Badarpur, New Delhi-110044

Preface

Cost Accounting (Volume II) is a meticulously crafted textbook designed for the 6th Semester students of Bachelor of Commerce (General) and Bachelor of Commerce in Accounting and Finance. This book aligns with the syllabus prescribed by the Tamil Nadu State Council for Higher Education (TANSCHE) and provides an in-depth exploration of advanced concepts in cost accounting. The text aims to equip students with both theoretical knowledge and practical applications, ensuring a comprehensive understanding of the subject.

Divided into five units, this textbook covers a wide range of topics crucial for mastering cost accounting. Each unit has been designed to address key areas of the syllabus, enabling students to gain clarity and confidence in applying these concepts to real-world scenarios.

1. **Unit I:** *Cost Accounting Standards* introduces students to the foundational principles and guidelines outlined in cost accounting standards. It also covers Responsibility Accounting, emphasizing accountability in cost control and performance evaluation within organizations.
2. **Unit II:** *Job Costing, Batch Costing, and Contract Costing* provides detailed insights into specific costing methods, focusing on how costs are allocated and managed in different production and operational contexts.
3. **Unit III:** *Process Costing* delves into the intricacies of costing for continuous production processes. It also includes Joint Product and By-Product Costing, shedding light on how costs are allocated between multiple products derived from a common process.
4. **Unit IV:** *Operation Costing* focuses on the costing methods applied to service industries and hybrid production systems, helping students understand the nuances of cost determination in such environments.
5. **Unit V:** *Standard Costing and Variance Analysis* explores the establishment of cost standards, the calculation of variances, and the interpretation of deviations to support managerial decision-making.

An appendix on recent developments in cost accounting offers insights into contemporary practices and emerging trends, ensuring that students remain updated with the latest advancements in the field.

This book is enriched with 230 illustrations, 169 objective-type questions, 60 theory questions, and 94 numerical problems to reinforce learning. These resources provide ample

opportunities for students to practice and master the concepts, preparing them effectively for examinations and professional challenges.

We hope this textbook serves as a valuable resource for students, educators, and professionals, fostering a deeper understanding of cost accounting principles and their applications. Feedback and suggestions for improvement are always welcome as we strive to enhance the learning experience.

Dr. M.P. Gupta
Dr. Ajay Gupta

Snapshot of the Book

Chapter No.	*Chapter Name*	*Pages*	*Illustrations*	*Assignments*		
				Objective Type Questions	*Theoretical Questions*	*Numerical Questions*
Unit-I Cost Accounting Standards						
1.	Cost Accounting Standards (CAS)	32	–	–	–	–
2.	Responsibility Accounting	22	3	39	15	–
Unit-II Job Costing, Batch Costing and Contract Costing						
3.	Job Costing, Batch Costing and Contract Costing	90	58	34	11	23
Unit-III Process Costing						
4.	Process Costing	112	64	49	9	26
5.	Joint Product and By-Product Costing	46	29	6	3	5
Unit-IV Operation Costing						
6.	Operation Costing	28	10	36	14	12
Unit-V Standard Costing and Variance Analysis						
7.	Standard Costing and Variance Analysis	106	66	15	8	28
Appendix – Recent Developments in Cost Accounting		10	–	–	–	–
Total		**446**	**230**	**169**	**60**	**94**

C

Contents

UNIT-I Cost Accounting Standards

S

Syllabus

Tamilnadu State Council for Higher Education (TANSCHE)
Cost Accounting – II

Unit-I: ***Cost Accounting Standards***

An Introduction to CAS – Purpose of CAS – Advantages of CAS – Difference between CAS and FAR Regulations – Different Degrees of CAS Coverage – Cost Accounting Standards – Responsibility Accounting and Divisional Performance Measurement.

Unit-II: ***Job Costing, Batch Costing and Contract Costing***

Definitions – Features – A Comparison – Calculation of Profit on Contracts – Cost Plus Contract – Preparation of Contract A/c.

Unit-III: ***Process Costing***

Process Costing – Meaning – Features of Process Costing – Application of Process Costing – Fundamental Principles of Process Costing – Preparation of Process Accounts – Treatment of Loss and Gain: Normal and Abnormal Loss – Abnormal Gain – Concept of Equivalent Production – Joint Products and By-Products.

Unit-IV: ***Operation Costing***

Operation Costing – Meaning – Preparation of Operating Cost Sheet – Transport Costing – Power Supply Costing – Hospital Costing – Simple Problems.

Unit-V: ***Standard Costing and Variance Analysis***

Definition – Objectives – Advantages – Standard Cost and Estimated Cost – Installation of Standard Costing System – Variance Analysis – Material, Labour, Overhead, and Sales Variances – Calculation of Variances.

UNIT I

Cost Accounting Standards

1

Cost Accounting Standards (CAS)

Cost Accounting Standards have been framed by Cost Accounting Standard Board (CASB) Constituted by the Institute of Cost Accountants of India.

There are 24 Cost Accounting Standards on different costing field. Each standard is discussed avoiding unnecessary details. Only relevant portions of the Standards have been edited.

Chapter Outline

- Introduction to Cost Accounting Standards (CAS)
- Purposes of Cost Accounting Standards (CAS)
- Advantages of Cost Accounting Standards (CAS)
- Differences between Cost Accounting Standards (CAS) and FAR Regulations
- Cost Accounting Standards (CAS) Coverage
- Classification of Cost
- Capacity Determination
- Production and Operation Overheads
- Cost of Production for Captive Consumption
- Determination of Average (Equalized) Cost of Transportation
- Material Cost
- Employee Cost
- Cost of Utilities
- Packing Material Cost
- Direct Expenses
- Administrative Overheads
- Repairs and Maintenance Cost
- Cost of Service Cost Centre
- Pollution Control Cost
- Selling and Distribution Overheads
- Depreciation and Amortisation
- Interest and Financing Charges
- Research and Development Costs
- Joint Costs
- Royalty and Technical Know-How Fee
- Quality Control
- Manufacturing Cost
- Overburden Removal Cost
- Treatment of Revenue in Cost Statements

INTRODUCTION TO COST ACCOUNTING STANDARDS (CAS)

Cost Accounting Standards (CAS) are a set of rules and guidelines established to ensure uniformity and consistency in the cost accounting practices of organizations, particularly in government contracts. Developed by the Cost Accounting Standards Board (CASB) in the United States, these standards aim to promote transparency, comparability, and accountability in how costs are identified, measured, and allocated. CAS is critical in fostering fair competition and ensuring that government funds are used effectively and efficiently.

PURPOSES OF COST ACCOUNTING STANDARDS (CAS)

CAS provides a uniform framework for cost accounting practices, ensuring consistency across different organizations and industries.

1. **Standardization:** CAS provides a uniform framework for cost accounting practices, ensuring consistency across different organizations and industries.
2. **Transparency:** By specifying clear rules for cost allocation and measurement, CAS enhances the transparency of financial reporting and cost management.
3. **Fair Pricing:** CAS helps prevent overcharging or undercharging in government contracts by ensuring accurate cost allocation, leading to fair pricing.
4. **Accountability:** It promotes accountability by requiring detailed documentation and justification of costs, reducing the risk of mismanagement or fraud.
5. **Regulatory Compliance:** CAS ensures that organizations comply with contractual and legal requirements, particularly when dealing with government contracts.

ADVANTAGES OF COST ACCOUNTING STANDARDS (CAS)

1. **Improved Cost Management:** CAS enables organizations to understand and control their costs better, leading to more efficient resource utilization.
2. **Enhanced Decision-Making:** Standardized cost data helps managers make informed decisions about pricing, budgeting, and resource allocation.
3. **Reduced Disputes:** Clear guidelines minimize disputes between contractors and government agencies by providing a common basis for cost evaluation.
4. **Fair Competition:** By leveling the playing field, CAS ensures that all contractors are evaluated based on consistent criteria, fostering fair competition.
5. **Regulatory Assurance:** Compliance with CAS builds trust with regulatory bodies and strengthens an organization's reputation in the marketplace.
6. **Risk Mitigation:** Adhering to CAS reduces the risk of financial misstatements and potential penalties associated with non-compliance.

DIFFERENCES BETWEEN COST ACCOUNTING STANDARDS (CAS) AND FEDERAL ACQUISITION REGULATIONS (FAR)

Aspect	*Cost Accounting Standards (CAS)*	*Federal Acquisition Regulation (FAR)*
Purpose	Ensures uniformity and consistency in cost accounting practices, especially for government contracts.	Governs the acquisition process for all federal contracts, covering procurement rules, policies, and procedures.

Scope	Focuses specifically on cost accounting methods, practices, and allocations.	Covers broader aspects of federal procurement, including contract terms, compliance, and contract management.
Applicability	Applies to certain large contractors or contracts exceeding specific thresholds (*e.g.*, CAS-covered contracts).	Applies to all federal contracts, irrespective of size or type.
Content	Includes detailed guidelines on cost allocation, measurement, and consistency (19 standards).	Addresses requirements for acquisition, contract performance, and cost allowability.
Cost Allowability	Does not determine whether costs are allowable or unallowable; focuses on how costs are assigned and measured.	Determines the allowability of costs charged to federal contracts (*e.g.*, FAR Part 31).
Enforcement	Enforced by the Cost Accounting Standards Board (CASB) and compliance audits by government agencies.	Enforced by federal agencies, with oversight by the Office of Federal Procurement Policy (OFPP).
Contractor Obligations	Requires contractors to disclose and follow specific cost accounting practices and adjust practices only with government approval.	Requires contractors to follow broader federal acquisition and performance rules, including allowable costs, competition, and ethical requirements.
Penalties for Non-Compliance	Non-compliance can result in contract cost disallowances or price adjustments.	Non-compliance can result in disallowance of costs, termination of contracts, or debarment from future federal contracts.
Key Focus Areas	- Cost allocation - Consistency in cost measurement - Disclosure statements.	- Procurement process - Contractor responsibilities - Cost allowability and compliance.

In essence, CAS is more focused and technical, dealing specifically with cost accounting practices, whereas FAR is broader, encompassing the entire lifecycle of federal acquisitions. Contractors working on federal projects must comply with both CAS (if applicable) and FAR to ensure compliance and successful contract performance.

COST ACCOUNTING STANDARDS (CAS) COVERAGE

In the Indian context, the Cost Accounting Standards (CAS) are issued by the Institute of Cost Accountants of India (ICAI) to establish uniformity and consistency in cost accounting practices. These standards primarily guide cost accounting practices for industries and entities in India. Unlike the U.S. CAS, Indian CAS does not have degrees of coverage based on contract size or thresholds. Instead, the application depends on the nature of the entity and regulatory requirements.

Applicability of Cost Accounting Standards in India

1. Mandatory Coverage

(*a*) ***Applicability:*** CAS is mandatory for industries or entities subject to Cost Audit as per the provisions of the Companies Act, 2013 and related rules (*e.g.*, Cost Records and Audit Rules, 2014).

Examples:

- Companies operating in regulated sectors like pharmaceuticals, telecommunications, and electricity.
- Industries notified for mandatory cost record maintenance (*e.g.*, cement, steel, or sugar).

Requirements:

- Preparation of cost records following relevant CAS guidelines.
- Submission of a cost audit report certified by a Cost Accountant.

2. Voluntary Coverage

(*b*) ***Applicability:*** CAS is voluntary for entities not covered under mandatory cost audit but seeking to improve cost management and financial reporting.

Examples:

- Non-regulated private companies or public entities not specifically mandated to comply with cost audit requirements.

Requirements:

- Adoption of CAS to enhance cost efficiency and provide transparency to stakeholders.

3. Sector-Specific Coverage

(*c*) ***Applicability:*** Certain sectors in India are encouraged or required to adopt specific CAS depending on regulatory oversight or industry best practices.

Examples:

- *Oil & Gas Companies:* Adherence to CAS 9 (Packing Material Cost) or CAS 4 (Determination of Cost of Production).
- *Infrastructure Projects:* Use of CAS 15 (Selling and Distribution Overheads).

Key Features of CAS Coverage in India

1. **Industry-Specific Standards:** CAS provides detailed frameworks for handling costs related to materials, labour, overheads, and services specific to industry needs.
2. **Integrated with Regulatory Frameworks:** The standards align with provisions under the Companies Act, 2013, and other regulatory guidelines for cost audit and record maintenance.
3. **Broad Scope:** While not divided into "degrees" like in the U.S., CAS in India offers flexibility for voluntary adoption across diverse industries and organization sizes.
4. **Support for Cost Auditors:** CAS assists cost auditors in preparing standardized and reliable cost reports for companies, ensuring compliance with regulatory expectations.

Summary – Table of Indian CAS Coverage

Coverage Type	*Applicability*	*Examples*
Mandatory Coverage	Companies notified for cost audit compliance	Cement, sugar, pharmaceuticals, steel, electricity, *etc*.
Voluntary Coverage	Entities not mandated but seeking better cost control	Private manufacturing firms, startups, or small-scale enterprises.
Sector-Specific Coverage	Industries with specific regulatory requirements	Oil & Gas, telecom, public infrastructure projects.

Benefits of CAS Coverage in India

1. Promotes cost efficiency and transparency.
2. Ensures regulatory compliance and accurate reporting for cost audits.
3. Helps entities identify cost-saving opportunities and improve profitability.

CAS - 1 (REVISED 2015)

Cost Accounting Standard on "Classification of Cost"

This standard deals with the principles of Classification of Cost for determining the cost of product or service.

The following terms are being used in this standard with the meaning specified.

1. ***Abnormal Cost***: An unusual or a typical cost whose occurrence is usually irregular and unexpected and/ or due to some abnormal situation of the production or operation.
2. ***Administrative Overheads***: Cost of all activities relating to general management and administration of an entity.
3. ***Classification of Cost***: Classification of cost is the arrangement of items of costs in logical groups having regard to their nature (subjective classification) and purpose (objective classification).
4. ***Conversion Cost***: Conversion cost is the production cost excluding the cost of direct materials.
5. ***Cost***: Cost is a measurement, in monetary terms, of the amount of resources used for the purpose of production of goods or rendering services.
6. ***Cost Centre:*** Any unit of an entity selected with a view to accumulating all cost under that unit. The unit can be division, department, section, group of plant and machinery, group of employees or combination of several units.
7. ***Cost of Production***: Cost of production of a product or a service consists of cost of materials consumed, direct employee costs, direct expenses, production overheads, quality control costs, packing costs, research and development costs and administrative overheads relating to production.
8. ***Cost Unit***: Cost Unit is a form of measurement of volume of production of a product or a service. Cost Unit is generally adopted on the basis of convenience and practice in the industry concerned.
9. ***Development Cost***: Development cost is the cost for application of research findings or other knowledge to a plan or design for the production of new or

substantially improved materials, devices, products, processes, systems or services before the start of commercial production or use.

10. ***Direct Expenses***: Expenses relating to manufacture of a product or rendering a service, which can be identified or linked with the cost object other than direct material cost and direct employee cost.
11. ***Direct Materials***: Materials, the costs of which can be attributed to a cost object in an economically feasible way.
12. ***Distribution Overheads***: Distribution overheads, also known as distribution costs, are the costs incurred in handling a product or service from the time it is ready for despatch or delivery until it reaches the ultimate consumer including the units receiving the product or service in an inter-unit transfer.
13. ***Fixed Costs***: Fixed costs are costs which do not vary with the change in the volume of activity. Fixed indirect costs are termed fixed overheads.
14. ***Indirect Employee Cost***: Employee cost, which cannot be directly attributed to a particular cost object.
15. ***Indirect Expenses***: Expenses, which cannot be directly attributed to a particular cost object.
16. ***Indirect Materials***: Materials, the costs of which cannot be directly attributed to a particular cost object.
17. ***Overheads***: Overheads comprise costs of indirect materials, indirect employees and indirect expenses.
18. ***Prime Cost***: Prime cost is the aggregate of direct material cost, direct employee cost and direct expenses.
19. ***Production Overheads***: Indirect costs involved in the production of a product or in rendering service.
20. ***Research Cost***: Research cost is the cost of original and planned investigation undertaken with the prospect of gaining new scientific or technical knowledge and understanding.
21. ***Selling Overheads***: Selling overheads are the expenses related to sale of products or services and include all indirect expenses incurred in selling the products or services.
22. ***Semi Variable Costs***: Semi Variable Costs are the costs that contain both fixed and variable elements. They partly change with the change in the level of activity.
23. ***Support-Service Cost Centre***: The cost centre which primarily provides auxiliary services across the entity.
24. ***Standard Cost***: A predetermined cost of a product or service based on technical specifications and efficient operating conditions.
25. ***Variable Costs***: Variable costs are the cost which tends to directly vary with the volume of activity.

CAS - 2 (REVISED 2015)

Cost Accounting Standard on "Capacity Determination"

This standard deals with the principles and methods of determining the capacity of a facility for producing goods or providing services by an entity.

The following terms are being used in this standard with the meaning specified.

1. ***Abnormal Idle Capacity***: Abnormal idle capacity is the difference between normal capacity and actual capacity utilization where the actual capacity is lower than the normal capacity.
2. ***Actual Capacity Utilization***: Actual capacity utilization is measured in terms of volume of production achieved or service provided in a specified period.
3. ***Cost Object***: An activity, contract, cost centre, customer, product, process, project, service or any other object for which costs are ascertained.
4. ***Installed Capacity***: Installed capacity is the maximum capacity of producing goods or providing services, determined either based on technical specification of the facility or through a technical evaluation.
5. ***Normal Capacity***: Normal capacity is the volume of production or services achieved or achievable on an average over a period under normal circumstances taking into account the reduction in capacity resulting from planned maintenance.
6. ***Normal Idle Capacity***: Normal idle capacity is the difference between installed capacity and normal capacity.

CAS - 3 (REVISED 2015)
Cost Accounting Standard on "Production and Operation Overheads"

This standard deals with the principles and methods of determining the Production and Operation Overheads. This standard deals with the principles and methods of classification, measurement and assignment of production or operation overheads.

The following terms are being explained in this standard with the meaning specified.

1. ***Abnormal Cost***: An unusual or a typical cost whose occurrence is usually irregular and unexpected or due to some abnormal situation of the production or operation.
2. ***Absorption of Production or Operation Overheads***: Assigning of Production or Operation Overheads to cost objects by means of appropriate absorption rate.
3. ***Administrative Overheads***: Cost of all activities relating to general management and administration of an entity.
4. ***Cost Centre***: Any unit of an entity selected with a view to accumulating all costs under that unit. The unit can be division, department, section, group of plant and machinery, group of employees or combination of several units.
5. ***Cost Object***: An activity, contract, cost centre, customer, product, process, project, service or any other object for which costs are ascertained.
6. ***Fixed Costs***: Fixed costs are costs which do not vary with the change in the volume of activity. Fixed indirect costs are termed fixed overheads.
7. ***Imputed Cost***: Notional cost, not involving cash outlay, computed for any purpose.
8. ***Indirect Employee Cost***: Employee cost, which cannot be directly attributed to a particular cost object.
9. ***Production or Operation Overheads:*** Indirect costs involved in the production of a product or in providing service.

10. ***Standard Cost***: A predetermined cost of a product or service based on technical specifications and efficient operating conditions.
11. ***Variable Costs***: Variable costs are the cost which tends to directly vary with the volume of activity.

Any change in the cost accounting principles applied for the measurement of the Production or Operation Overheads shall be made only if, it is required by law or for compliance with the requirements of a cost accounting standard, or a change would result in a more appropriate preparation or presentation of cost statements of an entity.

Absorption of Production or Operation Overheads shall be as follows:

1. The Variable Production or Operation Overheads shall be absorbed to products or services based on actual production.
2. The fixed Production or Operation Overheads shall be absorbed based on the normal capacity.

CAS - 4

Cost Accounting Standard on "Cost of Production for Captive Consumption"

The Cost Accounting principle for determination of cost of production is well established. Similarly, rules for levy of excise duty on goods used for captive consumption are also well defined. Captive Consumption means the consumption of goods manufactured by one division and consumed by another division(s) of the same organization or related undertaking for manufacturing another product(s).

The purpose of this standard is to bring uniformity in the principles and methods used for determining the cost of production of excisable goods used for captive consumption.

Following are important definition.

1. ***Cost of Production***: Cost of production shall consist of Material Consumed, Direct Wages and Salaries, Direct Expenses, Works Overheads, Quality Control Cost, Research and Development Cost, Packing Cost, Administrative Overheads relating to production.
2. ***Captive Consumption***: Captive Consumption means the consumption of goods manufactured by one division or unit and consumed by another division or unit of the same organization or related undertaking for manufacturing another product(s). To determine the cost of production for captive consumption, calculations of different cost components and adjustments are considered.
    1. ***Material Consumed***: Cost of material consumed shall consist of cost of material, duties and taxes, freight inwards, insurance and other expenditure directly attributable to procurement. Trade discount, rebates and other similar items will be deducted for determining the cost of materials. Cenvat credit, credit for countervailing customs duty, GST or Sales Tax set off, VAT, duty draw back and other similar duties subsequently recovered/ recoverable by the enterprise shall also be deducted.
    2. ***Direct Wages and Salaries***: Direct wages and salaries shall include house rent allowance, overtime and incentive payments made to employees directly engaged in the manufacturing activities.

3. ***Direct Expenses***: Direct expenses are the expenses other than direct material cost and direct employees costs which can be identified with the product.
4. ***Works Overheads***: Works overheads are the indirect costs incurred in the production process. Works overheads include the following expenses: Consumable stores and spares, Depreciation of plant and machinery, factory building, *etc*. Lease rent of production assets, repairs and maintenance of plant and machinery, factory building, *etc*., Indirect employees cost connected with production activities.
5. ***Quality Control Cost***: The quality control cost is the expenses incurred relating to quality control activities for adhering to quality standard. These expenses shall include salaries & wages relating to employees engaged in quality control activity and other related expenses as given below.
   (*a*) Research and Development Cost
   (*b*) Administrative Overheads
   (*c*) Packing Cost
   (*d*) Absorption of overheads
6. ***Valuation of Stock of Work-in-Progress and Finished Goods***: Stock of work-in-progress shall be valued at cost on the basis of stages of completion as per the cost accounting principles. Similarly, stock of finished goods shall be valued at cost. Opening and closing stock of work-in-progress shall be adjusted for calculation of cost of goods produced and similarly opening and closing stock of finished goods shall be adjusted for calculation of goods despatched.
7. ***Treatment of Joint Products and By-Products***: A production process may result in more than one product being produced simultaneously. In case joint products are produced, joint costs are allocated between the products on a rational and consistent basis. In case by-products are produced, the net realisable value of by-products is credited to the cost of production of the main product.
8. ***Treatment of Scrap and Waste***: The production process may generate scrap or waste. Realized or realizable value of scrap or waste shall be credited to the cost of production.
9. ***Miscellaneous Income***: Miscellaneous income relating to production shall be adjusted in the calculation of cost of production, for example, income from sale of empty containers used for despatch of the captivity consumed goods produced under reference.
10. ***Inputs Received Free of Cost***: In case any input material, whether of direct or indirect nature, including packing material is supplied free of cost by the user of the captive product, the landed cost of such material shall be included in the cost of production, Moulds, Tools, Dies & Patterns *etc*. Received Free of Cost.
11. ***Interest and Financial Charges***: Interest and financial charges being a financial charge shall not be considered to be a part of cost of production.
12. ***Abnormal and Non-recurring Cost***: Abnormal and non-recurring cost arising due to unusual or unexpected occurrence of events, such as heavy break

down of plants, accident, market condition restricting sales below normal level, abnormal idle capacity, abnormal process loss, abnormal scrap and wastage, payments like VRS, retrenchment compensation, lay-off wages *etc*. The abnormal cost shall not form the part of cost of production.

Cost Sheet / Statement of Cost

The cost sheet should be prepared in the format as per format given ahead or as near thereto as possible. The manufacturer will be required to maintain cost records and other books of account in a manner, which would facilitate preparation and verification of the cost of production. For manufacturers covered under the ambit of Section 148(1) of the Companies Act, 2013, *i.e.*, where Cost Accounting Records are statutorily required to be maintained, the Cost Accountant certifying the cost of production for captive consumption shall verify the correctness of the cost from these records. However, for manufacturers not covered under Section 148(1) of the Companies Act, 2013, it is desirable that they also maintain cost accounting records in line with the records so prescribed as to facilitate determination and certification of cost of production.

Statement of Cost of Production of_____ manufactured / to be manufactured during the period

Particulars	*Total Cost* (₹)	*Cost/ Unit* (₹)
1. Material Consumed		
2. Direct Wages and Salaries		
3. Direct Expenses		
4. Works Overheads		
5. Quality Control Cost		
6. Research & Development Cost		
7. Administrative Overheads (relating to production activity)		
8. *Total* (1 to 7)		
9. *Add*: Opening stock of Work-in-Progress		
10. *Less*: Closing stock of Work-in-Progress		
11. *Total* (8 + 9 – 10)		
12. *Less*: Credit for Recoveries/Scrap/By-Products /misc. income		
13. Packing cost		
14. *Cost of production* (11 – 12 + 13)		
15. *Add*: Inputs received free of cost		
16. *Add:* Amortised cost of Moulds, Tools, Dies & Patterns *etc*., received free of cost		
17. *Cost of Production for goods produced for captive consumption* (14 + 15 + 16)		
18. *Add*: Opening stock of finished goods		
19. *Less*: Closing stock of finished goods		
20. *Cost of production for goods despatched* (17 + 18 – 19)		

CAS - 5
Cost Accounting Standard on "Determination of Average (Equalized) Cost of Transportation"

Cost Accounting Records should present transportation cost separately from the other cost of inward materials or cost of sales of finished goods.

1. ***Cost of Transportation***: It comprises of the cost of freight, cartage, transit insurance and cost of operating fleet and other incidental charges whether incurred internally or paid to an outside agency for transportation of goods but does not include detention and demurrage charges.
2. ***Inward Transportation Cost:*** It is the transportation expenses incurred in connection with materials/goods received at factory or place of use or sale/ removal.
3. ***Outward Transportation Cost:*** It is the transportation expenses incurred in connection with the sale or delivery of materials or goods from factory or depot or any other place from where goods are sold/removed
4. ***Freight:*** Freight is the charges paid or payable for transporting materials/goods from one location to another.
5. ***Cartage:*** It is the expenses incurred for movement of goods covering short distance for further transportation for delivery to customer or storage.
6. ***Transit Insurance Cost***: It is the amount of premium to be paid to cover the risk of loss/damage to the goods in transit.
7. ***Treatment of Cost:*** Inward transportation costs shall form the part of the cost of procurement of materials which are to be identified for proper allocation/ apportionment to the materials/products.
8. ***Outward Transportation:*** The cost shall form the part of the cost of sale and shall be allocated/apportioned to the materials and goods on a suitable basis.

CAS - 6
Cost Accounting Standard on "Material Cost "

This standard deals with principles and methods of determining the Material Cost. Material for the purpose of this standard includes raw materials, process materials, additives, manufactured/bought out components, sub-assemblies, accessories, semi finished goods, consumable stores, spares and other indirect materials. This standard does not deal with Packing Materials as a separate standard is being issued on the subject.

This standard deals with the principles and methods of classification, measurement and assignment of material cost, for determination of the cost of product or service, and the presentation and disclosure in cost statements.

The objective of this standard is to bring uniformity and consistency in the principles and methods of determining the material cost with reasonable accuracy.

Following are some relevant definitions.

1. ***Abnormal Cost***: An unusual or a typical cost whose occurrence is usually irregular and unexpected and/ or due to some abnormal situation of the production or operation (Adapted from CAS-1).

2. ***Administrative Overheads***: Cost of all activities relating to general management and administration of an entity.
3. ***Cost Object***: An activity, contract, cost centre, customer, process, product, project, service or any other object for which costs are ascertained.
4. ***Defectives***: Materials, products or intermediate products that do not meet quality standards. This may include reworks or rejects.
   (*i*) *Reworks:* Defectives which can be brought up to the standards by putting in additional resources.
   (*ii*) *Rejects:* Defectives which cannot meet the quality standards even after putting in additional resources.
5. ***Imputed Costs***: Notional cost, not involving cash outlay, computed for any purpose.
6. ***Intermediate Product***: An intermediate product is a product that requires further processing before it is saleable.
7. ***Materials***: (*i*) *Direct Materials* Materials the costs of which can be attributed to a cost object in an economically feasible way (Adapted from CAS).
   (*ii*) *Indirect Materials:* Materials, the costs of which cannot be directly attributed to particular cost object (Adapted from CAS-1).
8. ***Waste and Spoilage:*** (*i*) *Waste:* Material lost during production or storage and discarded material which may or may not have any value.
   (*ii*) *Spoilage:* Production that does not meet the quality requirements or specifications and cannot be rectified economically.
9. ***Principle of Valuation of Receipt of Materials***: The material receipt should be valued at purchase price including duties and taxes, freight inwards, insurance, and other expenditure directly attributable to procurement (net of trade discounts, rebates, taxes and duties refundable or to be credited by the taxing authorities) that can be quantified with reasonable accuracy at the time of acquisition.

   Finance costs incurred in connection with the acquisition of materials shall not form part of material cost.

   Self-manufactured materials shall be valued including direct material cost, direct employee cost, direct expenses, factory overheads, share of administrative overheads relating to production but excluding share of other administrative overheads, finance cost and marketing overheads. In case of captive consumption, the valuation shall be in accordance with Cost Accounting Standard 4.
10. ***Principle of Valuation of Issue of Material***: Issues shall be valued using appropriate assumptions on cost flow. *e.g.* First In First Out, Last In First Out, Weighted Average Rate. The method of valuation shall be followed on a consistent basis.

    Where materials are accounted at standard cost, the price variances related to materials shall be treated as part of material cost.

    Any abnormal cost shall be excluded from the material cost.

    Wherever, material costs include transportation costs, determination of costs of transportation.

    Material cost may include imputed costs not considered in financial accounts.

11. ***Disclosures***: Quantity and rates of major items of materials shall be disclosed. Major items are defined as those who form 5% of cost of materials. The basis of valuation of materials shall be disclosed. Any change in the cost accounting principles and methods applied for the determination of the material cost during the period covered by the cost statement which has a material effect on the cost of the material shall be disclosed. Where the effect of such change is not ascertainable wholly or partly, the fact shall be indicated. Any abnormal cost excluded from the material cost shall be disclosed. Any demurrage or detention charges, penalty levied by transport or other authorities excluded from the material cost shall be disclosed. Any Subsidy/Grant/Incentive or any such payment reduced from material cost shall be disclosed. Cost of Materials procured from related parties should be disclosed (Related party as per the applicable legal requirements relating to the cost statement as on the date of statements) shall be disclosed. Any cost imputed in arriving at the material cost shall be disclosed. Disclosures shall be made only where significant and quantifiable. Material Disclosures may be made in the body of the Cost Statement or as a footnote or as a separate schedule.

CAS - 7
Cost Accounting Standard on "Employee Cost"

This standard deals with the principles and methods of determining the Employee Cost. This standard deals with the principles and methods of classification, measurement and assignment of Employee Cost, for determination of the cost of product or service, and the presentation and disclosure in cost statements.

The objective of this standard is to bring uniformity and consistency in the principles and methods of determining the Employee Cost with reasonable accuracy.

Definitions

1. ***Abnormal Cost***: An unusual or a typical cost whose occurrence is usually irregular and unexpected and/ or due to some abnormal situation of the production or operation (Adapted from CAS 1).
2. ***Abnormal Idle Time***: An unusual or atypical idle time occurrence of which is irregular and unexpected or due to some abnormal situations. e.g.: Idle time due to a strike, lockout or an accident.
3. ***Administrative Overheads***: Cost of all activities relating to general management and administration of an entity.
4. ***Cost Object***: An activity, contract, cost centre, customer, process, product, project, service or any other object for which costs are ascertained.
5. ***Direct Employee Cost***: Employee cost, which can be attributed to a Cost object in an economically feasible way (Adapted from CAS 1).
6. ***Distribution Overheads***: Distribution overheads, also known as distribution costs, are the costs incurred in handling a product or service from the time it is ready for despatch or delivery until it reaches the ultimate consumer including the units receiving the product or service in an inter-unit transfer
7. ***Employee Cost***: Benefits paid or payable for the services rendered by employees (including temporary, part time and contract employees)of an entity.

8. ***Idle Time***: The difference between the time for which employees are paid / payable to employees and the employees' time booked against cost objects.
9. ***Imputed Costs***: Notional cost, not involving cash outlay, computed for any purpose.
10. ***Indirect Employee Cost***: Employee cost, which cannot be directly attributed to a particular cost object (Adapted from CAS 1).
11. ***Marketing Overheads***: Marketing overheads comprise of selling overheads and distribution overheads.
12. ***Overtime Premium***: The extra amount payable beyond the normal wages and salaries for beyond the normal working hours.
13. ***Production Overheads***: Indirect costs involved in the production of a product or in rendering service.
14. ***Selling Overheads***: Selling overheads are the expenses related to sale of products or services and include all indirect expenses incurred in selling the products or services.
15. ***Standard Cost***: A predetermined cost of a product or service based on technical specifications and efficient operating conditions.

Presentation

1. Direct Employee Costs shall be presented as a separate cost head in the cost statement.
2. Indirect Employee Costs shall be presented in cost statements as a part of overheads relating to respective functions *e.g.* manufacturing, administration, marketing *etc.*
3. The cost statement shall furnish the resources consumed on account of Employee Cost, category wise such as wages salaries to permanent, temporary, part time and contract employees piece rate payments, overtime payments, Employee benefits (category wise) *etc.* Wherever such items form a material part of the total Employee cost.

CAS - 8

Cost Accounting Standard on "Cost of Utilities"

This standard deals with the principles and methods of determining the cost of utilities. This standard deals with the principles and methods of classification, measurement and assignment of cost of utilities, for determination of the cost of product or service, and the presentation and disclosure in cost statements.

Definitions

1. ***Abnormal Cost:*** An unusual or atypical cost whose occurrence is usually irregular and unexpected and/ or due to some abnormal situation of the production or operation (Adapted from CAS 1).
2. ***Committed Cost***: The cost of maintaining stand-by utilities shall be the committed cost.
3. ***Cost Object***: An activity, contract, cost centre, customer, process, product, project, service or any other object for which costs are ascertained.
4. ***Imputed Costs***: Notional cost, not involving cash outlay, computed for any purpose.
5. ***Interest and Finance Charges***: Interest, including any payment in the nature of interest for use of non equity funds and incidental cost that an entity incurs in arranging those funds.

Disclosures

The cost statements shall disclose the following:

1. The basis of distribution of Cost of Utility to the consuming centres:
   (*i*) The cost of purchase, production, distribution, marketing and price with reference to sales to outside parties;

(*ii*) Where cost of utilities is disclosed at standard cost, the price and usage variances;

(*iii*) The cost and price of Utility received from/supplied to related parties (Related party as per the applicable legal requirements relating to the cost statement as on the date of the statement);

(*iv*) The cost and price of Utility received from/supplied as inter unit transfers and intercompany transfers. Cost of utilities incurred in foreign exchange;

(*v*) Any Subsidy/Grant/Incentive and any such payment reduced from cost of utilities credits/recoveries relating to the Cost of utilities;

(*vi*) Any abnormal cost excluded from Cost of utilities;

(*vii*) Penalties and damages paid *etc*., excluded from cost of utilities.

2. Any change in the cost accounting principles and methods applied for the measurement and assignment of the Cost of utilities during the period covered by the cost statement which has a material effect on the Cost of utilities. Where the effect of such change is not ascertainable wholly or partly the fact shall be indicated.

CAS - 9
Cost Accounting Standard on "Packing Material Cost"

This standard deals with the principles and methods of determining the Packing Material Cost. This standard deals with the principles and methods of classification, measurement and assignment of Packing Material Cost, for determination of the cost of product, and the presentation and disclosure in cost statements. Packing Materials for the purpose of this standard are classified into primary and secondary packing materials.

Definitions

1. ***Abnormal Cost***: An unusual or a typical cost whose occurrence is usually irregular and unexpected and/ or due to some abnormal situation of the production or operation (Adapted from CAS 1).
2. ***Administrative Overheads***: Cost of all activities relating to general management and administration of an entity. Administrative overheads shall exclude any overhead relating to production, operations and marketing.
3. ***Cost Object***: An activity, contract, cost centre, customer, process, product, project, service or any other object for which costs are ascertained.
4. ***Direct Employee Cost***: Employee cost, which can be attributed to a cost object in an economically feasible way (Adapted from CAS 7).
5. ***Direct Expenses***: Expenses relating to manufacture of a product or rendering a service, which can be identified or linked with the cost object other than direct material or direct employee cost.
6. ***Packing Materials***: Materials used to hold, identify, describe, store, protect, display, transport, promote and make the product marketable.
7. ***Defectives***: Materials, products or intermediate products that do not meet quality standards. This may include reworks or rejects.
8. ***Reworks***: Defectives which can be brought up to the standards by putting in additional resources.
9. ***Rejects***: Defectives which cannot meet the quality standards even after putting in additional resources. Rejects may be disposed off as waste or sold for salvage value or recycled in the production process.
10. ***Packing Material Cost***: The cost of material of any nature used for the purpose of packing of a product.

11. ***Primary Packing Material***: Packing material which is essential to hold and preserve the product for its use by the customer.

Disclosures

The cost statements shall disclose the following:

1. *The basis of valuation of Packing Material*s. Where Packing Materials Cost is disclosed at standard cost, the price and usage variances: The cost and price of Packing Materials received from/supplied to related parties (Related party as per the applicable legal requirements relating to the cost statement as on the date of the statement).
2. *Packing Materials cost incurred in foreign exchange*. Any Subsidy/Grant/Incentive and any such payment reduced from Packing Materials Costs: Credits/recoveries relating to the Packing Materials Costs. Any abnormal cost excluded from packing materials Costs penalties and damages paid *etc*., are excluded from Packing Materials Costs.
3. Any change in the cost accounting principles and methods applied for the measurement and assignment of the Packing Materials Costs during the period covered by the cost statement which has a material effect on the Packing Materials Cost shall be disclosed. Where the effect of such change is not ascertainable wholly or partly the fact shall be indicated.

CAS - 10

Cost Accounting Standard on "Direct Expenses"

This standard deals with the principles and methods of classification, measurement and assignment of Direct Expenses, for determination of the cost of product or service, and the presentation and disclosure in cost statements. The objective of this standard is to bring uniformity and consistency in the principles and methods of determining the Direct Expenses with reasonable accuracy.

Definitions

1. ***Abnormal Cost***: An unusual or a typical cost whose occurrence is usually irregular and unexpected and/ or due to some abnormal situation of the production or operation (Adapted from CAS 1).
2. ***Cost Object***: An activity, contract, cost centre, customer, process, product, project, service or any other object for which costs are ascertained.
3. Direct Employee Cost: Employee cost, which can be directly attributed to a cost object in an economically feasible way (Adapted from CAS 1).
4. ***Direct Expenses***: Expenses relating to manufacture of a product or rendering a service, which can be identified or linked with the cost object other than direct material cost and direct employee cost (Adapted from CAS 1).

Disclosures

The cost statements shall disclose the following:

(*i*) The basis of distribution of Direct Expenses to the cost objects/ cost units.
(*ii*) Quantity and rates of items of Direct Expenses, as applicable.
(*iii*) Where Direct Expenses are accounted at standard cost, the price and usage variances.
(*iv*) Direct expenses representing procurement of resources and expenses incurred in connection with resources generated.
(*v*) Direct Expenses paid/payable to related parties (Related party as per the applicable legal requirements relating to the cost statement as on the date of the statement).
(*vi*) Direct Expenses incurred in foreign exchange.
(*vii*) Any Subsidy/Grant/Incentive and any such payment reduced from Direct Expenses.

(*viii*) Credits/recoveries relating to the Direct Expenses, any abnormal portion of the Direct Expenses, penalties and damages excluded from the Direct Expenses.

CAS - 11
Cost Accounting Standard on "Administrative Overheads"

This standard deals with the principles and methods of classification, measurement and assignment of administrative overheads, for determination of the Cost of product or service, and the presentation and disclosure in cost statements. The objective of this standard is to bring uniformity and consistency in the principles and methods of determining the administrative overheads with reasonable accuracy.

Definitions

1. ***Abnormal Cost***: An unusual or a typical cost whose occurrence is usually irregular and unexpected and/ or due to some abnormal situation of the production or operation (Adapted from CAS 1).
2. ***Absorption of Overheads***: Assigning of overheads to cost objects by means of appropriate absorption rate.

   Overhead Absorption Rate = Overheads of the Cost object/Quantum of base.
3. ***Administrative Overheads***: Cost of all activities relating to general management and administration of an entity.
4. ***Imputed Costs***: Notional cost, not involving cash outlay, computed for any purpose.
5. ***Interest and Finance Charges***: Interest, including any payment in the nature of interest for use of non equity funds and incidental cost that an entity incurs in arranging those funds.
6. ***Normal Capacity***: Normal Capacity is the production achieved or achievable on an average over a number of periods or seasons under normal circumstances taking into account the loss of capacity resulting from planned maintenance (Adapted from CAS 2).
7. ***Overheads***: Overheads comprise costs of indirect materials, indirect employees and indirect expenses.

Principles of Measurement

1. Administrative overheads shall be the aggregate of cost of resources consumed in activities relating to general management and administration of an organisation.
2. In case of leased assets, if the lease is an operating lease, the entire rentals shall be included in the administrative overheads. If the lease is a financial lease, the finance cost portion shall be segregated and treated as part of finance costs.
3. The cost of software (developed in house, purchased, licensed or customized), including up-gradation cost shall be amortised over its estimated useful life.
4. Administrative overheads shall not include any abnormal administrative cost. Example: Expense incurred in a situation of natural calamity.
5. Fines, penalties, damages and similar levies paid to statutory authorities or other third parties shall not form part of the administrative overheads.
6. Credits/recoveries relating to the administrative overheads including those rendered without any consideration, material and quantifiable, shall be deducted to arrive at the net administrative overheads.

Disclosures

The cost statements shall disclose the following

(*i*) The basis of assignment of administrative overheads to the cost objects.

(*ii*) Any imputed cost included as a part of administrative overheads.
(*iii*) Administrative overheads incurred in foreign exchange.
(*iv*) Cost of administrative activities received from or supplied to related parties (Related party as per the applicable legal requirements relating to the cost statement as on the date of the statement).
(*v*) Any Subsidy/Grant/Incentive or any amount of similar nature received/receivable reduced from administrative overheads.
(*vi*) Credits /recoveries relating to the administrative overheads.
(*vii*) Any abnormal portion of the administrative overheads.
(*viii*) Penalties and damages excluded from the administrative overheads.

CAS - 12
Cost Accounting Standard on "Repairs and Maintenance Cost"

This standard deals with the principles and methods of determining the repairs and maintenance cost. The objective of this standard is to bring uniformity and consistency in the principles and methods of determining the repairs and maintenance cost with reasonable accuracy.

Definitions

1. ***Cost Object***: An activity, contract, cost centre, customer, process, product, project, service or any other object for which costs are ascertained.
2. ***Direct Expenses***: Expenses relating to manufacture of a product or rendering a service, which can be identified or linked with the cost object other than direct material cost and direct employee cost.
3. ***Imputed Costs***: Notional cost, not involving cash outlay, computed for any purpose.
4. ***Interest and Finance Charges***: Interest, including any payment in the nature of interest for use of non equity funds and incidental cost that an entity incurs in arranging those funds.
5. ***Normal Capacity***: Normal Capacity is the production achieved or achievable on an average over a number of periods or seasons under normal circumstances taking into account the loss of capacity resulting from planned maintenance (Adapted from CAS 2).
6. ***Production Overheads***: Indirect costs involved in the production of a product or in rendering service.
7. ***Repairs and Maintenance Cost***: Cost of all activities which have the objective of maintaining or restoring an asset in or to a state in which it can perform its required function at intended capacity and efficiency.
8. ***Standard Cost***: A predetermined cost of a product or service based on technical specifications and efficient operating conditions.

Principles of Measurement

1. Repairs and maintenance cost shall be the aggregate of direct and indirect cost relating to repairs and maintenance activity.
2. Cost of in-house repairs and maintenance activity shall include cost of materials, consumable stores, spares, manpower, equipment usage, utilities, and other resources used in such activity.
3. Cost of repairs and maintenance activity carried out by outside contractors inside the entity shall include charges payable to the contractor and cost of materials, consumable stores, spares, manpower, equipment usage, utilities, and other costs incurred by the entity for such jobs.

Disclosures

The cost statements shall disclose the following:

(*i*) The basis of distribution of repairs and maintenance cost to the cost objects/cost units. Where standard cost is applied in repairs and maintenance cost, the price and usage variances.

(*ii*) Repairs and maintenance cost of Jobs done in-house and out sourced separately.

(*iii*) Cost of major overhauls, asset category wise and the basis of amortisation.

(*iv*) Repairs and maintenance cost paid/payable to related parties (Related party as per the applicable legal requirements relating to the cost statement as on the date of the statement).

(*v*) Repairs and maintenance cost incurred in foreign exchange.

(*vi*) Any Subsidy/Grant/Incentive or any amount of similar nature received/ receivable reduced from repairs and maintenance cost.

(*vii*) Any credits / recoveries relating to the repairs and maintenance cost.

(*viii*) Any abnormal portion of the repairs and maintenance cost. Penalties and damages excluded from the repairs and maintenance cost.

CAS - 13
Cost Accounting Standard on "Cost of Service Cost Centre"

This standard deals with the principles and methods of determining the cost of Service Cost Centre. This standard covers the Service Cost Centre as defined in this standard. It excludes Utilities and Repairs & Maintenance Services dealt with in CAS-8 and CAS-12 respectively.

Definitions

The Following Terms Are Being Used In This Standard With The Meaning Specified:

1. ***Abnormal Cost***: An unusual or atypical cost whose occurrence is usually irregular and unexpected and/ or due to some abnormal situation of the production or operation (Adapted from CAS 1 paragraph 6.5.19).
2. ***Administrative Overheads***: Cost of all activities relating to general management and administration of an entity.
3. ***Cost Object***: An activity, contract, cost centre, customer, process, product, project, service or any other object for which costs are ascertained.
4. ***Distribution Overheads***: Distribution overheads, also known as distribution costs, are the costs incurred in handling a product or service from the time it is ready for despatch or delivery until it reaches the ultimate consumer including the units receiving the product or service in an inter-unit transfer.
5. ***Imputed Cost***: Notional cost, not involving cash outlay, computed for any purpose.
6. ***Interest and Finance Charges***: Interest, including any payment in the nature of interest for use of non equity funds and incidental cost that an entity incurs in arranging those funds.
7. ***Marketing Overheads***: Marketing overheads comprise of selling overheads and distribution overheads.
8. ***Production Overheads***: Indirect costs involved in the production of a product or in rendering service.
9. ***Selling Overheads***: Selling overheads are the expenses related to sale of products or services and include all indirect expenses incurred in selling the products or services.
10. ***Standard Cost***: A predetermined cost of a product or service based on technical specifications and efficient operating conditions.

11. ***Stand-by service***: Any facility created as backup against any failure of the main source of service.
12. ***Support-Service Cost Centre***: The cost centre which primarily provides auxiliary services across the entity.

Disclosures

The cost statements shall disclose the following:

(*i*) The basis of distribution of cost of each service cost centre to the consuming centres.

(*ii*) The cost of purchase, production, distribution, marketing and price of services with reference to sales to outside parties.

(*iii*) Where the cost of service cost centre is disclosed at standard cost, the price and usage variances.

(*iv*) The cost of services received from/rendered to related parties (Related party as per the applicable legal requirements relating to the cost statement as on the date of the statement).

(*v*) Cost of service cost centre incurred in foreign exchange.

(*vi*) Any Subsidy/Grant/Incentive and any such payment reduced from cost of Service Cost Centre.

(*vii*) Credits/recoveries relating to the cost of Service Cost Centre.

(*viii*) Any abnormal cost excluded from cost of Service Cost Centre Penalties and damages paid excluded from cost of Service Cost Centre.

CAS - 14

Cost Accounting Standard on "Pollution Control Cost"

This standard deals with principles and methods of determining the Pollution control costs. This standard deals with the principles and methods of classification, measurement and assignment of pollution control costs, for determination of cost of product or service, and the presentation and disclosure in cost statements. The objective of this standard is to bring uniformity and consistency in the principles and methods of determining the Pollution Control Costs with reasonable accuracy.

Definitions

1. ***Air Pollutant***: Air Pollutant means any solid, liquid or gaseous substance (including noise) present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment (Section 2 (*a*) of The Air (Prevention and Control of Pollution) Act, 1981).
2. ***Air Pollution***: Air pollution means the presence in the atmosphere of any air pollutant (Section 2 (*b*) of The Air (Prevention and Control of Pollution) Act, 1981).
3. ***Cost Object***: An activity, contract, cost centre, customer, process, product, project, service or any other object for which costs are ascertained.
4. ***Direct Expenses***: Expenses relating to manufacture of a product or rendering a service, which can be identified or linked with the cost object other than direct material cost and direct employee cost (Adapted from CAS - 10).
5. ***Environment***: Environment includes water, air and land and the inter-relationship which exists among and between water, air and land, and human beings, other living creatures, plants, micro-organism and property (Section 2 (*a*) of The Environment (Protection) Act, 1986).
6. ***Environmental Pollutant***: Environmental Pollutant means any solid, liquid or gaseous substance present in such concentration as may be, or tend to be, injurious to environment (Section 2 (*b*) of The Environment (Protection) Act, 1986).

7. ***Environment Pollution***: Environmental pollution means the presence in the environment of any environmental pollutant (Section 2 (c) of The Environment (Protection) Act, 1986).
8. ***Imputed Costs***: Notional cost, not involving cash outlay, computed for any purpose.
9. ***Interest and Finance Charges***: Interest, including any payment in the nature of interest for use of non equity funds and incidental cost that an entity incurs in arranging those funds.
10. ***Normal Capacity***: Normal Capacity is the production achieved or achievable on an average over a number of periods or seasons under normal circumstances taking into account the loss of capacity resulting from planned maintenance (Adapted from CAS 2).
11. ***Pollution Control***: Pollution Control means the control of emissions and effluents into environment. It constitutes the use of materials, processes, or practices to reduce, minimize, or eliminate the creation of pollutants or wastes. It includes practices that reduce the use of toxic or hazardous materials, energy, water, and/ or other resources.
12. ***Production Overheads***: Indirect costs involved in the production of a product or in rendering service.

Disclosures

The cost statements shall disclose the following:

(*i*) The basis of distribution of Pollution Control cost to the cost objects/cost units.
(*ii*) Where standard cost is applied in Pollution Control cost, the price and usage variances.
(*iii*) Pollution Control cost of Jobs done in-house and out sourced separately.
(*iv*) Pollution Control cost paid/payable to related parties (Related party as per the applicable legal requirements relating to the cost statement as on the date of the statement) Pollution Control cost incurred in foreign exchange.
(*v*) Any Subsidy/Grant/Incentive or any amount of similar nature received/receivable reduced from Pollution Control cost.
(*vi*) Any credits/recoveries relating to the Pollution Control cost.
(*vii*) Any abnormal portion of the Pollution Control cost.
(*viii*) Penalties and damages excluded from the Pollution Control Cost.
(*ix*) Related party as per the applicable legal requirements relating to the cost statement as on the date of the statement

CAS - 15
Cost Accounting Standard on "Selling and Distribution Overheads"

The objective of this standard is to bring uniformity and consistency in the principles and methods of determining the Selling and Distribution Overheads with reasonable accuracy. This standard should be applied to cost statements, which require classification, measurement, assignment, presentation and disclosure of Selling and Distribution Overheads including those requiring attestation.

Definitions

1. ***Abnormal Cost***: An unusual or a typical cost whose occurrence is usually irregular and unexpected and/or due to some abnormal situation of the production or operation (CAS 3).
2. ***Absorption of Overheads***: Assigning of overheads to cost objects by means of appropriate absorption rate.

   Overhead Absorption Rate = Overheads of the Cost object/Quantum of base.
3. ***Cost Object***: An activity, contract, cost centre, customer, process, product, project, service or any other object for which costs are ascertained.

4. ***Distribution Overheads***: Distribution overheads, also known as distribution costs, are the costs incurred in handling a product or service from the time it is ready for despatch or delivery until it reaches the ultimate consumer including the units receiving the product or service in an inter-unit transfer.
5. ***Imputed Costs***: Notional cost, not involving cash outlay, computed for any purpose.
6. ***Indirect Expenses***: Expenses which cannot be directly attributed to a particular cost object.
7. ***Marketing Overheads***: Marketing overheads comprise of selling overheads and distribution overheads.
8. ***Overheads***: Overheads comprise costs of indirect materials, indirect employees and indirect expenses.
9. ***Selling Overheads***: Selling overheads are the expenses related to sale of products or services and include all indirect expenses incurred in selling the products or services.

Disclosures

The cost statements shall disclose the following:

(*i*) The basis of distribution of Selling and Distribution Overheads to the cost objects.
(*ii*) Selling and Distribution Overheads incurred in foreign exchange.
(*iii*) Cost of Selling and Distribution services rendered to related parties (Related party as per the applicable legal requirements relating to the cost statement as on the date of the statement).
(*iv*) Any Subsidy / Grant / Incentive and any such payment reduced from Selling and Distribution Overheads.
(*v*) Credits / recoveries relating to the Selling and Distribution Overheads.
(*vi*) Penalties and damages excluded from the Selling and Distribution Overheads.

CAS -16
Cost Accounting Standard on "Depreciation and Amortisation"

The objective of this standard is to bring uniformity and consistency in the principles and methods of determining the Depreciation and Amortisation with reasonable accuracy. This standard shall be applied to cost statements which require measurement, assignment, presentation and disclosure of Depreciation and Amortisation, including those requiring attestation.

Definitions

1. ***Amortisation***: Amortisation is the systematic allocation of the depreciable amount of an intangible asset over its useful life.
2. ***Asset***: An Asset is a resource; (*a*) controlled by an entity as a result of past events; and (*b*) from which future economic benefits are expected to flow to the entity.
3. ***Cost Object***: An activity, contract, cost centre, customer, process, product, project, service or any other object for which costs are ascertained.
4. ***Current Asset***: An entity shall classify an asset as current when: (*a*) it expects to realise the asset, or intends to sell or consume it, in its normal operating cycle; (*b*) it holds the asset primarily for the purpose of trading; (*c*) it expects to realise the asset within twelve months after the reporting period; or (*d*) the asset is cash or a cash equivalent unless the asset is restricted from being exchanged or used to settle a liability for at least twelve months after the reporting period.
5. ***Depreciation***: Depreciation is the systematic allocation of the depreciable amount of an asset over its useful life.

6. ***Depreciable Amount***: The cost of an asset, or other amount substituted for cost in the financial statement, less its residual value.
7. ***Depreciable Fixed and Intangible Assets:*** These are Assets which: (*i*) are expected to be used during more than one accounting period; (*ii*) have a limited useful life; and (*iii*) are held by an enterprise for use in the production or supply of goods and services, for rental to others, or for administrative purposes and not for the purpose of sale in the ordinary course of business.
8. ***Residual (salvage) Value***: The estimated amount that an entity would currently obtain from disposal of an asset, after deducting the estimated costs of disposal, if the assets were already of the age and in the condition expected at the end of its useful life.
9 ***Useful Life of Asset***: Useful life of asset is either: (*a*) the period over which an asset is expected to be available for use by an entity ; or (*b*) the number of production or similar units expected to be obtained from use of the asset by the entity.

Disclosures

The cost statement shall disclose the following:

(*i*) The basis of distribution of Depreciation and Amortisation to the cost objects.
(*ii*) Any credits /recoveries relating to Depreciation and Amortisation.
(*iii*) Additional Depreciation on account of revaluation of asset, which is not included in cost.
(*iv*) Amount of depreciation that is not included in cost because of temporary retirement of assets from production of goods and services.

CAS - 17
Cost Accounting Standard on "Interest and Financing Charges"

The objective of this standard is to bring uniformity and consistency in the principles, methods of determining and assigning the Interest and Financing Charges with reasonable accuracy.

Definitions

1. ***Asset***: An Asset is a resource; (*a*) controlled by an entity as a result of past events; and (*b*) from which future economic benefits are expected to flow to the entity.
2. ***Cost Object***: An activity, contract, cost centre, customer, process, product, project, service or any other object for which costs are ascertained.
3. ***Current Asset***: An entity shall classify an asset as current when: (*a*) it expects to realise the asset, or intends to sell or consume it, in its normal operating cycle; (*b*) it holds the asset primarily for the purpose of trading; (*c*) it expects to realise the asset within twelve months after the reporting period; or (*d*) the asset is cash or a cash equivalent unless the asset is restricted from being exchanged or used to settle a liability for at least twelve months after the reporting period.
4. ***Current Liabilities***: An entity shall classify a liability as current when: (*a*) it expects to settle the liability in its normal operating cycle; (*b*) it holds the liability primarily for the purpose of trading; (*c*) the liability is due to be settled within twelve months after the reporting period; or (*d*) it does not have an unconditional right to defer settlement of the liability for at least twelve months after the reporting period.
5. ***Imputed Costs***: Notional cost, not involving cash outlay, computed for any purpose.
6. ***Intangible Asset***: An intangible asset is an identifiable non-monetary asset without physical substance.
7. ***Interest and Finance Charges***: Interest, including any payment in the nature of interest for use of non equity funds and incidental cost that an entity incurs in arranging those funds.

The terms Interest and financing charges, finance costs, and borrowing costs are used interchangeably.

8. ***Net Current Asset***: Net current asset is the excess of current assets over current liabilities.

   Current Liabilities shall include short term borrowings and that part of long term borrowings which are classified as current liabilities Short term borrowing is the borrowing which is repayable within one year from the date of disbursal as per Loan Agreement. Long term borrowing is the borrowing which is repayable after one year from the date of disbursal as per Loan Agreement.

Disclosures

The cost statements shall disclose the following:

(*i*) The basis of distribution of Interest and Financing Charges to the cost objects/cost units.

(*ii*) Where predetermined cost is applied in Interest and Financing Charges, the rate and usage variances.

(*iii*) Interest and Financing Charges paid/payable to related parties.

(*vi*) Interest and Financing Charges incurred in foreign exchange.

(*v*) Any Subsidy/Grant/Incentive or any amount of similar nature received/receivable reduced Interest and Financing Charges. Disclosures shall be made only where material, significant and quantifiable. Interest and Financing Charges incurred relating to prior periods and taken to reconciliation directly shall be disclosed separately.

CAS -18
Cost Accounting Standard on "Research and development Costs"

This standard deals with the principles and methods of determining the Research, and Development Costs and their classification, measurement and assignment for determination of the cost of product or service, and the presentation and disclosure in cost statements.

The objective of this standard is to bring uniformity and consistency in the principles and methods of determining the Research, and Development Costs with reasonable accuracy and presentation of the same.

Definitions

The following terms are being used in this standard with the meaning specified.

1. ***Abnormal Cost***: An unusual or a typical cost whose occurrence is usually irregular and unexpected and/ or due to some abnormal situation of the production or operation (Adapted from CAS 1).
2. ***Cost Object***: An activity, contract, cost centre, customer, process, product, project, service or any other object for which costs are ascertained.
3. ***Direct Employee Cost***: Employee cost, which can be attributed to a Cost Object in an economically feasible way (Adapted from CAS 1).
4. ***Direct Expenses***: Expenses relating to manufacture of a product or rendering a service, which can be identified or linked with the cost object other than direct material or direct employee cost (Adapted from CAS 1).
5. ***Direct Materials***: Materials, the cost of which can be attributed to a cost object in an economically feasible way (Adapted from CAS 1).
6. ***Imputed Costs***: Notional cost, not involving cash outlay, computed for any purpose.
7. ***Indirect Employee Cost***: The employee cost which cannot be directly attributed to a particular cost object.

8. ***Indirect Material Cost***: Material cost that cannot be directly attributed to a particular cost object.
9. ***Indirect Expenses***: Expenses which cannot be directly attributed to a particular cost object.
10. ***Overheads***: Overheads comprise costs of indirect materials, indirect employees and indirect expenses.
11. ***Research and Development***:
    (*i*) ***Research***: Research is original and planned investigation undertaken with the prospect of gaining new scientific or technical knowledge and understanding (Adapted AS 26).
    (*ii*) ***Development Cost***: Development cost is the cost for application of research finding or other knowledge to a plan or design for the production of new or substantially improved materials, devices, products, processes, systems, or services before the start of commercial production or use.
    (*iii*) ***Research Cost***: Research cost is the cost of original and planned investigation undertaken with the prospect of gaining new scientific or technical knowledge and understanding.

Disclosures

The cost statements shall disclose the following:

1. (*i*) The basis of accumulation and assignment of Research and Development costs.
   (*ii*) The Research, and Development costs paid to related parties (Related party as per the applicable legal requirements relating to the cost statement as on the date of the statement).
   (*iii*) Credit/recoveries from related parties Research, and Development cost incurred in foreign exchange.
   (*iv*) Any Subsidy/Grant/Incentive and any such payment reduced from Research, and Development cost. Credits/recoveries deducted from the Research, and Development cost.
   (*v*) Any abnormal cost excluded from Research, and Development cost including cost of abandoned projects and research activities considered abnormal.
   (*vi*) Penalties and damages paid *etc*., excluded from Research and Development cost.
2. Any change in the cost accounting principles and methods applied for the measurement and assignment of the Research, and Development cost during the period covered by the cost statement that has a material effect on the Research, and Development cost shall be disclosed. Where the effect of such change is not ascertainable wholly or partly the fact shall be indicated.
3. Disclosures shall be made only where material, significant and quantifiable.
4. Disclosures shall be made in the body of the Cost Statement or as a foot note or as a separate schedule.

CAS - 19
Cost Accounting Standard on "Joint Costs"

The standard deals with the principles and methods of measurement and assignment of Joint Costs and the presentation and disclosure in cost statement.

Definitions:

The following terms are being used in this standard within the meaning specified.

1. ***By-Product***: Product with relatively low value produced incidentally in the manufacturing of the product or service.

2. ***Cost Object***: An activity, contract, cost centre, customer, process, product, project, service or any other object for which costs are ascertained.
3. ***Imputed Cost***: Notional cost, not involving cash outlay, computed for any purpose.
4. ***Joint Costs***: Joint costs are the cost of common resources used to produce two or more products or services simultaneously.
5. ***Joint Product***: Products or services that are produced simultaneously, by the same process, identifiable at the end of the process and recognised as main products or services having sufficient value.
6. ***Scrap***: Discarded material having no or insignificant value and which is usually either disposed off without further treatment (other than reclamation and handling) or reintroduced into the process in place of raw material.
7. ***Split off Point***: The point in the production process at which joint products become separately identifiable. The terms split off point and separation point are used interchangeably.
8. ***Waste***: Material lost during production or storage and discarded material which may or may not have any value.

Disclosures

1. The Cost statement shall disclose the basis of allocation of Joint costs to individual products and the value assigned to the By-Products.
2. The disclosure should be made only where material, significant & quantifiable.
3. Disclosures shall be made in the body of Cost Statements or as a foot note or as a separate schedule.
4. Any change in the cost accounting principles and methods applied for the measurement and assignment of the Joint costs and the value assigned to by-product during the period covered by the cost statement which has a material effect on the Joint/ By-Products shall be disclosed. Where the effect of such change is not ascertainable wholly or partly the fact shall be indicated.

CAS - 20
Cost Accounting Standard on Royalty and Technical know-how Fee

This standard deals with the principles and methods of classification, measurement and assignment of the amount of Royalty and Technical Know-how Fee, for determination of the cost of product or service, and their presentation and disclosure in cost statements.

Definitions

The following terms are being used in this standard with the meaning specified.

1. ***Cost Object***: An activity, contract, cost centre, customer, process, product, project, service or any other object for which costs are ascertained.
2. ***Imputed Costs***: Notional cost, not involving cash outlay, computed for any purpose.
3. ***Interest and Finance Charges***: Interest, including any payment in the nature of interest for use of non equity funds and incidental cost that an entity incurs in arranging those funds.
4. ***Royalty***: Royalty is any consideration for the use of asset (tangible and/or intangible) to the owner.
5. ***Technical Service Fee***: Technical service fee is any consideration payable to provider of technical or managerial services.

Disclosures

The cost statements shall disclose the following:

(*i*) The basis of distribution of the amount Royalty and Technical Know-how fee to the cost objects/ cost units.

(*ii*) Quantity and the related rate of items of the amount of Royalty and Technical Know-how fee, as applicable.

(*iii*) Royalty and Technical Know-how fee paid/ payable to related parties (Related party as per the applicable legal requirements relating to the cost statement as on the date of the statement).

(*iv*) Royalty and Technical Know-how fee incurred in foreign exchange.

(*v*) Any Subsidy/Grant/Incentive and any such payment reduced from the amount of Royalty and Technical Know-how fee.

(*vi*) Credits/recoveries relating to the amount of Royalty and Technical Know-how fee.

(*vii*) Penalties and damages excluded from the amount of Royalty and Technical Know-how fee.

CAS - 21

Cost Accounting Standard on "Quality Control"

The standard deals with the principles and methods of measurement and assignment of Quality Control cost and the presentation and disclosure in cost statement. The objective of this standard is to bring uniformity, consistency in the principles, methods of determining and assigning Quality Control Cost with reasonable accuracy.

Definitions

The following terms are being used in this standard with the meaning specified.

1. ***Abnormal Cost***: An unusual or a typical cost whose occurrence is usually irregular and unexpected and/ or due to some abnormal situation of the production or operation (Adopted from CAS 1).
2. ***Cost Object***: An activity, contract, cost centre, customer, process, product, project, service or any other object for which costs are ascertained.
3. ***Defectives***: Materials, products or intermediate products that do not meet quality standards. This may include reworks or rejects.
   (*i*) *Rework*: Defectives which can be brought up to the standards by putting in additional resources. Rework includes repairs, reconditioning and refurbishing.
   (*ii*) *Rejects*: Defectives which cannot meet the quality standards even after putting in additional resources. Rejects may be disposed off as waste or sold for salvage value or recycled in the production process.
4. ***Imputed Costs***: Notional cost, not involving cash outlay, computed for any purpose
5. ***Interest and Finance Charges***: Interest, including any payment in the nature of interest for use of non equity funds and incidental cost that an entity incurs in arranging those funds.
6. ***Overheads***: Overheads comprise costs of indirect materials, indirect employees and indirect expenses.
7. ***Quality***: Quality is the conformance to requirements or specifications. The quality of a product or service is fitness of that product or service for meeting its intended use as required by customer.
8. ***Quality Control***: A procedure or a set of procedures exclusively designed to ensure that the manufactured products or performed service adhere to a defined set of quality criterion or meets requirement of the client or the customer.

9. ***Quality Control Cost***: Cost of resources consumed towards quality control procedures.
10. ***Scrap***: Discarded material having no or insignificant value and which is usually either disposed off without further treatment (other than reclamation and handling) or reintroduced into the process in place of raw material.
11. ***Waste and Spoilage***: (1) *Waste*: Material lost during production or storage and discarded material which may or may not have any value. (2) *Spoilage*: Production that does not meet the quality requirements or specifications and cannot be rectified economically.

Disclosures

The cost statements shall disclose the following:

1. The basis of distribution of Quality Control cost to the cost objects/ cost units.
2. Quantity and Cost of resources used for Quality Control cost as applicable.
3. Quality Control cost paid/ payable to related parties (Related party as per the applicable legal requirements relating to the cost statement as on the date of the statement).
4. Quality Control cost incurred in foreign exchange.
5. Any abnormal portion of the Quality Control cost.
6. Penalties and damages excluded from the Quality Control cost.

Disclosures shall be made only where material, significant and quantifiable. Disclosures shall be made in the body of the Cost Statement or as a foot note or as a separate schedule. Any change in the cost accounting principles and methods applied for the measurement and assignment of the Quality Control cost during the period covered by the cost statement which has a material effect on the Quality Control cost shall be disclosed.

CAS - 22
Cost Accounting Standard on "Manufacturing Cost"

This standard deals with the principles and methods of classification, measurement and assignment for determination of the Manufacturing Cost of excisable goods and the presentation and disclosure in cost statements. The objective of this standard is to bring uniformity and consistency in the principles and methods of determining the Manufacturing Cost of excisable goods.

Definitions

The following terms are being used in this standard with the meaning specified.

1. ***Abnormal and Non-recurring Cost***: An unusual or a typical cost whose occurrence is usually irregular and unexpected and/or due to some abnormal situation of the production or operation.
2. ***Administrative Overheads:*** Cost of all activities relating to general management and administration of an organisation.
3. ***Captive Consumption***: Captive Consumption means the consumption of goods manufactured by one division or unit and consumed by another division or unit of the same organization or related undertaking for manufacturing another product(s).
4. ***Defectives***: End Product and/or intermediate product units that do not meet quality standards. This may include reworks or rejects. An intermediate product is a product that might require further processing before it is saleable to the ultimate consumer. *Reworks:* Defectives which can be brought up to the standards by putting in additional resources. *Rejects*: Defectives which cannot meet the quality standards even after putting in additional resources.
5. ***Depreciation***: Depreciation is a measure of the wearing out, consumption or other loss of value of a depreciable asset arising from use, efflux of time or obsolescence through

technology and market changes. Depreciation does not include impairment loss. Depreciation is allocated so as to charge a fair proportion of the depreciable amount in each accounting period during the estimated useful life of the asset. Depreciable amount of a depreciable asset is its historical cost, or other amount substituted for historical cost in the financial statements, less the estimated residual value.

6. ***Direct Expenses***: Expenses relating to manufacture of an excisable good, which can be identified to such excisable goods other than direct material cost and direct employee cost.
7. ***Employee Cost***: The aggregate of all kinds of consideration paid, payable and provisions made for future payments for the services rendered by employees of an enterprise (including temporary, part time and contract employees). Consideration includes wages, salary, contractual payments and benefits, as applicable or any amount paid or payable on behalf of employee. This is also known as Labour Cost. *Direct Employee Cost*: The cost of employees which can be attributed to an excisable goods in an economically feasible way. *Indirect Employee Cost*: The cost of employees which cannot be directly attributed to a particular excisable goods.
8. ***Interest and Finance Costs***: Costs incurred by an enterprise in connection with the borrowing of funds.
9. ***Manufacturing Cost***: Manufacturing cost of an excisable goods is the aggregate of costs of all resources used in the process of its manufacturing. Manufacturing Cost and Cost of Production are used interchangeably.
10. ***Manufacturing Overheads***: Indirect costs involved in the manufacturing process. The terms Manufacturing Overheads, Factory Overheads, Works Overheads and Production Overheads have the same meaning and are used interchangeably. Manufacturing overheads shall include administration cost relating to production, factory, works or manufacturing and depot.
11. ***Normal Capacity*** is the production achieved or achievable on an average over a period or season under normal circumstances taking into accounts the loss of capacity resulting from planned maintenance. Capacity may be determined in terms of units of production or equivalent machine or man hours.
12. ***Packing Material Cost***: The cost of material of any nature used for the purpose of packing of excisable goods.
13. ***Quality Control Cost***: The quality control cost is the expenses incurred relating to quality control activities for adhering to quality standard. These expenses include salaries & wages relating to employees engaged in quality control activity and other related expenses.
14. ***Repairs & Maintenance Cost***: Cost of all activities which have the objective of maintaining or restoring an asset in or to a state in which it can perform its required function at intended capacity and efficiency.
15. ***Research and Development Cost***: The research and development cost incurred for development and improvement of the process or the excisable goods.
16. ***Royalty***: Royalty is compensation/periodic payments for the use of asset (tangible and/or intangible) to the owner for use of his asset in the production/manufacture, selling and distribution by an entity.

Disclosures

Disclosure shall be made only where material, significant and quantifiable. If there is any change in cost accounting principles and practices during the period under review which may materially affect the manufacturing cost of excisable goods in terms of comparability with previous period(s), the same shall be disclosed.

CAS - 23
Cost Accounting Standard on "Overburden Removal Cost"

The standard deals with the principles and methods of measurement and assignment of Overburden Removal Cost and the presentation and disclosure in cost statements. The objective of this standard is to bring uniformity, consistency in the principles, methods of determining and assigning Overburden Removal Cost with reasonable accuracy.

Definitions

1. ***Abnormal Cost***: An unusual or a typical cost whose occurrence is usually irregular and unexpected and/ or due to some abnormal situation of the production or operations.
2. ***Administrative Overheads***: Cost of all activities relating to general management and administration of an organization.
3. ***Amortization***: Amortization is the systematic allocation of the depreciable amount of an intangible asset over its useful life.
4. ***Cost Object***: This includes a product, service, cost centre, activity, sub-activity, project, contract, customer or distribution channel or any other unit in relation to which costs are ascertained. Activity includes mining operations also.
5. ***Current Ratio***: the ratio of overburden removed to mineral produced in a particular patch of mine during the year.
6. ***Depreciation***: Depreciation is a measure of the wearing out, consumption or other loss of value of a depreciable asset arising from use, efflux of time or obsolescence through technology and market changes. Depreciation is allocated so as to charge a fair proportion of the depreciable amount in each accounting period during the estimated useful life of the asset.
7. ***Imputed Costs***: Hypothetical or notional costs, not involving cash outlay, computed for any purpose at any time.
8. ***Interest and Finance Charges***: Interest, including any payment in the nature of interest for use of non-equity funds and incidental cost that an entity incurs in arranging those funds.
9. ***Mines Overheads***: Indirect costs involved in the mining process for rendering services. This relates to the activities of both Mineral Extraction and Overburden Removal.
10. ***Mining Plan***: It is the plan expected to provide information required to measure the stripping activity with reasonable consistency.
11. ***Overheads***: Overheads comprise of indirect materials, indirect employee costs and indirect expenses which are not directly identifiable or allocable to a cost object.
12. ***Overburden:*** It is the overlying materials generally having no commercial value.
13. ***Overburden Removal Cost***: It is the cost incurred to remove the overlying material from the mine site.
14. ***Ratio Variance***: It is the variance between current ratio and standard /average stripping ratio in terms of quantity of mineral produced during the period.
15. ***Repair and Maintenance Cost***: Cost of all activities which have the objective of maintaining or restoring an asset in or to a state in which it can perform its required function at intended capacity and efficiency.
16. ***Stripping Activity***: It is the activity of overburden removal that benefits the identified component of an ore to be mined by the entity.
17. ***Stripping Ratio***: Stripping ratio is ratio of excavation of overburden to ore. Generally, overburden is measured in cubic metres and ore in tonnes. Therefore, the Stripping Ratio is equal to Volume of Overburden.

18. ***Standard Stripping Ratio***: This is the ratio between the total quantity of overburden to be removed (in cubic meters) and the total mineral to be extracted (in tonnes) during the Projected life of the project.
19. ***Advance Stripping:*** Advance Stripping is the excess overburden removed in between the overburden bench and assumed angle of repose drawn from the starting of Mineral bench from the surface of Mineral than what is needed for extraction of Mineral.

Disclosures

The cost statements shall disclose the following:

(*i*) The basis of determining the overburden removal cost.
(*ii*) Where cost of removal is considered on the basis of standard ratio, any variation positive or negative from the current ratio.
(*iii*) Any subsidy grant/ incentive and any such payment reduced from the cost of overburden removal.
(*iv*) Credit/ recoveries relating to overburden removal.
(*v*) Any abnormal cost excluded from overburden removal cost.
(*vi*) Penalties and damages excluded from the overburden removal cost.

Disclosures shall be made only where material, significant and quantifiable. Disclosures shall be made in the body of the Cost Statement or as a foot note or as a separate schedule.

Any change in the cost accounting principles and methods applied for the measurement and assignment of the overburden removal cost during the period covered by the cost statement which has a material effect on the overburden removal cost shall be disclosed. Where the effect of such change is not ascertainable wholly or partly the fact shall be indicated.

CAS - 24
Cost Accounting Standard on "Treatment of Revenue in Cost Statements"

This standard deals with the principles and methods of classification, measurement, treatment and assignment of revenue and its presentation and disclosure in cost statements. The objective of this standard is to bring uniformity and consistency in the principles and methods for treatment of revenue in cost statements with reasonable accuracy.

Definitions

1. ***By-product:*** Product with relatively low value produced incidentally in the manufacturing of the product or service.
2. ***Defectives***: Materials, products or intermediate products that do not meet quality standards. This may include reworks or rejects.
3. ***Intermediate Product***: An intermediate product is a product that requires further processing before it is saleable.
4. ***Joint Product***: Products or services that are produced simultaneously, by the same process, identifiable at the end of the process and recognised as main products or services having sufficient value.
5. ***Net Sales Realization***: It is the revenue from operations net of discounts and indirect taxes.
6. ***Other Income:*** It is the income that cannot be classified as revenue from operations.
7. ***Reporting Period***: It is the period for which the cost statements are prepared.
8. ***Revenue***: The term Revenue will have the same meaning as assigned in the Accounting Standards notified by the Central Government under the Companies (Accounting

Standards) Rules 2006 or in the Indian Accounting Standards notified under the Companies (Indian Accounting Standards) Rules 2015, as applicable.

9. ***Revenue from Operations***: is the income arising in the course of the ordinary activities of an entity from the sale of goods or rendering of services.
10. ***Rejects***: Defectives which cannot meet the quality standards even after putting in additional resources.
11. ***Scrap***: Discarded material having no or insignificant value and which is usually either disposed off without further treatment (other than reclamation and handling) or reintroduced into the process in place of raw material.
12. ***Spoilage***: Production that does not meet the quality requirements or specifications and cannot be rectified economically.
13. ***Waste***: Material lost during production or storage and discarded material which may or may not have any value.

Disclosures

The cost statements shall disclose the following:

(*i*) Revenue from sale of goods or services made to each related party with basis of determining the selling price;

(*ii*) Revenue from by-products and costs of further processing after split-off point, reduced from cost of relevant product;

(*iii*) Amount and nature of any subsidy, grant or incentive received or receivable and included in the revenue.

Any change in the cost accounting principles and methods applied for the measurement and assignment of revenue during the period covered by the cost statement which has a material effect on the revenue shall be disclosed. Where the effect of such change is not ascertainable, wholly or partly, the fact shall be indicated. Disclosures shall be made only where material, significant and quantifiable. Disclosures shall be made in the body of the cost statements or as a foot note or as a separate schedule.

2 Responsibility Accounting

Chapter Outline

- Meaning of Responsibility Accounting
- Responsibility Accounting *vs*. Cost Accounting
- Responsibility Centres
- Pre-requisites to Responsibility Accounting
- Responsibility Reporting
- Levels of Reporting
- Feedback and Feed-forward Controls
- Guidelines for Reporting
- Limitations of Responsibility Accounting
- Divisional Performance Measurement: Financial Measurement
- *Objective Questions*
- *Assignments*

MEANING OF RESPONSIBILITY ACCOUNTING

Responsibility accounting is not yet another branch of accounting like financial or cost accounting. It is only a control system of accounting and reporting.

Under this system, the organisation structure is split into a number of sub-units. Each such sub-unit is placed in charge of a manager. He is, in fact, made responsible for the activities of the sub-unit under his control. Being a supplementary cost control device, responsibility accounting traces costs to these individual managers.

Till recently, most cost accounting systems were designed to accumulate costs for product costing and inventory valuation. As such, they emphasised general cost control. With the available controlling devices, a sincere attempt was made to ascertain and control both product costs and period costs. Cost accounting system was thus directed towards expenditure, and showed the actual costs and where money was spent. However, the system did not pinpoint the individual manager who spent money. As such, the system failed to fix individual responsibility for the money spent.

Responsibility accounting seeks to overcome this limitation. It shifts the emphasis from product costing to divisional performance measurement. The basic feature of responsibility accounting is that every manager is made responsible for the activities which are under his control. His actions are measured by the revenue results achieved by him. Accordingly, responsibility accounting may be defined as "a system designed to accumulate and report costs by individual levels of responsibility. Each supervisory area is charged only with the cost for which it is responsible and over which it has control".

RESPONSIBILITY ACCOUNTING *VS*. COST ACCOUNTING

Cost accounting was evolved with the main objective of ascertaining product cost. Incidentally, it also helped inventory valuation for purposes of balance sheet. With the passage of time, however, the emphasis was shifted from product costing to cost control. Cost finding was subordinated to cost control.

Control is the process of ensuring that the activities of a concern are in conformity with its plans so that its objectives are achieved. A control system is a communications network that monitors the activities within the organisation. Such a system also provides the basis for corrective action. Effective control requires that corrective action is taken in order to make actual performance conform to planned performance.

It is, in this, context that we refer to responsibility accounting. Normally, control of day-to-day operations is in the hands of lower level managers. As such, in order to enable them to effectively control the day-to-day operations, it is necessary to provide them with information at frequent intervals. The information should enable them to compare the actual performance with budgeted performance. Such information may not help them control past inefficiencies. However, it certainly facilitates isolation of such past inefficiencies and the reasons for the same. This, in turn, facilitates further action in preventing the recurrence of the same in future. The system that provides reports facilitating comparison of budgeted performance with the actual performance is known as responsibility accounting.

Thus, responsibility accounting is only an aspect of cost accounting. Its purpose is to facilitate control of day-to-day performance. In other words, one of the fundamental

objectives of cost accounting, viz., cost control is achieved through the system of responsibility accounting.

RESPONSIBILITY CENTRES

Responsibility accounting is based on the recognition of individual areas of responsibility as specified in the organisation structure of a business unit. These areas of responsibility are known as 'responsibility centres.' The Official Terminology of the *CIMA* Institute defines a responsibility centre as "a department or organisational function whose performance is the direct responsibility of a specific manager".

A responsibility centres is thus a segment or sub-unit of an organisation. It is under the control of an individual manager. He is directly responsible for the segment's performance. The Official Terminology recognises the following types of responsibility centres:

(*i*) **Budget Centre:** This is "a centre for which an individual budget is drawn up".
(*ii*) **Contribution Centre:** It is a "profit centre whose expenditure is reported on a marginal or direct cost basis".
(*iii*) **Cost Centre:** "A production or service location, function, activity or item of equipment for which costs are accumulated", is known as a cost centre.
(*iv*) I**nvestment Centre:** "A profit centre with additional responsibilities for capital investment and possibly for financing, and whose performance is measured by its return on investment".
(*v*) **Profit Centre:** A profit centre is "a part of a business accountable for both costs and revenues".
(*vi*) **Revenue Centre:** According to the Official Terminology, a revenue centre is "a centre devoted to raising revenue with no responsibility for costs, e.g., a sales centre. Often used in a not-for-profit organisation".

The same Terminology defines the term "centre" as "a department, area or function to which costs and/or revenues are charged".

PRE-REQUISITES TO RESPONSIBILITY ACCOUNTING

The success or failure of a system of responsibility accounting depends upon the following essential requirements:

(*i*) Well-defined organisation structure,
(*ii*) Proper authority-relationships, i.e., superior-subordinate relationships,
(*iii*) Clear-cut goals and objectives of the organisation,
(*iv*) Responsibility centres,
(*v*) Communication network,
(*vi*) Frequent performance reports,
(*vii*) Isolation of inefficiencies and reasons for the same,
(*viii*) Corrective action,
(*ix*) Budgeting performance for future in the light of isolated inefficiencies.

RESPONSIBILITY REPORTING

The objective of responsibility accounting is to accumulate costs and revenue for each responsibility centre so that deviations from budgeted performance can be attributed to

the individual manager in charge of that centre. A system of responsibility accounting postulates the existence of an effective system of communication. As such, the system is implemented by issuing performance reports at frequent intervals.

Responsibility reporting is the issuance of performance reports to managers of responsibility centres informing them of the deviations from the budget in respect of various items of expenses. In the process of reporting, it is necessary to distinguish between controllable and uncontrollable costs. Normally, it is considered appropriate to charge an area of responsibility only those costs that is influenced by the manager of that centre.

Although it is difficult to distinguish between an items of cost that can be controlled and that which is not so amenable, it is absolutely necessary to make such a distinction for purpose of performance reporting. Only then will it be possible to compare the budgeted with the actual costs, bring out the differences, analyse the causes, locate responsibility and take appropriate remedial action to prevent the recurrence of the same.

LEVELS OF REPORTING

The number of responsibility centres in an organisation depends upon the degree of delegation of authority. Deep down decentralisation has the effect of bringing into existence a number of smaller responsibility centres. A problem, therefore, that arises in the course of operating a system of responsibility accounting is that of determining the lowest levels of responsibility for purpose of responsibility reporting.

As pointed out above, this problem arises in the context of decentralisation of authority. Greater the degree of decentralisation, the greater will be the number of responsibility centres. The greater the number of responsibility centres, the greater will be the cost of responsibility reporting. Accordingly, a very small responsibility centre is not worth its existence from the point of view of reporting performance. In case this appears to be so, it may be considered necessary to combine small responsibility centres and treat several of them as a single unit. Reporting will then be this single unit considered as a department and responsibility centre.

FEEDBACK AND FEED-FORWARD CONTROLS

In the context of responsibility accounting, it is necessary to distinguish between feedback and feed-forward controls. According to the definition given by the Official Terminology, feedback system of control is "the measurement of differences between planned output and actual outputs achieved, and the modification of subsequent action and/or plans to achieve future required results".

Feedback control system is thus the process of monitoring output achieved against desired output and, in case of deviation, taking corrective action.

According to the Official Terminology, feed-forward control is "the forecasting of differences between actual and planned outcomes, and the implementation of action, before the event, to avoid such differences". In the case of feed-forward control system, instead of comparing actual output against desired output, forecasts are made of outputs expected at some future time. In case the forecast outputs are different from the desired outputs, action is taken to minimise the differences.

Thus, in the case of feed-forward control system, possible errors are anticipated and steps are taken to overcome or minimise them. This is in contrast with the feed-back control system in the case of which actual errors are identified after the event and corrective action is taken to prevent the recurrence of the same while implementing future actions.

GUIDELINES FOR REPORTING

The essence of responsibility accounting is the issuance of performance reports at frequent intervals. The main purpose behind such reporting is to inform the responsibility centre managers of deviations of actual performance from the budgeted performance and to take corrective action for the future.

Comparison of actual performance with the budgeted performance is, essentially, in terms of costs or expenses. For this purpose, it is necessary to distinguish between controllable costs and uncontrollable costs. But, it is not always easy to decide which items of cost are controllable and which of them are uncontrollable. Controllability depends upon two factors, *viz*., level of management and time span involved.

It is necessary to remember that when the organisation is viewed as a whole, there is nothing like uncontrollable costs. All costs can be controlled. Similarly, the cost of any department can be reduced to zero by closing down that department. As such, there is nothing like uncontrollable costs. What is, therefore, necessary is to know that for any item of cost there is someone in the organisation who can influence it. Accordingly, the question is which of the costs are controllable by a specific responsibility centre?

LIMITATIONS OF RESPONSIBILITY ACCOUNTING

A system of responsibility accounting provides a built-in means of evaluating a manager's performance. Timely reports of performance ensure prompt corrective action directed towards deviations from the budgeted performance. In spite of these advantages, responsibility accounting suffers from the following limitations:

(*i*) It is difficult to establish a sound organisation structure with clearly defined authority and responsibility. This is so owing to the interdependent nature of many departments.

(*ii*) It is equally difficult to match the responsibility centres and the chart of accounts for collecting costs by such centres.

(*iii*) Individual interest may come into conflict with the interests of the organisation.

(*iv*) The system may not work well unless it has the support of the people who operate the system. Since the person who incurs costs is to be held responsible for each item of cost, he should willingly accept responsibility for deviations.

(*v*) The system does not take into consideration the reactions of those who are involved in it.

Illustration 1:

Home Comforts Ltd. deals in three product, Ace, Nice and Grace, which are sold directly through salesmen in three zones, Prime, Extension and Outreach. The responsibility for sales promotion rests with the headquarters and so does the overall control of distribution and sales.

Cost of sales are:	Ace	85 per cent of sales,
	Nice	80 per cent of sales,
	Grace	75 per cent of sales.

Details of sales and selling and distribution expenses for the year are as follows:

		Sales	*Selling and distribution expenses allocated direct*
		(₹)	(₹)
Prime zone:	Ace	9,00,000	63,990
	Nice	9,00,000	84,465
	Grace	4,50,000	47,160
		22,50,000	1,95,615
Extension zone:	Ace	6,75,000	46,710
	Nice	4,50,000	47,700
	Grace	2,25,000	23,940
		13,50,000	1,18,350
Outreach zone:	Ace	2,25,000	18,900
	Nice	1,80,000	15,165
	Grace	4,95,000	66,375
		9,00,000	1,00,440

Selling and distribution expenses at headquarters are as follows:

Office expenses	₹ 94,500
Advertisement	1,35,000
Other Expenses	1,21,500

Advertisement costs are allocated to zones and products on the basis of sales. Office expenses and other expenses are apportioned equally to the zones or the products, while computing the profit or loss for the zones or the products as the case may be.

Prepare comparative profit and loss statement presenting zonal performance as distinct from product perfosrmance.

(*I.C.W.A. Final*)

Solution:

Comparative Profit and Loss Statement of Zonal Performance

Particulars	*Zones*			
	Prime (₹)	*Extension* (₹)	*Outreach* (₹)	*Total* (₹)
Sales revenue (*A*)	22,50,000	13,50,000	9,00,000	45,00,000
Less: Cost of sales:				
Ace (85% of sales)	7,65,000	5,73,750	1,91,250	15,30,000
Nice (80% of sales)	7,20,000	3,60,000	1,44,000	12,24,000
Grace (75% of sales)	3,37,500	1,68,750	3,71,250	8,77,500
Total (*B*)	18,22,500	11,02,500	7,06,500	36,31,500
Gross profit (*A*) – (*B*)	4,27,500	2,47,500	1,93,500	8,68,500

Less: Selling and Distribution expenses:				
Allocated direct	1,95,615	1,18,350	1,00,440	4,14,405
Office expenses (equal)	31,500	31,500	31,500	94,500
Other expenses (equal)	40,500	40,500	40,500	1,21,500
Advertisement (sales)	67,500	40,500	27,000	1,35,000
Total	3,35,115	2,30,850	1,99,440	7,65,405
Net profit/loss	92,385	16,650	(5,940)	1,03,095

Illustration 2:

Zimmedar Works Ltd. has, at the factory, three production departments, Machine-shop, Fabrication and Assembly, which are the responsibility of the shop superintendent. He, along with material manager, planning superintendent, and maintenance engineer, reports to the works manager at the factory. The office administration, sales and publicity come under the sales manager who, along with the works manager, reports to the managing director of the company. The following data relating to a month's performance is extracted from the books of the company:

	Budget (₹)	*Variance from budget* (₹)
Sales commission	800	50 A
Raw material and components:		
Machine-shop	900	20 A
Publicity expenses	1,100	100 A
Printing and stationery	3,200	200 F
Travelling expenses	4,000	200 A
Wages: Machine-shop	800	10 F
Fabrication	600	20 A
Assembly	720	10 A
Material: Assembly	760	40 A
Fabrication	460	10 A
Utilities: Machine-shop	320	10 A
Assembly	470	60 F
Fabrication	560	30 F
Maintenance	400	20 A
Stores	210	40 F
Planning	180	20 A
Shop superintendent's Office:		
Salaries & expenses	1,100	22 F
Depreciation: Factory	3,880	40 A
Works manager's Office:		
Salaries and administration	3,810	40 A
General office:		
Salaries and administration	4,270	30 A
Managing Director's:		
Salary and administration	2,800	20 F

(A = Adverse, F = Favourable)

(*i*) Treating the machine-shop, fabrication and assembly as cost centres, prepare cost sheets for each centre with the help of the following additional information:

The shop-superintendent devotes his time amongst machine shop, fabrication assembly in the ratio of 4 : 3 : 4. Other factory overheads are absorbed on the basis direct labour in each cost centre. Office, administration, selling and distribution overheads are borne equally by the cost centres.

(*ii*) Treating the machine-shop, fabrication and assembly as responsibility centres, prepare a responsibility accounting report for the shop superintendent. (*C.A. Final*)

Solution:

(*i*) Cost Sheet for Machine-shop, Fabrication and Assembly Cost Centres

Particulars	*Machine-shop*		*Fabrication*		*Assembly*	
	Budget	*Actual*	*Budget*	*Actual*	*Budget*	*Actual*
	(₹)	(₹)	(₹)	(₹)	(₹)	(₹)
Raw material and components	900	920	460	470	760	800
Wages	790	600	620	720	730	–
Utilities	320	330	560	530	470	410
Prime cost	2,020	2,040	1,620	1,620	1,950	1,940
Factory overheads:						
Shop superintendent's office salaries and expenses:						
Budget: ₹ 1,100						
Actual: ₹ 1,078 in 4 : 3 : 4	400	392	300	294	400	392
Other factory overheads in 80 : 60 : 72 and 79 : 62 : 73 for budgeted and actual respectively	3,200	3,160	2,400	2,480	2,880	2,920
Factory cost	5,620	5,592	4,320	4,394	5,230	5,252
Add: Administration selling and distribution overheads, equal	5,390	5,443	5,390	5,443	5,390	5,444
Total cost	11,010	11,035	9,710	9,837	10,620	10,696

Factory overhead:	*Budget*	*Actual*
	(₹)	(₹)
Utilities: Maintenance	400	420
Stores	210	170
Planning	180	200
Depreciation: Factory	3,880	3,920
Works manager's office salaries and admm.	3,810	3,850
Apportioned in the wages ratio of 800 : 600 : 720 and 790 : 620 : 730 respectively	8,480	8,560

Administration & selling overheads:	*Budget*	*Actual*
Sales commission	800	850
Publicity expenses	1,100	1,200
Printing and Stationery	3,200	3,000
Travelling expenses	4,000	4,200
General office salaries & administration	4,270	4,300
Managing Director's salary & administration	2,800	2,780
Apportioned equally (1/3 each)	16,170	16,330

(*ii*) Responsibility Accounting Report

Particulars	*Budget* (₹)	*Actual* (₹)	*Variance* (₹)
Machine-shop:			
Materials	900	920	20 A
Labour	800	790	10 F
Utilities	320	330	10 A
	2,020	2,040	20 A
Fabrication:			
Materials	460	470	10 A
Labour	600	620	20 A
Utilities	560	530	30 F
	1,620	1,620	Nil
Assembly:			
Materials	760	800	40 A
Labour	720	730	10 A
Utilities	470	410	60 F
	1,950	1,940	10 F
Total	5,590	5,600	10 A

Note: Factory overheads and administrative and selling overheads being common costs which are not influenced by the decision of the manager of the responsibility centre, are ignored.

Illustration 3:

A production department of a large manufacturing organisation has furnished the following data for May 2022:

	Budget (₹)	*Actual* (₹)
Direct Materials	4,00,000	5,10,000
Direct wages	2,50,000	3,25,000
Repairs and Maintenance (₹ 1,00,000 Fixed)	2,00,000	2,20,000
Supervision (Fixed)	1,00,000	1,10,000
Consumable Stores (Fixed)	75,000	95,000
Factory Rent (Fixed)	50,000	50,000
Depreciation (Fixed)	1,00,000	10,00,000
Tools (Variable)	25,000	30,000
Power and Fuel (Variable)	1,50,000	1,80,000
Administration (Fixed)	2,50,000	2,65,00

The department has 50 identical machines. During May 2022, the budgeted and actual production of the department are 10,000 and 12,500 units respectively. However, if the department was closed and the machine production services were hired from outside, the cost of hiring the services of similar machines would be ₹ 150 per unit.

(*i*) You are required to present reports showing the evaluation of the performance of the department based on the concept of (*a*) Cost Centre, (*b*) Profit Centre, and (*c*) Responsbility Centre.

(*ii*) It is felt that since the total budgeted cost of production per unit is greater than the cost of hired service, the possibility of closing down the department and use of hired services should be explored if the budgeted production cannot be increased in June 2022. Assuming that the budgeted expenses and level of output planned for May 2022 will hold good for June 2022 also. Calculate the volume of output required to justify the continuance of the department. (*I.C.W.A. Final*)

Solution:

(*i*) (*a*) Performance Evaluation Report of the Department

Cost Centre Basis:	*Budget*	*Allowed*	*Actual*
Variable costs:	10,000 units	12,500 units	12,500 units
Direct Materials	₹ 4,00,000	₹ 5,00,000	₹ 5,10,000
Direct Wages	2,50,000	3,12,500	3,25,000
Repairs & Maintenance	1,00,000	1,25,000	1,20,000
Consumable Stores	75,000	93,750	95,000
Tools	25,000	31,250	30,000
Power and Fuel	1,50,000	1,87,500	1,80,000
Total	10,00,000	12,50,000	12,60,000
Fixed costs:			
Repairs & Maintenance	1,00,000	1,00,000	1,00,000
Supervision	1,00,000	1,00,000	1,10,000
Factory rent	50,000	50,000	50,000
Depreciation	1,00,000	1,00,000	1,00,000
Administration	2,50,000	2,50,000	2,60,000
Total	6,00,000	6,00,000	6,25,000
Total cost (Variable + Fixed)	16,00,000	18,50,000	18,85,000

Expenditure Variance: ₹ 18,50,000 – ₹ 18,85,000 = ₹ 35,000 Adv.
Volume Variance: (Budgeted production – Actual production) × *OH* rate
(10,000 – 12,500) × 6,00,000/10,000 = ₹ 1,50,000 F
Overhead cost variance = ₹ 1,50,000 Fav. + ₹ 35,000 Adv. = ₹ 1,15,000 Fav.

(*b*) *Profit Centre basis:*

Cost of hiring similar machines: ₹ 150 × 12,500	=	₹ 18,75,000
Actual cost incurred	=	18,85,000
Profit variance		10,000

(*c*) *Responsibility Centre Basis:*

	Budget (₹)	*Actual* (₹)	*Variance* (₹)
Controllable costs:			
Direct Materials	5,00,000	5,10,000	10,000 Adv.
Direct Wages	3,12,500	3,25,000	12,500 Adv.
Repairs & Maintenance	2,25,000	2,20,000	5,000 Fav.
Consumable stores	93,750	95,000	1,250 Adv.
Tools	31,250	30,000	1,250 Fav.
Power and Fuel	1,87,500	1,80,000	7,500 Fav.

Supervision	1,00,000	1,10,000	10,000 Adv.
Total	14,50,000	14,70,000	20,000 Adv.
Non-controllable costs:			
Factory rent	50,000	50,000	–
Depreciation	1,00,000	1,00,000	–
Administration	2,50,000	2,65,000	15,000 Adv.
Total	4,00,000	4,15,000	15,000 Adv.

(*ii*) Volume of output required to justify continuance of the Dept.

Variable cost of making as per budget = $\frac{₹10,00,00}{10,000}$	=	₹ 100
Variable cost on hired services	=	150
Savings if manufactured on own machines		50
Total fixed Cost	=	₹ 6,00,000
Minimum number of units to justify continuance	=	$\frac{₹6,00,00}{5}$
	=	12,000 units.

DIVISIONAL PERFORMANCE MEASUREMENT: FINANCIAL MEASURES[1]

A division is defined as:

"A company unit headed by a man fully responsible for the profitability of its operations, including planning, production, financial and accounting activities, and who usually, has his own sales force. The division may be a unit of the parent company or it may be a wholly or partially owned subsidiary".

The work of all the divisions must be conducted in such a manner that the work of no division comes in *the way of the profitability of other divisions* or the profitability of the company as a whole. The essence of divisional performance measurement is that all divisions must be so motivated as to maximise the profit of the company and not merely of the division itself. The method of evaluation must be such and should be used in such a manner as to prevent a divergence between the objective of the company as a whole and that of the individual divisions.

Significance of Measurement of Divisional Manager's Performance

Measuring divisional manager's performance is important in the following ways:

(*a*) It directs top management's supervision and assistance where it is most needed and where it will be most productive.

(*b*) It indicates to the executive concerned the manner in which he ought to do his work –accomplishment of goals or objectives and also, along with it, the way in which these goals or objectives are achieved.

(*c*) It shapes the future executive team by indicating whom to promote, whom to retain and whom to remove.

(*d*) It directs the activity of executives towards high scores on the aspects of performance on which they are measured and judged.

---

1 T.S. Grewal, N.L. Hingorani and A.R. Ramanathan, Management Accounting – Text, Sultan Chand & Sons, Delhi, pp. 361-73.

(*e*) It gives job satisfaction directly by letting the executives know how they are doing.

(*f*) It provides the objective factual foundation for sound executive compensation.

Requirements for Divisional Performance Measurement

To measure in quantitative terms the performance of divisional managers, the following requirements are essential:

(*a*) The profit centre, *viz*., the division, should be clearly identified.

(*b*) A clear-cut system of transfer pricing should be prescribed so that one department does not become a burden on the other.

(*c*) There should be a foolproof, clear and uniform system of accounting to measure the profits.

(*d*) Realistic standards of profit and profitability should be evolved to of compare against actuals.

(*e*) There should be a system of rewards or executive compensation to provide incentives for the executives to attain higher levels of performance.

When an individual joins an organisation, he has a certain amount of enthusiasm to prove his abilities and he sincerely wishes these abilities to be recognised. From time to time he expects to be rewarded in one form or the other which may not necessarily be money. As a human being, he wishes to become a part of the organisation and get a feeling of belonging. He is willing to adapt himself to the organisation and become a part of its management process, is adaptation and involvement of individuals at various levels in decision-making, build-up of the workforce, setting up norms of behaviour, etc., create a sense of satisfaction and achievement which normal monetary gains do not provide. It may be pointed out here that abnormal monetary rewards cannot sustained in any organisation.

To motivate an individual there is a clear need for satisfying his human wants which have a number of aspects such as psychological, economic, social, moral, political, etc. Among these, generally the economic aspect predominates. However, over a period of time that spectrum keeps on changing and some aspects become more important than others. The top management in the organisation has to recognise changes and adopt ways and means to act in a manner that would motivate these working individuals to become a part of the organisation and derive satisfaction from various activities besides merely getting money for doing work. The relative strength of various factors as well their limitations must be fully recognised. To arrive at optimal behaviour of number of individuals within an organisation, the top management has to work continuously and keep the problem of recognising changes in various needs of individuals within focus. The ultimate point achieved is a compromise among the personal aspirations of all individuals within an organisation.

Difficulty in Measurement of Divisional Manager's Performance

It is undesirable to fix targets for performance in respect of divisional managers in quantitative terms only. A division's performance in various areas, though notI expressible in quantitative terms, may contribute to the achievement of the organisation's objective more liberally. For instance, the cordial personnel relationship within a division may contribute a great deal to the organisation's productivity and

hence profitability. Thus, the problems in measurement of excutive performance are two fold, viz., the difficulty of expressing in qantifiable terms certain objectives like quality control, safety, industrial peace, customer service, etc. The second one is to keep in view the long-term objective, while measuring the performance in the short run.

Most of the objectives ultimately will have their bearing on the profitability of the division. Hence, profitability is used as a measure of divisional performance.

Financial Methods of Evaluation of Divisional Performance

The following are the financial measures for divisional performance evaluation.

1. Return on Investment $= \frac{\text{Divisional Net Income}}{\text{Divisional Investment}} \times 100$
2. Residual Income = Operating Income – (Minimum Required return × Operating Assets)
3. Economic Value Added = Net Operating Profit after Taxes – Cost of Capital Employed
4. Return on Sales $= \frac{\text{Divisional Operating Income}}{\text{Divisional Sales}} \times 100$
5. Divisional Contribution = Divisional Sales – Divisional Variable Cost

1. Rate of Return on Investment

Under this method, for each divisional manager a target rate of return on the capital placed at his disposal is determined beforehand and, later, this is compared with the actual rate of return. It is quite possible and is often the' case that the target for one division may be different from that of others, taking into account the special circumstances of each case. For example, if a new venture has been created for the purpose, it would obviously be not proper to expect the same rate of return in the initial years as is being earned by other well-established divisions. A division which enjoys a ready market and is otherwise in a growing industry should also be able to give much better results than a division which is in a static or declining industry.

The rate of return obviously should be connected with the firm's cost of capital but it is not that the rate of return must be equal to the cost of capital even for the firm as a whole. There is such a thing as opportunity cost and firms obviously should be able to earn from the use of funds at least that much as they would have earned by using the funds in some other manner. Also there will be a number of activities which will not bring any income as they involve only investment such as the investment on research and development in the company as a whole. Obviously, the divisions which produce goods and sell them should be able to earn such a rate of return as, together with those, in which no income is being earned, will make the firm's yield acceptable to the management as well as to the outside world.

The profit on the basis of which the division's rate of return is to be calculated should be such as will be under the control of the division even though the division's profit and loss account may also have items which haw been apportioned out of the total relating to the company as a whole. Since the amount which is apportioned is not within the control of the divisional manager, he should obviously not be judged on the basis of profit after such apportionment. Further, the incidence of income-tax

is difficult to measure, as far as divisional manager is concerned; it is also beyond his control. Therefore, the profit on the basis of which the manager has to be judged should be profit before tax and after taking into account only the controllable costs.

1. **Limitations:** Should a division want to show higher profits or rate of return it can easily do so. The following are some of the obvious ways:
   (*a*) The basis of accounting may be changed, for example, if prices have been rising, a change in the method of valuation from Lifo to Fifo will lead to an increase in profit for the year concerned. Also a change in the method of depreciation may bring about the same result, especially in the first few years of the life of the firm a change from the diminishing value method to the straight line method will increase the profits by a substantial figure.
   (*b*) The divisional manager may not incur certain essential expenditure which is necessary for maintaining the health and the earning capacity of the firm. The absence of such expenditure may not show adverse results in the year or so but the avoidance of it may lead to a big increase in the profit. But, in later years the profits are bound to fall because it will lead to a decline in the operating efficiency of the firm.
   (*c*) The divisional manager may from the very beginning include in his budgets a good deal of expenditure which he expects to save later on to show lower target rate of return. Later he will manage to show actually higher rate of return and will thus win praise.
   (*d*) Since the rate of return is naturally the relationship of profit to capital employed, the divisional manager may also be inclined to reduce the figure of capital employed by retiring assets which temporarily may not be required but which later on may be necessary.
2. **Remedies:** The remedies for the situation would be as follows:
   (*a*) When budgets are being prepared, they should be most carefully gone through to see that they do not include inflated figures of cost or deflated figures of revenue. If this is not ensured, it will mean less than optimum effort being made by the divisional manager since he will then be merely aiming at bettering the rate of return shown by his budget and not at maximising it.
   (*b*) When actuals are compared with budgets, one should see to it that the essential expenditure which is necessary for the health of the firm as a whole is being incurred. If desired, such essential expenditure may even be treated as uncontrollable and profit, on the basis of which the rate of return is to be calculated, determined before such essential expenditure.
   (*c*) The capital base on which the rate of return is to be established should better be calculated as follows:
      (*i*) The production facilities assigned to the division should be valued at their current economic value, *i.e.*, the replacement cost less adjusted depreciation: annually the investment base should be reduced by the additional depreciation written off.
      (*ii*) Current assets and current liabilities should be computed on the basis of actual balances (including amount owed by and to other sister divisions) at the end of each month.

(*iii*) Cash should be included on the basis of the needs of the division rather than the actual balance lying with it; this is because finance will be centrally managed and usually cash requirements of divisions and surplus balances will be taken care of by the central finance management.

3. **Caution:** No divisional manager should be judged automatically and wholly or even substantially on the basis of the comparison of the actual rate of return and the standard. If a divisional manager is judged on the basis of the problems faced by him and the decisions taken by him to face them, i.e., if the capability that he brings to bear on work is watched continuously, rather than the one time figure which is calculated at the end of the year, the divisional manager will have little temptation to artificially raise the rate of return. He will then concentrate on trying to do the very best and taking decisions in the interest of the company as a whole. This is what is required for maximisation of the long-term profitability of the company.

To some extent, the remuneration of the divisional manager should be linked with the state of affairs of the company. This is ideally achieved through 'stock options'.

2. Residual Income Method of Evaluation

The concept of 'Residual Income' seeks to ensure that the total profit in rupees will be what management thinks to be proper. Suppose a firm employs ₹ 10 crore and the cost of capital is 11%. The concept of residual income would mean that the divisional manager will have to earn at least ₹ 1.1 crore *plus* something more which will be determined for him by head office in consultation with him; this amount would not be in terms of percentage ratio but in terms of amount of rupees.

The Residual Income Method focuses better the attention of management on the total profit required to meet objectives of the firm. The Rate of Return Method will leave the ultimate profit to be earned a little hazy. It is possible that though each department has met the goal in respect of rate of return, the total profit earned by the company is not what it aimed at. The Residual Income Method will ensure this.

When the rate of return is the goal, many divisional managers hesitate to enter into a transaction on which the profit will be less than the rate of return on the capital to be employed. This difficulty will be removed in Residual Income Method since the divisional manager will think of the profit in terms of amount of rupees. Suppose *for a particular transaction*, he is able to borrow from the bank at 15% and is able to cam a profit of 18% on the transaction involved, he will still be adding some profit and this is as it should be. *But for the operations of the undertaking as a whole*, he must keep in view the need of only such investment as will bring him at least the yield equal to the cost of capital.

Pitfalls. Residual Income Method is not radically different from the Rate of Return Method and is subject to almost all the pitfalls as the Rate of Return Method. The divisional manager, if he is hard pressed, may still take measures as will temporarily increase the profit but may damage the long-term interests of the company such as cutting down of customer service or postponing repairs ; and maintenance or reducing expenditure on advertising and sales promotion or research and development or even labour welfare. Further, he will naturally be motivated towards padding the budgets so that he is able to produce the target figure of profit without much difficulty. At this

is likely to be the result if the divisional manager is judged wholly or substantially on the basis of the results shown by his profit and loss account. If he is automatically condemned on the amount of profit being smaller than what was targeted for him or is automatically rewarded when it is the other way round, it will only be natural for the divisional manager to resort to this practice.

Conclusion

Hence, the need of judging the performance of the divisional manager not merely on the basis of numbers or tangible results shown by him for a year but on the basis of what he has been really trying to do. If we want to have good divisional managers and want them to work in the long-term interest of the company, they should be judged not on the basis of a year's profit but on the basis of the way they are handling the problems they have already faced and are thinking of the future which the division or the company will face.

What is stated above should not be taken to mean that profits are irrelevant as a basis of judgment. If a divisional manager has not been able to meet the profit objective of his division for a number of years, there must be something wrong either with him or with the company and there must be a thorough enquiry. In a nutshell, in the long run, over a number of years, the financial position and the profits earned by a division provide a fairly good measure of the division's performance; but in the short run, it would be unsafe to rely on these figures alone.

Computing Divisional Investment

Whatever may be the method employed for evaluating the performance of divisional management, there will be need for a proper measurement of the investment case. For this purpose, some of the questions to which answers must be found are the following:

(*i*) What does investment mean? Total assets? Net fixed assets? Gross fixed assets?

(*ii*) Should fixed assets be included at cost, net book value or at an appraisal value?

(*iii*) How should assets be shared by two or more divisions or held by the company as corporate assets (*e.g.*, central research laboratory) be treated in computing the investment in one of the divisions? What about cash managed centrally or accounts receivable not recoverable divisionally?

(*iv*) Where inventories of some or all divisions are valued on Lifo basis, is any adjustment necessary when computing investment in a division?

(*v*) Should the investment base be as at the beginning, at the end, at an intermediate point or be the average?

(*vi*) What should be included in net income for rate of return purposes?

(*vii*) Should divisional return on investment be calculated before or after tax?

It is, of course, necessary that the answers to the above questions should be consistent from year to year. As a broad observation, it is the amount of capital put in, rather than the amount that can be taken out. which is relevant. For more forward-looking purposes of guiding the division's investment policy, the reported earnings cannot be useful as a guide. There are decisions in connection with which it is relevant to ask how much capital can be disinvested from a division. Such decisions call for ad hoc computations.

The following are some recommendations:

(*i*) Total investment is best defined in most situations as total assets. To determine controllable investment, deduct controllable liabilities. The degree of autonomy is important for deciding the controllability of fixed assets.

(*ii*) Fixed assets should be included at cost. It is desirable to adjust the values of fixed assets by means of index number because of changes in the value of the rupee but this adjustment is seldom made.

(*iii*) Central corporate assets should not be allocated. However, assets centrally controlled but used by divisions should be suitably allocated.

(*iv*) Investment in a division's inventory (controllable) should be valued on Lifo basis but any adjustment to make Lifo into Fifo should be treated as non-divisional.

(v) In case of quarterly calculations, the figures of investment in the beginning will do; but for longer periods average is best recommended.

(*vi*) For evaluation of managerial performance if the rate of return is to be used, the percentage of controllable operating profit to controllable investment is most appropriate. For evaluating overall performance of the division's business, relationship between net residual income plus interest and total investment in the division is more suitable.

(*vii*) The question of transfer prices should be settled in a manner which is acceptable to various divisional managers.

(*viii*) The before-tax rate of return is more appropriate for judging the performance of the division's management, whereas the after-tax rate is more appropriate for judging division's business – to assess whether or not the business is worthw hile.

Transfer Price

One of the most important questions, where two or more interdependent departments are concerned is – what should be the price to be put on the goods or services transferred by one department to another? The transfer price must satisfy the undermentioned two criteria:

(*i*) It should help to establish the profitability of each division or department.

(*ii*) It should permit and encourage maximisation of the profits of the company as a whole rather than individual departments.

There are various alternatives in regard to the computation of the transfer price. These are briefly discussed below:

(*a*) **At Cost:** The goods or services may be transferred to the transferee department on the basis of the actual costs incurred. For example, if there is a separate repairs and maintenance department, its services maybe charged to various other departments on the basis of the cost incurred by this department in keeping the assets of the other departments in good working order.

The drawback of this alternative is that it cannot establish the efficiency of the department in rendering the service, since the whole of the costs of such a department will be passed on to the other departments.

This method may be used only where a market price cannot be otherwise determined.

In case of certain goods, which undergo different processes, it becomes difficult to put a market price on the completion of each process. For example, if furniture is being made, it would be difficult to determine the market price on the completion of each operation or even a set of operations involved in the making of the furniture.

(*b*) **Cost plus a Predetermined Margin of Profit:** This method is not much different from the method discussed above. It has almost all the drawbacks and, in addition, it splits up the profit of the firm into portions which are not really significant. The profits of individual departments can be easily increased or decreased by simply changing the margin of profit. An important shortcoming of this method may be that the transferee department considers the transfer price as the cost of the input; it may compute its own cost and also fix the selling price on the basis of such cost. This may mean that the price quoted is unduly high. Specially when there is a strong competition and in periods of slump, sales, will be much hampered.

In some cases there is no escape from this method. In India there are a number of companies which are owned by Government and which often work only for Government or for Government companies. The quotations by such companies usually are based on cost plus profit. Such companies are then bound to show a profit which cannot be useful for ascertaining the level of efficiency attained by these companies.

The flat system of adding profit to cost to determine the transfer price is unsuitable for divisional management evaluation. It would be better to base the transfer price on budgets and standard costs.

(*c*) **Market Price:** This is the most suitable commonly used system of pricing of transfer of goods and services from one division to another or from one company, under *the same management, to another company. Under this* method, inefficiencies of one division or department cannot be passed on to the next division or department and similarly, the next department or division (or company) cannot take advantage of the efficiency displayed by the one which produces the goods or services. If the quality of the goods or services available in the market is the same as the one produced by the transferor department or company, there will be no difficulty in arriving at the market price but often there is some difference. Also, when sale is made to a sister company or division, a good deal of selling expenses are avoided, *e.g.*, debt collection charges. The market price should be adjusted for all these factors.

Really what is involved is that the buying department and selling department should deal with each other as if they are independent outside parties, dealing with each other at arm's length. If a transfer price is arrived at by these (departments through such negotiations, it is likely that the price will be such as can be used to even evaluate the goods or services concerned. The essential requirement is that the buying department should be under no compulsion to buy from the sister department; similarly, the selling department should also be under no compulsion to sell to the other department. Usually, the prevailing market price is adjusted for two very obvious savings in costs – namely, the cost

of collecting the debt and the cost of obtaining orders. To this extent, the buying department gains when it buys from a sister department without also any loss to the selling department.

(*d*) **Marginal Cost:** A problem may arise – what should be the transfer price when there is a difference of opinion between the selling department and the buying department about the transfer price? The selling department may insist on a price which the buying department is unwilling to pay on the ground that it can buy the same goods or services from outside at a lower price.

The problem should be resolved by reference to the overall interest of the company, *i.e.*, maximisation of the profit of the company rather than the profit of any individual department.

Suppose a department produces goods at a cost of ₹ 10 per unit and wishes to sell to the other department at ₹ 11 per unit whereas the buying department can obtain them from the market at ₹ 9 per unit. If purchase is made from the market at ₹ 9 per unit and the goods produced by the sister division are left unsold, there will clearly be loss to the company as a whole since cost of ₹ 10 per unit has been incurred and it is not being recovered.

Suppose further, the marginal cost of the goods is ₹ 7 per unit; then taking the company as a whole, there will be an error in purchasing goods at ₹ 9 per unit whereas the amount which can be saved by not producing the goods is only ₹ 7 per unit. If the company were to function as one unit, it would have definitely produced the goods and refused to buy from any outside source. There is no reason why this principle should be given up simply because, for the sake of convenience of management, the company has been split up into two or more divisions. The divisions which require the goods must not buy these from outside unless the outside price is below marginal cost of producing the goods.

From the theoretical point of view also, marginal cost appears to be suitable. It is clearly in the interest of all firms to expand their output to a point where marginal cost equals marginal revenue; in the same manner divisions, working independently and autonomously, should expand their output to a point where marginal revenue and marginal cost are equal. Since firms make the best profit by working on this principle, divisions also earn the best profit by following the same rule. Therefore, from the point of view of divisions as well as from that of the company as a whole, the transfer price should be based on the marginal cost principle.

Conclusion

The adoption of a particular method depends upon the special circumstances. Market price cannot be adopted when a product at an intermediate stage does not have a market value. Cost or cost-plus-profit may be ineffective for control purposes. Hence, a compromise has to be arrived at. Whatever be the method adopted, the overall interest of the company should not be jeopardised. The individual goal of a divisional manager should not be at the cost of the corporate goal. In other words, there should be a perfect "goal congruence".

OBJECTIVE QUESTIONS

I. State whether the following statements are True or False:

(*a*) Managerial functions start with planning and end with planning.
(*b*) Final stage in the management process is control.
(*c*) Managerial personnel may rest assured that everything is bound to proceed as per the plan laid down.
(*d*) Control operates on things, people and actions.
(*e*) The singular form 'control' is the same as the plural form 'controls'.
(*f*) Controls may be considered to be the means of control.
(*g*) Controls are the methods and procedures employed for directing employees to work towards realisation of enterprise objectives.
(*h*) Control system monitors activities within an organisation.
(*i*) Controls may be established even without an organisation structure.
(*j*) A good organisation structure facilitates performance of the other managerial functions more efficiently.
(*k*) Responsibility accounting is another branch of accounting.
(*l*) Responsibility accounting is a control system of accounting and reporting.
(*m*) Under responsibility accounting the emphasis is shifted from product costing to measurement of divisional performance.
(*n*) Under responsibility accounting, the actions of a departmental manager are measured by the revenue results achieved by him.
(*o*) Responsibility accounting is a system designed to accumulate and report costs by individual levels of responsibility.
(*p*) The purpose of responsibility accounting is to facilitate control of day-to-day performance.
(*q*) Individual areas of responsibility as specified in the organisation structure are known as responsibility centres.
(*r*) Responsibility centre is the same as profit centre.
(*s*) Responsibility centre is similar to a budget centre.
(*t*) The term 'centre' means a department, area or function to which costs and/or revenues are charged.
(*u*) Communication network is one of the prerequisites to responsibility accounting.
(*v*) The greater the degree of decentralisation, the lesser will be the responsibility centres.
(*w*) Feedback controls are the same as feed-forward controls.
(*x*) There is nothing like feed-forward controls.

Ans. *(a) False, (b) True, (c) False, (d) True, (e) False, (f) True,*
(g) True, (h) True, (i) False, (j) True, (k) False, (l) True,
(m) True, (n) True, (o) True, (p) True, (q) True, (r) False
(s) True, (t) True, (u) True, (v) False, (w) False, (x) False.

II. Answer the following questions in a sentence or two each:

(*a*) Define the term 'control'.
(*b*) What do you mean by the term 'control'?
(*c*) Why is control necessary?
(*d*) Why are controls necessary?
(*e*) How does control operate on things, people and actions?
(*f*) Why activities of an organisation need close monitoring?
(*g*) What do you mean by responsibility accounting?
(*h*) Why is control impossible without an organisation structure?

(*i*) Define an organisation structure of a large undertaking.
(*j*) What is the significance of authority relationships?
(*k*) What is the purpose behind responsibility accounting?
(*l*) What is a 'centre'?
(*m*) What do you mean by responsibility centre?
(*n*) Give the meaning of the term 'feedback' controls.
(*o*) What do you mean by 'feed-forward' controls?

ASSIGNMENTS

Theoretical Questions

1. Define responsibility accounting. Enumerate the requirements that are necessary for an effective responsibility accounting system. (*M.Com., Maharshi Dayanand*)
2. "Responsibility accounting ties accounting, budgeting and reporting to organisation and responsibilities". Explain. (*B.Com., Punjab*)
3. Explain the essential ingredients of a system of responsibility accounting. (*B.Com., Hons., Delhi*)
4. Why will you like to introduce Responsibility Accounting System? What are its prerequisites? What type of responsibility centres can be established for this purpose? (*M.Com., Maharshi Dayanand*)
5. Define a responsibility centre. Why is responsibility centres created? Explain the various kinds of responsibility centres. (*M.Com., Himachal Pradesh*)
6. Outline the basic principles of 'Responsibility Accounting. (*B.Com., Hons., Delhi*)
7. "Responsibility Accounting is an important device for control". Discuss. (*B.Com., Punjab*)
8. What is responsibility accounting? State its merits and limitations. (*M.Com., Bharathidasan*)
9. Write a note on responsibility accounting. (*M.Com, Madras*)
10. Define Responsibility Accounting. How is it related to Management Accounting? (*C.S. Inter*)
11. Write short notes on:
    (*a*) Responsibility centres,
    (*b*) Performance budgeting. (*M.Com., Himachal Pradesh*)
12. What is Responsibility Centre? Discuss briefly the nature of various types of responsibility centres. (*B.Com., Hons., Delhi*)
13. Explain, with suitable illustration, the process of Responsibility Accounting. What is the role of management accountant in this area? (*M.Com., Delhi*)
14. "The aim of responsibility accounting is not to place blame. Instead, it is to evaluate performance and provide feedback so that future operations can be improved". Discuss. (*B.Com., Punjab*)
15. Define Responsibility Accounting. Bring out how the performance is controlled through responsibility centres. (*M.Com., Himachal Pradesh*)

II
UNIT

Job Costing, Batch Costing and Contract Costing

3

Job Costing, Batch Costing and Contract Costing

Chapter Outline

- Job Costing
- Batch Costing
- Contract Costing
- Elements of Contract Cost
- Contracts to Run for More than One Year
- Contracts Near Completion
- Accounting Standard (*AS-7*) (Revised) and Ind *AS-11*
- *Miscellaneous Illustrations*
- *Objective Questions*
- *Assignments*

JOB COSTING

Job costing is a method of costing applied in industries where production is measured in terms of completed jobs. Industries where job costing is generally applied are Printing Press, Automobile Garage, Repair Workshops, Ship Building, Foundry and other similar manufacturing units which manufacture to customers' specific requirements.

Job costing is a method of costing whereby cost is compiled for a job or work order. The production is against customer's orders and not for stock. The cost is not related to the unit of production but is a cost for the job, *e.g.,* printing of 5,000 ledger sheets, repairs of 50 equipments, instead of printing one sheet or repair of one equipment. The elements of cost comprising Prime Cost viz. direct materials, direct labour and direct expenses are charged directly to the jobs concerned, the overhead charged to a job is an apportioned portion of the departmental overhead.

Documents used in a Job Order Cost System

The following are the important documents used in a Job Order Cost System.

(i) *Production Order or Manufacturing Order*: This is a works order authorising the production department to produce a specified quantity of a product which constitutes the job.

(ii) *Cost Sheet*: For recording costs, very often a separate record called a cost sheet is used. The cost sheet and the works order may also be combined, when costs are recorded on the production order itself.

(iii) *Other Documents*: The other documents which are used as control mechanism by the despatching function are : Material Requisitions, Tool Orders, Time Tickets, Inspection Order, *etc*.

Job Cost Accounting Procedure

Cost of direct materials in respect of a job is obtained from copies of Material Requisitions costed by the Stores Accounting Section. Cost of direct wages is obtained from various Time Tickets costed by the Payroll Department. Direct Expenses, if any, are also taken up.

Manufacturing overheads are then applied at predetermined departmental absorption rates and recorded in the cost sheet. Various overheads may be recorded in the separate columns meant for these in the cost sheet which are totalled to obtain the total cost of direct material, direct labour, direct expenses and apportioned manufacturing overheads. These are the four elements of cost which together give the production cost or manufacturing cost of the job.

Following is a specimen of a job cost sheet meant for publishing of a book.

Job Cost Sheet

Customer : Description : Production Order No. :
Customer's Order No. : Quantity : To Start on:
Our Quotation No. : Bill of Materials No.: To Finish on:

Week ended	Composing			Printing			Knifing			Laminating			Binding			Total		
	Material	Lab	O.H	Material	Lab	O.H	Material	Lab	O.H	Material	Lab	O.H	Material	Lab	O.H	Material	Lab	O.H
Total																		
Estimate																		
Difference																		

Comments on Variations: Comments:
Production Manager Bill No....for ₹ ... sent on.... Cost Acc.

Advantages of Job Order Costing

(i) Profitability of each job can be individually determined.
(ii) It provides a basis for estimating the cost of similar jobs which are to be taken in future.
(iii) It provides the detailed analysis of the cost of material, labour and overheads for each job as and when required.
(iv) Plant efficiency can be controlled by confining attention to costs relating to individual jobs.
(v) Spoilage and defective work can be identified with a specific job and responsibility for the same may be fixed on individuals.
(vi) By adopting predetermined overhead rates in job costing, we can get all advantages of budgetary control.
(vii) Job costing is essential for cost-plus contract where contract price is determined directly on the basis of cost.

Limitations of Job Order Costing

1. It is expensive to operate as it requires considerable detailed clerical work.
2. With the increase in the clerical work the chances of errors are increased.
3. Job order costing cannot be efficiently operated without highly developed production control system. The job costing requires intricate factory organisation system.

4. The costs as ascertained are historical as they are compiled after incidence and therefore does not provide control of cost unless it is used with standard costing system.

Illustration 1:

(Job Cost Sheet).

A has undertaken a job No. DT/97. As per cost ledger, the following expenses have been debited to this job. You are required to prepare a job cost sheet and calculate the total amount to be charged to the customer in order to secure 20 per cent profit on sales.

Following are additional information based on normal capacity.

Particulars	*Dept. A*	*Dept. B*	*Total for factory as a whole*
Budgeted Production in terms of Direct Labour hours	9000	13,500	30,000
Budgeted Variable Overhead (₹)	13,500	16,200	—
Budgeted Fixed Overhead (₹)	—	—	30,000

Job Cost Details:

Direct Material	
(i) Cast Iron	15 kg @ ₹ 2 Per kg
(ii) Gun Metal	5 kg @ ₹ 10 Per kg
Direct Labour	
Dept. *A*	20 hrs. @ ₹. 1 Per hour
Dept. *B*	15 hrs. @ ₹. 0.6 Per hour

Direct Expenses – Special Total ₹ 31 (to be paid by the customers)

Solution:

... Co.
Job Cost Sheet

Particulars..... Job No. DT/97
Customers.....
Ref.....

Particulars	*Qty.*	*Rate* (₹)	*Details* (₹)	*Total Cost* (₹)
Direct Material				
Cost Iron	15 kg.	2.00	30.00	
Gun Metal	5 kg.	10.00	50.00	80.00
Direct Labour				
Dept. *A*	20 hrs.	1.00	20.00	
Dept. *B*	15 hrs.	0.60	9.00	29.00
Direct Expenses				31.00
Prime Cost				140.00
Add: Variable Overheads				
Dept. *A* (13,500/9,000) × 20 hrs.	20 hrs.	1.50	30.00	
Dept. *B* (16,200/13,500) × 15 hrs.	15 hrs.	1.20	18.00	
Fixed Overheads				
(30,000/30,000) × 35 hrs.	35 hrs.	1.00	35.00	83.00
Total Cost				223.00
Add: Profit (20% on sales or 25% on cost)				55.75
Total Amount to be charged				278.75

Illustration 2:

From the following data given below, procured from the books of a factory, for the year ended 31st March 2022, prepare *(i)* Consolidated Completed Job Account showing the profit or loss and *(ii)* Consolidated Work-in-Progress Account.

Particulars	*Completed Job* (₹)	*Work-in-Progress* (₹)
Raw Materials supplied from the stores	18,000	6,000
Chargeable Expenses	2,000	800
Wages	20,000	8,000
Materials transferred to Work-in-Progress	400	400
Materials returned to store	200	—

Factory overhead is 80% of wages and office overhead 25% of factory cost.

The value of executed job during the year ended 31st March 2022 was ₹ 82,000.

Solution:

Dr. Consolidated Completed Job Account Cr.

Particulars	₹	₹	*Particulars*	₹
To Material	18,000		By Contractee A/c	
Less: Transfer to WIP	– 400		(Amount of Job Finished)	82,000
Less: Returns	– 200	17,400		
To Wages		20,000		
To Chargeable Exps.		2,000		
To Factory Overheads				
(80% of Wages)		16,000		
Factory Cost		55,400		
To Office Overheads				
(25 % of Factory cost)		13,850		
To Net Profit		12,750		
		82,000		82,000

Dr. Consolidated Work-in-Progress Account Cr.

Particulars	₹	₹	*Particulars*	₹
To Raw Materials	6,000		By Balance c/d	27,000
Add: Transferred from completed job.	400	6,400		
To Wages		8,000		
To Chargeable Exps.		800		
To Factory Overheads				
(80% of wages)		6,400		
Factory Cost				
To Office Overhead		21,600		
(25% of Factory cost)		5,400		
		27,000		27,000

Illustration 3:

A shop floor supervisor of a small factory presented the following costs for Job No. 303, to determine the selling price.

	Per Unit
	₹
Materials	70
Direct wages 18 hours @ ₹ 2.50	
(Dept. *X* 8 hours; Dept. *Y* 6 hours; Dept. *Z* 4 hours)	45
Chargeable expenses	5
	120
Add: 33 -1/3% for expenses cost	40
	160

Analysis of the Profit/Loss Account
(for the year 2021)

		₹		₹
Materials used		1,50,000	Sales less returns	2,50,000
Direct wags:				
Dept. *X*	10,000			
Dept. *Y*	12,000			
Dept. *Z*	8,000	30,000		
Special stores items		4,000		
Overheads:				
Dept. *X*	5,000			
Dept. *Y*	9,000			
Dept. *Z*	2,000	16,000		
Works Cost		2,00,000		
Gross Profit c/d		50,000		
		2,50,000		2,50,000
Selling expenses		20,000	Gross Profit b/d	50,000
Net Profit		30,000		
		50,000		50,000

It is also noted that average hourly rates for the three Departments *X*, *Y* and *Z* are similar.
You are required to:
Draw up a job cost sheet.
Calculate the entire revised cost using 2021 actual figures as basis.
Add: 20% to total cost to determine selling price.

Solution:

Job Cost Sheet

Costumer Details ..... Job No. .....
Date of commencement Date of completion

Particulars	Amount ₹
Direct Materials	70
Direct Wages	
Dept. *X* ₹ 2.50 × 8 hrs. = ₹ 20.00	
Dept. *Y* ₹ 2.50 × 6 hrs. = ₹ 10.00	
Dept. *Z* ₹ 2.50 × 4 hrs. = ₹ 10.00	45
Chargeable expenses	5
Prime Cost	120

Overheads: (Charged as a percentage of wages)

Dept $X = \frac{₹5.000}{₹10.000} \times 100 = 50\%$ of ₹ 20 = ₹ 10.00

Dept $Y = \frac{₹9,000}{₹12,000} \times 100 = 75\%$ of ₹ 15 = ₹ 11.25

Dept. $Z = \frac{₹\,2,000}{₹\,9,000} \times 100 = 25\%$ of ₹ 10 = ₹ 2.50 — 23.75

Works Cost — 143.75

Selling expenses = $\frac{₹\,20,000}{₹\,2,00,000} \times 100 = 10\%$ of works cost — 14.38

Total cost — 158.13

Profit (20% of total cost) — 31.63

Selling Price — 189.76

Illustration 4:

A shop floor supervisor of a factory presented the following cost for Job. No. 421 to determine selling price:

	₹
Material	5,600
Direct wages (180 hours @ ₹ 20 per hour)	
(Dept. *X* 80 hrs: Dept. *Y* 60 hrs, Dept. *Z* 40 hrs.)	3,600
Chargeable Expenses (Special Stores Items)	400
	9,600
Add: 33-1/3% for expenses	3,200
Total Cost	12,800

Analysis of the Profit and Loss Account for the previous year shows the following:

Dr. **Cr.**

Particulars		₹	*Particulars*	₹
To Materials used		12,00,000	By Sales *Less* returns	20,00,00
To Direct wages:				
Dept. *X*	80,000			
Dept. *Y*	96,000			
Dept. *Z*	64,000	2,40,000		
To Special Stores Items		32,000		
To Overheads:				
Dept. *X*	40,000			
Dept. Y	72,000			
Dept. Z	16,000	1,28,000		
To Gross Profit c/d		4,00,000		
		20,00,000		20,00,000
To Selling Exps.		1,60,000	By Gross Profit c/d	4,00,000
To Net Profit		2,40,000		
		4,00,000		4,00,000

It is also noted that average hourly rates for the 3 departments *X*, *Y* and *Z* are similar.

You are required to calculate and enter revised cost of Job No. 421 using the actual figures for the previous year as the basis. Add 20% to the total works cost to determine the selling price (excluding selling Exps). *[CMA Inter]*

Solution:

Job Cost Sheet

Job No. 421 Date of commencement.....
Particulars Date of completion.....

			Details	₹
Materials:				5,600
Direct Wages –	Dept.	*X* 80 hrs @ ₹ 20	1,600	
	Dept.	*Y* 60 hrs @ ₹ 20	1,200	
	Dept.	*Z* 40 hrs @ ₹ 20	800	3,600
Chargeable Exps.:				400
Overheads	Dept.	*X* 80 hrs @ ₹ 10	800	
	Dept.	*Y* 60 hrs @ ₹ 15	900	
	Dept.	*Z* 40 hrs @ ₹ 5	200	1,900
		Total Works Cost		11,500
		Profit (20% on Total Cost)		2,300
		Selling Price		13,800

Working Notes:

1. Hours of department: Departmental wages ÷ Labour hour rate: Dept. *X* ₹ 80,000/20 = 4,000 hrs.; Dept. *Y* ₹ 96,000/20 = 4,800 hrs.; Dept. *Z* ₹ 64,000/20 = 3,200 hrs.
2. Departmental overheads on the basis of previous year's figures : Dept. *X* ₹ 40,000/4,000 = ₹ 10; Dept. *Y* ₹ 72,000/4,800 = ₹ 15; Dept. *Z* ₹ 16,000/3,200 = ₹ 5.

Illustration 5:

The equipments division of M/s Centurion Engineering Works Limited have completed manufacture of a rubber solution mixing equipment as per order received from one of its customers at an agreed price of ₹ 2,55,000. From the following details available, you are required to prepare a Job Order Cost Sheet for consideration by the management.

(a) *Details of the Job*

Customer	RSA Enterprises
Order No. of the customer	RS 1,691 dated Dec. 21, 2020
Job Order No. allotted	30,631
Date of starting the job at works	January 27, 2021
Date of completion at works	March 15, 2021
Date of delivery at site	March 28, 2021
Date of commissioning	March 30, 2021

(b) *Details of Expenditure*

		January	February	March
Materials:				
Machining section		₹ 22,350	₹ 1,875	₹ 675
Assembly section		₹ 4,683	₹ 517	₹ 6,100
Direct Labour Hours:				
	Rate per hr.			
Machining	₹ 12.00	160 hrs.	2,000 hrs.	1,650 hrs.
Assembly	₹ 15.00	40 hrs.	800 hrs.	1,260 hrs.
Total machining hours spent in machine section		60 hrs	1,440 hrs	500 hrs.
Cost of Drawings	₹ 6,500			

The company had to procure some dies and tools worth ₹ 15,000 specifically required for use in executing the above order. However, on completion the value of such used dies and tools was estimated at 30% of the original cost and the company envisages to use them up in executing a future order already in the pipeline.

The company has a system of absorbing production overheads at predetermined rates on machine hours utilised for machining section and direct labour spent for assembly section. The current rates are ₹ 18 per machine hour and ₹ 6 per labour hour for machining and assembly sections respectively.

The company also incurred an expenditure of ₹ 6,150 towards installing and carrying out trial runs at the customer's premises. As per the company's policy these expenses are to be charged as direct production cost.

Selling and distribution costs are to be charged to individual jobs at 16.67% of production cost. *[CMA Inter]*

Solution:

Job Order Cost Sheet
Job Order No. 30631

Date of commencement	27.01.21	Date of commissioning	30.3.21
Date of completion	15.03.21	Price quoted	₹ 2,55,000

Details		*Jan.*	*Feb.*	*March*	*Total (₹)*
Materials:					
Jan. Machining		₹ 22,350			
Assembly		4,683			27,033
Feb. Machining			₹ 1,875		
Assembly			517		2,392
March Machining				₹ 675	
Assembly				6,100	6,775
***(a)* Total Materials Cost**					36,200
Labour:					
Jan. Machining	160 hrs. @ ₹ 12	1,920			
Assembly	40 hrs. @ ₹ 15	600			2,520
Feb. Machining	2,000 hrs. @ ₹ 12		24,000		
Assembly	800 hrs. @ ₹ 15		12,000		36,000
March Machining	1,650 hrs. @ ₹ 12			19,800	
Assembly	1,260 hrs. @ ₹ 15			18,900	38,700
***(b)* Total Labour Cost**					77,220
Production Overheads:					
Jan. Machining	60 hrs. @ ₹ 18	1,080			
Assembly	40 hrs. @ ₹ 6	240			1,320
Feb. Machining	1,440 hrs. @ ₹ 18		25,920		
Assembly	800 hrs. @ ₹ 6		4,800		30,720
March Machining	500 hrs. @ ₹ 18			9,000	
Assembly	1,260 hrs. @ ₹ 6			7,560	16,560
***(c)* Total Production Overheads**					48,600
Other Direct Costs:					
Cost of drawings					6,500
Dies and tools		₹15,000			
Less: Residual value (30%)		4,500			10,500
Installation & trial runs					6,150
***(d)* Total Direct Costs**					23,150

Total Cost of Production ***(a) + (b) + (c) + (d)***	1,85,170
Selling and Distribution Overheads (16.67% of cost)	30,868
Total Cost of Sales	2,16,038
Profit (balancing figure)	38,962
Selling price	2,55,000

Illustration 6:

The following data presented by the supervisor of a factory for a job.

	₹ *Per unit*
Direct Material	120
Direct Wages @ ₹ 4 per hour (Departments *A*-4 hrs, *B*-7 hrs, *C*-2 hrs & *D*-2 hrs)	60
Chargeable Expenses	20
Total	200

Analysis of the Profit and Loss Account for the year ended 31st March, 2022

Dr. **Cr.**

Particulars	₹	₹	*Particulars*	₹
Material		2,00,000	Sales	4,30,000
Direct Wages				
Dept. *A*	12,000			
Dept. *B*	8,000			
Dept. *C*	10,000			
Dept. *D*	20,000	50,000		
Special Store Items		6,000		
Overheads				
Dept. *A*	12,000			
Dept. *B*	6,000			
Dept. *C*	9,000			
Dept. *D*	17,000	44,000		
Gross Profit c/d		1,30,000		
		4,30,000		4,30,000
Selling Expenses		90,000	Gross Profit b/d	1,30,000
Net Profit		40,000		
		1,30,000		1,30,000

It is also to be noted that average hourly rates for all the four departments are similar:

Required:

(i) Prepare a Job Cost Sheet

(ii) Calculate the entire revised cost using the above figures as the base.

(iii) Add 20% profit on selling price to determine the selling price.

[CA]

Solution:

Job Cost Sheet

Customer details..... Job No. .....
Date of Commencement..... Date of Completion

Particulars	*Amount (₹)*
Direct Materials	120
Direct Wages:	
Dept. *A* = ₹ 4 × 4 hrs = ₹ 16	
Dept. *B* = ₹ 4 × 7 hrs = ₹ 28	
Dept. *C* = ₹ 4 × 2 hrs = ₹ 8	
Dept. *D* = ₹ 4 × 2 hrs = ₹ 8	60
Chargeable Expenses	20
Prime Cost	200
Overheads Cost	
Dept. *A* = $\frac{₹\ 12,000}{₹\ 12,000} \times 100$ = 100% of ₹ 16 = ₹ 16	
Dept. *B* = $\frac{₹\ 6,000}{₹\ 8,000} \times 100$ = 75% of ₹ 28 = ₹ 21	
Dept. *C* = $\frac{₹\ 9,000}{₹\ 10,000} \times 100$ = 90% of ₹ 8 = ₹ 7.2	
Dept. *D* = $\frac{₹\ 17,000}{₹\ 20,000} \times 100$ = 85% of ₹ 8 = ₹ 6.8	51
Works Cost	251
Selling Expenses = $\frac{₹\ 90,000}{₹\ 3,00,000} \times 100$ = 30% of works costs	75.3
Total Cost	326.3
Profit (20% of Selling Price)	81.58
Selling Price	407.88

Illustration 7:

A firm uses Job Costing System and recovers OH based on Direct Labour. Three jobs were worked on during a month and their details are as follows:

Particulars	*Job 1*	*Job 2*	*Total*
Opening Work in Progress	₹ 8,500	Nil	₹ 46,000
Material Costs for the month	₹ 17,150	₹ 29,025	Nil
Labour Costs for the month	₹ 12,500	₹ 23,000	₹ 4,500

OH for the period were exactly as budgeted ₹ 1,40,000. Jobs 1 and 2 are incomplete at the end of the month. You are required to calculate the value of Closing W.I.P.

Solution:

1. Computation of OH Recovery Rate

   Total Labour Cost for the month = ₹ 12,500 + ₹ 23,000 + ₹ 4,500 = ₹ 40,000

   So, OH Absorption Rate = $\frac{₹\ 1,40,000}{₹\ 40,000}$ = 350% of Direct Labour Cost

2. Valuation of Closing Work-in-Progress (only for job 1 and 2, which are incomplete at the month end)

Particulars	*Job 1*	*Job 2*	*Total*
Opening Work-in-Progress Value	₹ 8,500	Nil	₹ 8,500
Material Costs for the month	₹ 17,150	₹ 29,025	₹ 46,175
Labour Costs for the month	₹ 12,500	₹ 23,000	₹ 35,500
OH absorbed at 350% of Direct Labour Cost	₹ 43,750	₹ 80,500	₹ 1,24,250
Total	₹ 81,900	₹ 1,32,525	₹ 2,14,425

Illustration 8:
A furniture making business manufactures quality furniture to customers order. It has three production Departments (*A, B* and *C*) which have OH Absorption Rates (per Direct Labour Hour) of ₹ 12.86, ₹ 12.40 and ₹ 14.03 respectively.

Two pieces of furniture are to be manufactured for customers. Direct Costs are as follows:

Particulars	*Job 1*	*Job 2*
Direct Materials	₹ 154	₹ 108
Direct Labour:		
Department *A* Labour Rate ₹ 7.60 per hour	20 hours	16 hours
Department *B* Labour Rate ₹ 7.00 per hour	12 hours	10 hours
Department *C* Labour Rate ₹ 6.80 per hour	10 hours	14 hours

The firm quotes prices to customers that reflect a required profit of 25% on Selling Price calculate the total cost and selling price of each job.

Solution:

Job Cost Sheet

Particulars	*Job 1*	*Job 2*
Direct Materials	154.00	108.00
Direct Labour:		
Department *A*	20 hours × ₹ 7.60 = 152.00	16 hours × ₹ 7.60 = 121.60
Department *B*	12 hours × ₹ 7.00 = 84.00	10 hours × ₹ 7.00 = 70.00
Department *C*	10 hours × ₹ 6.80 = 68.00	14 hours × ₹ 6.80 = 95.20
Prime Cost	458.00	394.80
Add: Overheads:		
Department *A*	20 hours × ₹ 12.86 = 257.20	16 hours × ₹ 12.86 = 205.76
Department *B*	12 hours × ₹ 12.40 = 148.80	10 hours × ₹ 12.40 = 124.00
Department *C*	10 hours × ₹ 14.03 = 140.03	14 hours × ₹ 14.03 = 196.42
Total Cost	1,004.03	920.98
Add: Profit (25% *i.e.,* 1/4th on Price = 1/3th on Cost)	334.68	306.99
Quoted Selling Price	1,338.71	1,227.97

Illustration 9:
From the records of a manufacturing Company, the following budgeted details are available.

Particulars		₹	₹
Direct Materials			1,99,000
Direct Wages	Machine Shop 12,000 hours	63,000	
	Assembly Shop 10,000 hours	48,000	1,11,000
Works Overheads	Machine Shop 12,000 hours	88,200	
	Assembly Shop 10,000 hours	51,800	1,40,000
Administrative Overheads			90,000
Selling Overheads			81,000
Distribution Overheads			62,100

The Company follows Absorption Costing method. You are required to prepare-

Schedule of OH Rates from the data available stating the basis of OH Recovery Rates used the given circumstances.

A Cost Estimate for the following job based on the overhead rates so computed.

(a) Direct Materials 25 kg at ₹ 16.80 per kg and 15 kg at ₹ 20.00 per kg

(b) Direct Labour Machine Shop 30 hours. Assembly Shop 42 hours.

Solution:

Cost Estimate

Particulars	*Budget* (₹)	*Recovery Rates*	*New Job* (₹)
Direct Materials	1,99,000	(25 kg × ₹ 16.8) + (15 kg × ₹ 20)	720.00
Direct Wages:			
Machine Shop	63,000	$\frac{₹\ 63,000}{₹\ 12,000\ \text{hours}}$ = ₹ 5.25 per hour	30 hrs × ₹ 5.25 = 157.50
Assembly Shop	48,000	$\frac{₹\ 48,000}{₹\ 10,000\ \text{hours}}$ = ₹ 4.80 per hour	42 hrs × ₹ 4.80 = 201.60
Prime Cost	3,10,000		1,079.10
+Works Overheads:			
Machine Shop	88,200	$\frac{₹\ 88,200}{₹\ 12,000\ \text{hours}}$ = ₹ 7.35 per hour	30 hrs × ₹ 7.35 = 220.50
Assembly Shop	51,800	$\frac{₹\ 51,800}{₹\ 10,000\ \text{hours}}$ = ₹ 5.18 per hour	42 hrs × ₹ 5.18 = 217.56
Factory Cost	4,50,000		1,517.16
+ AOH	90,000	$\frac{₹\ 90,000}{₹\ 4,50,000}$ = 20% on Works Cost	20% × ₹ 1,517,16 = 303.43
Sub Total	5,40,000		1,820.59
+ S&D OH	1,43,100	$\frac{₹\ 1,43,100}{₹\ 4,50,000}$ = 31.8% on Works Cost	31.8% × ₹ 1,517.16 = 482.46
Cost of Sales	6,83,100		2,303.05

Illustration 10:

A company has been asked to quote for a job. The company aims to make a net profit of 30% on sales. The estimated cost for the job is as follows:

Direct materials 10 kg @ ₹ 10 per kg

Direct Labour 20 hours @ ₹ 5 per hour

Variable production overheads are recovered at the rate of ₹ 2 per labour hour.

Fixed production overheads for the company are budgeted to be ₹ 1,00,000 each year and are recovered on the basis of labour hours.

There are 10,000 budgeted labour hours each year. Other costs in relation to selling, distribution and administration are recovered at the rate of ₹ 50 per job.

Determine quote for the job by the Company.

Solution:

Determination of Quotation Price for the Job

Cost	*(₹)*
Direct Material (10 kg × ₹ 10)	100
Direct Labour (20 hrs × ₹ 5)	100
Variable production overheads (20 hrs × ₹ 2)	40
Fixed Overheads $\left(\frac{₹\ 1,00,000}{10,000\ \text{Budgeted hours}} \times 20\ \text{hours}\right)$	200
Other Costs	50
Total Costs	490
Profit	210
Quotation Price	700

Net Profit is 30% of sales, therefore total costs represent 70% (₹ 490 × 100) ÷ 70 = ₹ 700 price to quote for job. To check answer is correct; Profit achieved will be ₹ 210 (₹ 700 – ₹ 490) = ₹ 210 ÷ ₹ 700 = 30%

BATCH COSTING

It is a kind of job costing. In this method, the cost of a group of products is ascertained. The unit of cost is a batch or group of identical products, instead of a single job, order or contract. The method is applicable to general engineering factories which produce components in convenient economical batches for subsequent assembly or manufacture on mass scale, comparatively small items of products. Except for the difference that in batch costing, a batch instead of a job constitutes the cost unit for which costs are compiled, the procedure for batch costing is similar to that of Job Costing. Separate Job Cost Sheets are maintained for each batch of components manufactured and for the assembly of finished products. When products are stocked for sale, a greater degree of control is required.

Essentials of Batch Costing

1. Entire production is divided into economic groups or batches and usual and appropriate costing methods are applied to each group or batch.
2. This method is used where small parts of considerable number are produced, such as factories producing machinery parts, machine tools, *etc*.
3. The advantages of the method are that the unit cost of each group is determined so that the total production cost is broken down into its constituent parts and profit and loss of each batch is known separately.
4. As production cost and volume of sales vary considerably from batch to batch, it sometimes becomes difficult to allocate overhead charges equitably. It is main drawback of the method.

5. No special costing principles are involved, each batch constituting a separate unit divided into subunits of each piece produced.

Economic Batch Quantity

In Batch Costing Method production is carried on in batches. In each batch, there are a number of units. The ascertainment of economic batch quantity is very useful. Economic batch quantity may be calculated by using the formula meant for calculating Economic Order Quantity (*EOQ*) in case of material control.

$$\text{Economic Batch Quantity} = \sqrt{\frac{2AO}{C}}$$

where A = Demand of components in a year
O = Setting up cost per batch
C = Cost of capital and storage (carrying cost) per unit per annum

Set up cost: Set up cost of tools and machines is a fixed amount which is incurred for a batch of production irrespective of the size of that particular batch. Set up cost varies directly with the number of batches or with batch frequency; as batches become more frequent, the total set up cost increases. In other words, for a given production during a period, the total set up costs increase with a reduction in the number of units manufactured in a batch. Following certain other costs also increase the total set up cost: *(a)* Time cost during changeover from one batch to another, *(b)* Loss of skill and speed of worker due to too frequent changes, *(c)* Closer supervision of each set up, *(d)* Wastage of material due to change in the machine feeding, *(e)* Other cost related to short runs.

Cost of Capital and Storage (Carrying Cost): Carrying cost depends upon several variable factors such as storage and obsolescence of inventory, interest on locked up capital, depreciation, machine breakdowns and substandard and defective work. This cost varies directly with the size of a batch *i.e.,* with the batch quantity. With the increase in the number of units produced in a batch, or in other words, with the decrease in batch frequency, the cost of carrying the inventory rises:

Illustration 11:

[*Economic Batch Quantity*]

Calculate Economic Batch Quantity:
Total Number of Units to be produced in a year: 10,000
Unit set-up cost per batch: ₹ 200.
Carrying cost per unit of production: ₹ 0.10 per unit

Solution:

$$\text{Economic Batch Quantity} = \sqrt{\frac{2AO}{C}}$$

A = Total number of units or demand of components in a year.
O = Setting up cost per batch
C = Carrying cost per unit.

$$EBQ = \sqrt{\frac{2 \times 10,000 \times 200}{0.10}} = 6,324 \text{ units}$$

Illustration 12:

[*Economic Batch Quantity*]

M/s Kobo Bearings Ltd is committed to supply 24,000 bearings for fans p.a. on a steady daily basis. It is estimated that it cost 10 paise as inventory holding cost per bearing per month and that the set up cost per run of bearing manufacturing is ₹ 324.

(i) What should be the optimum run size for bearing manufacturing?

(ii) What should be the interval between two consecutive optimum runs?

(iii) Find out the minimum inventory holding cost. *[CA Inter]*

Solution:

(i) Economic Batch Quantity = $\sqrt{\frac{2AO}{C}}$ where

A = Units supplied
O = Setting up cost
C = Cost of inventory handling per unit p.a.

$$= \sqrt{\frac{2 \times 24,000 \times 324}{0.10 \times 12}} = 3,600 \text{ units}$$

(ii) Interval between two consecutive optimum runs

= 24,000/3,600 = 20/3

= 360 ÷ 20/3 = 54 days

(iii) Minimum inventory cost per annum

= (Annual Production/*EBQ*) × Setting up Cost

+ Average Inventory per annum × holding cost per unit

= (24,000/3,600) × 324 + (3,600/2) × (0.10 × 12) = ₹ 4,320

Illustration 13:

XYZ Ltd. has obtained an order to supply 48,000 bearings per year from a concern. On a steady basis. it is estimated that it costs ₹ 0.20 as inventory holding cost per bearing per month and the set-up cost per run of bearing manufacture is ₹ 384.

You are required to:

(i) Compute the optimum run size and number of runs for bearing manufacture.

(ii) Compute the interval between two consecutive runs.

(iii) Find out the extra costs to be incurred, if company adopts a policy to manufacture 8,000 bearings per run as compared to optimum run size.

(iv) Give your opinion regarding run size of bearing manufacture Assume 365 days in a year. *[CA Inter]*

Solution:

(i) Economic Batch Quantity (*EBQ*) :

$$\text{EBQ} = \sqrt{\frac{2\text{A}O}{\text{C}}} = \sqrt{\frac{2 \times 48,000 \times 384}{0.2 \times 12}} = \sqrt{\frac{3,68,64,000}{2.4}} = 3,919 \text{ units}$$

Number of optimum runs for Bearing Manufacture = 48,000 ÷ 3,919 = 12.25 runs or 12 runs

(ii) Interval between two runs (in days) = 365 days ÷ 12.25 = 29.80 days

(iii) Total Cost of maintaining the inventories) when Production run size *(a)* are 3,919 units and 8,000 units respectively.

Total Cost = Total Setup Cost ÷ Total Carrying Cost

Particulars	*When run size is 3,919 bearings*	*When run size is 8,000 bearings*
Total Set-up Cost	$= \frac{48,000}{3919} \times ₹384 = ₹ 4,703.24$	$= \frac{48,000}{8000} \times ₹384 = ₹ 2,304$
Total Carrying Cost	$^1/_2 \times 3,919 \times 0.2 \times 12 = ₹4,702.80$	$^1/_2 \times 8,000 \times 0.2 \times 12 = ₹ 9,600$
Total Cost	₹ 9,406.04	₹ 11,904

(iv) At the optimum run size of 3,919 units the setup cost and the carrying costs are the same. So, it is the most economical batch quantity and should be preferred.

Illustration 14:

GHI Ltd. manufactures 'Stent' that is used by hospitals in heart surgery. As per the estimates provided by Pharmaceutical Industry Bureau, there will be a demand of 40,00,000 'Stents' in the coming year. GHI Ltd. is expected to have a market share of 2.5% of the total market demand of the Stents in the coming year. It is estimated that it costs ₹ 1.50 as inventory holding cost per stent per month and that the set-up cost per run of stent manufacture is ₹ 225.

Required:

(i) What would be the optimum run size for stent manufacture?

(ii) What is the minimum inventory holding cost?

(iii) Assuming that the company has a policy of manufacturing 4,000 stents per run, how much extra costs the company would be incurring as compared to the optimum run suggested in *(i)* above?

[CA Inter]

Solution:

(i) Computation of Optimum Run size of ' Stents' or Economic Batch Quantity (EBQ):

Economic Batch Quantity (EBQ) = $\sqrt{\frac{2AO}{C}}$

Where,

A = Annual demand for the Stents
= 40,00,000 × 2.5% = 10,00,000 units

O = Set-up cost per run
= ₹ 225

C = Carrying Cost per unit per annum
= ₹ 1.50 × 12 = ₹ 18

EBQ = $\sqrt{\frac{2 \times 10,00,000 \times ₹ 225}{₹ 18}}$
= 5,000 units of Stents

Minimum Inventory Holding Cost = Average Inventory × Inventory Carrying Cost per unit per annum
= (5,000 ÷ 2) × ₹ 18
= ₹ 45,000

Calculation of the extra cost due to manufacturing policy

Particulars	*When run size is 4,000 units*		*When run size is 5,000 units i.e., at EBQ*	
Total set up cost	$= \frac{10,00,000}{4,000} \times$ ₹ 225	= ₹ 56,250	$= \frac{10,00,000}{5,000} \times$ ₹ 225	= ₹ 45,000
Total Carrying Cost	1/2 × 4,000 × ₹ 18	= ₹ 36,000	1/2 × 5,000 × ₹ 18	= ₹ 45,000
Total Cost		₹ 92,250		₹ 90,000

Extra cost = ₹ 92,250 – ₹ 90,000 = ₹ 2,250

Illustration 15:

(Batch Costing).

Following information relate to the manufacturing of a component - 101 in a cost centre:

Cost of Materials	6 paise per component
Operator's Wages	72 paise an hour
Machine Hour Rate	₹ 1.50
Setting up time of the machine	2 hours 20 minutes
Manufacturing time	10 minutes per component

Prepare cost sheets showing both production and setting up cost, total and per unit when batch consists of *(i)* 10 components, *(ii)* 100 components and *(iii)* 1,000 components.

[CA Inter and CMA Inter]

Solution:

Cost Statement for a Batch of 10 Components

Particulars	*Total* ₹	*Per unit* ₹
Setting up costs:		
(a) Operators wages: 2 hrs. 20 mts @ 72 paise per hour	1.68	
(b) Overheads of the machine for 2 hrs. and 20mts @ ₹ 1.50 per hr.	3.50	
Total Setting up Cost *(A)*	5.18	0.52
Production Cost :		
(a) Material: 10 units @ 6 paise	0.60	0.06
(b) Wages 10mts × 10 components @ 72 paise per hr.	1.20	0.12
(c) Overheads 10 × 10 minutes @ 1.50 per hour	2.50	0.25
Total Production Cost *(B)*	4.30	0.43
Total Production Setting Cost (*A*+*B*)	9.48	0.95

Cost Statement for a Batch of 100 Components

Particulars	*Total* (₹)	*Per Unit* (₹)
Setting up Cots (as calculated above)	5.18	0.05
Production Cost :		
(a) Materials : 100 units @ 6 paise per unit	6.00	0.06
(b) Wages : 1,000 minutes @ 72 paise per hour	12.00	0.12
(c) Overheads : 1,000 minutes @ 1.50 per hour	25.00	0.25
Total	48.18	0.48

Cost Statement for a Batch of 1,000 Components

Particulars	*Total* (₹)	*Per Unit* (₹)
Setting up Cost (as calculated above)	5.18	0.005
Production Cost:		
(a) Materials : 1,000 units @ 6 paise per unit	60.00	0.060
(b) Wages : 1,000 minutes @ 72 paise per hour	120.00	0.120
(c) Overheads : 10,000 minutes @ 1.50 per hour	250.00	0.250
Total	435.18	0.435

Illustration 16:

Leo Ltd. undertakes to supply 1,000 units of a component per month for the month of January, February and March. Every month a batch order is opened against which materials and labour costs are booked at actuals. Overheads are levied on the basis of labour hours. The selling price is contracted at ₹ 15 per unit.

From the following data, present the cost and profit per unit of each batch order and the overall position of the order for 3,000 units. Ignore set up costs.

Months	*Batch output (Number)*	*Materials Cost* (₹)	*Labour Cost* (₹)
January	1,250	6,250	5,000
February	1,500	9,000	6,000
March	1,000	5,000	4,000

Labour is paid at the rate of ₹ 4 per hour. The other details are:

Months	*Overhead (₹)*	*Total labour hours*
January	12,000	4,000
February	9,000	4,500
March	15,000	5,000

[CA Inter}

Solution:

LEO Limited
Statement of Cost and Profit Per Unit

Particulars	*Batches*			
	January 1,250 units	*February 1,500 units*	*March 1,000 units*	*Total 3,750 units*
Materials	6,250	9,000	5,000	20,250
Wages	5,000	6,000	4,000	15,000
Overheads	3,750	3,000	3,000	9,750
Total cost	15,000	18,000	12,000	45,000
Sales @ ₹ 15 per unit	18,750	22,500	15,000	56,250
Profit	3,750	4,500	3,000	11,250
Cost per unit (Total cost/units)	12.00	12.00	12.00	12.00
Profit per unit (Profit/units)	3.00	3.00	3.00	3.00

Illustration 17:

ABC Ltd. undertakes to supply 1,000 assemblies per month for the months of January, February and March. Every month a batch order is opened against which Materials and Labour Cost is booked at actuals. Labourers are paid at ₹ 2 per hour. Overheads are levied at a rate per labour hour.

The unit Selling Price is fixed at ₹ 15. From the following data, present the profit per unit each batch order and the overall position of the order for 3,000 units.

Month	*Batch Output*	*Material Cost*	*Labour Cost*	*Total OH for the month*	*Total Labour Hour for the month*
Jan	₹ 1,250 units	₹ 6,250	₹ 2,500	₹ 12,000	4,000
Feb	₹ 1,500 units	₹ 9,000	₹ 3,000	₹ 9,000	4,500
Mar	₹ 1,000 units	₹ 5,000	₹ 2,000	₹ 15,000	5,000

Solution:

Computation of OH for the Batch

Month	*Total OH*	*Total Direct Labour Hrs*	*So. OH Rates*	*Direct Lab. hours in the batch = Direct Wages ÷ Wage Rate*	*OH for the job*
(1)	(2) (given)	(3) (given)	(4) = (2) ÷ (3)	(5) = Wages ÷ ₹ 2	(6) = (5) × (4)
Jan	₹ 12,000	4,000	₹ 3 per hour	= 1,250 hour	₹ 3,750
Feb	₹ 9,000	4,500	₹ 2 per hour	= 1,500 hour	₹ 3,000
Mar	₹ 15,000	5,000	₹ 3 per hour	= 1,000 hour	₹ 3,000

Batch Cost Sheet

Particular	*Jan*	*Feb*	*March*	*Total*
Quantity	*1,250 units*	*1,500 units*	*1,000 units*	*3,750 units*
Direct Material (given)	6,250	9,000	5,000	20,250
Direct Labour (given)	2,500	3,000	2,000	7,500
Overheads (as per WN above)	3,750	3,000	3,000	9,750
Total Cost (Sub-total)	12,500	15,000	10,000	37,500
Add: Profit (balancing figure)	6,250	7,500	5,000	18,750
Sales at ₹ 15 p.u. (Qty. × ₹ 15)	18,750	22,500	15,000	56,250
Cost per unit (Total Cost ÷ Qty	10	10	10	10
Profit per unit (bal. fig.)	5	5	5	5
Selling Price per unit (given)	15	15	15	15

Over all profit position for 3,000 units = 3,000 × ₹ 5 (average profit p.u.) = ₹ 15,000.

Illustration 18:

A Company produces product X to order and has the following budgeted OH:

Department	*Budgeted Overheads*	*Budgeted Activity Levels*
Welding	₹ 6,000	1,500 Labour Hours
Assembly	₹ 10,000	1,000 Labour Hours

Selling and Administration OH are 20% of Factory Cost. An order for 250 product type X–128 and made as Batch S – 937, had the following costs – (1) Material – ₹ 12,000, (2) Labour–100 hours in Welding Shop at ₹ 10 per hour, 200 hours in Assembly Shop at ₹ 8 per hour, (3) ₹ 500 was paid for hire of Special scan equipment for testing the product: From the given data calculate the cost per unit for Batch S – 937.

Solution:

1. Computation of OH Absorption Rates

   Welding Department: $\frac{₹\,6,000}{1,500}$ = 4 per Labour Hour.

   Assembly Department: $\frac{₹\,10,000}{1,000}$ = ₹ 10 per Labour Hour

2. **Batch Cost Sheet**

Particulars	₹
Direct Materials Given	12,000
Direct Wages 100 hours in Welding Shop at ₹ 10 per hour	1,000
200 hours in Assembly Shop at ₹ 8 per hour	1,600
Direct Expenses Hire of Special Scan Equipment	500
Prime Cost	15,100
Add: Overheads 100 hours in Welding Shop at ₹ 4 per hour	400
200 hours in Assembly Shop at ₹ 10 per hour	2,000
Factory Cost	17,500
Add: SOH absorbed at 20% on Factory Cost of ₹ 17,500	3,500
Total Cost	21,000

Cost per unit = $\frac{₹\,21,000}{250}$ = ₹ 84.00

CONTRACT COSTING

Contract costing is a variant of job costing system, which is applied in business engaged in building or other construction work. The jobs are usually the contracts entered into with the customers. The basic principles applied in contract costing are the same as those used in job costing but these are modified to suit the particular requirements of the contracts.

Difference between Job Costing and Contract Costing

It is considered that contract costing is comparatively simpler in operation than job costing system. The accumulation, analysis, apportionment, allocation and control of cost is simplified in contract costing. Most of the expenses are chargeable direct to Contract Account but direct allocation to such an extent is not possible in Job Costing. Normally the number of jobs in hand at any time in a concern may be large, only a few contracts may be undertaken at a time. As contracts may run for long periods, there arises the problem of assessment and crediting of profits on incomplete contracts at the end of accounting period.

A 'contract' differs from a job only in size. We generally reserve the word 'contract' for those jobs which require all the attention or most of it to be devoted to it. Work is done for a customer who agrees to pay a fixed sum of money at the completion of the work. Usually, however, the contractee pays a portion of the work done progressively.

A contract may be for the construction of a building, a road, a ship or a complicated piece of machinery, *etc*. Since the number of contracts in hand is never likely to be large, it is not necessary to maintain separate books of account for costing purposes. Financial books are sufficient but they will have to be remodelled to give the required information. For example, if two contracts are being undertaken simultaneously, wages or materials will have to be separately recorded for each, otherwise it will be difficult to know the total cost of completing a particular contract. It will even be better if, in the account opened to record the cost of a contract, columns are provided to classify the expenditure.

Contract Ledger

Contract No..... Contract Price.....
Date of Completion..... Terms of Payment.....
Site..... Work Certified.....
Remark..... Date.....₹.....
..... Date.....₹.....

Date	*Particulars*	*Materials* (₹)		*Wages* (₹)		*Direct Charges* (₹)		*Plant* (₹)		*Indirect Exp. Total*		*Total* (₹)
	Total ₹											

ELEMENTS OF CONTRACT COST

1. Materials

There is no special principle involved in the issue of materials to contracts. For materials issued out of stores, requisition slips in the usual form will be made out and they will be costed by the stores ledger clerk, again in the usual manner. On analysis, the amount to be debited to each contract will be found out and, of course, the total of all the requisition slips will be credited to the Stores Control Account maintained in the general ledger. But since each contract is likely to be different in nature and since large quantities of main raw materials will be required, stocks are not maintained of such materials. On the signing up of each contract, arrangements will be made to buy the main materials required. The concerned contract account will then be debited and the suppliers credited.

The return of materials also involves no departure from the principles already discussed. If materials are returned from any contract, a Store Returned Note or Contra Requisition Slip should be made out. The amount involved will be debited to the Stores Control Account and credited to the Contract Account concerned.

Transfer of materials from one contract to another should, in the usual manner, be accompanied by Materials Transfer Note so that the contract receiving the materials is debited and the contract giving up the materials is credited.

Sometimes surplus materials are sold. In that case the sale proceeds will have to be credited to the respective contract accounts. Sometimes it so happens that the contractee, under the terms of the contract, supplies some materials which do not affect the contract price. The value of such materials should not be brought into books but a note will have to be kept to account for the quantity received and issued. Any balance will naturally belong to the contractee. Should any purchased material be found unsuitable, the cost of such material should not be debited to the cost of the contract concerned. The profit or loss on sale of such materials should be credited or debited to the Profit and Loss Account. This applies not only to materials but also to plant, machinery, tools, *etc*., that may be found unsuitable for the contract.

2. Labour

The wages of everybody working at the site of the contract will be treated as direct. Normally, in other business, supervisory staff or watch and ward staff are treated as indirect workers but, in case of contracts, everybody is a direct worker if he is present at the site throughout the time it takes to complete the contract. Those, of course, who supervise the completion of two or more contracts are not included in the category of direct workers. Their salaries and the salaries, *etc*., of the office staff are treated as indirect.

A contract can be divided into different stages. For instance, in the case of construction of a building, firstly foundations have to be dug, then construction is brought up to the plinth level. Construction up to roof level is another stage. The next stage is roofing. Plastering the roofs and walls and laying floors are different stages. It is desirable that the cost of doing work at each stage should be known. Job cards should, therefore, be issued to workers so that they can record their time for the purpose of analysis. But in the contract account itself wages may be recorded as a lump sum for finding out the cost of each section the contract ledger can be used with minor changes.

For facilitating determination of wages spent on each contract, separate wage sheets should be prepared for each contract. Otherwise, wages will have to be analysed as has been explained earlier.

3. Plant

There are two possibilities with regard to plant. Plant may be specially bought for a contract and it may be expected to be exhausted there. In such a case the value of the plant should be debited to the contract account concerned and when the contract is completed or at the end of accounting period, it may be credited with the value that might be placed on the plant. The other possibility is that plant is already in stock and it is expected to be used only for a short while on the contract and not exhausted there. In that case the usual depreciation of the plant should be debited to the contract account concerned.

4. Indirect Expenses

All the expenses at site are treated as direct, but sometimes when two or more contracts are being undertaken at the same time, some of the executive officers of the contractor firm and the office will be paying attention to all the contracts. The total indirect expenses, arising out of such common services, will have to be apportioned equitably

among all the contracts. Or, the expenses may be spread according to the ratio of total cost incurred on a contract. Thus, if two contracts have cost ₹ 5 crore and ₹ 3 crore in materials, labour and plant, *etc*., the indirect expenses maybe apportioned between the two contracts in the ratio of 5 : 3.

5. Cost of Extra Work Done

Sometimes the contractee desires to get some additions or alterations made which may not have been included in the original contract. This extra work will have to be charged for in addition to the contract price. It is essential, therefore, to ascertain the exact cost of doing the extra work.

Needless to say, besides materials and labour, an equitable amount for supervision and other indirect expenses (these expenses may be really direct as far as the main contract is concerned) will have to be included. If the extra work is not substantial, the cost of doing it can be included in the cost of the contract. But a separate account should be maintained if the extra work is substantial.

6. Cost of Sub-Contract

In contrast with the above, some portion of the contract may be entrusted to another contractor. For example, in the construction of a building, the main contractor may entrust the task of digging foundations to another contractor for a fixed price. If this is done, the price so paid should be included in the cost of the main contract as a separate item. It is of course a direct charge.

7. Cost of Maintenance Periods

Sometimes contractors are required to maintain the work during a specified period after completion, the cost of maintenance is also debited to the Contract Account.

Illustration 19:

The following is summarised record relating to Contract No. 103, commenced from 1st January, 20....

	₹
Materials issued from stores	60,000
Materials from Contract No. 106	6,000
Materials Purchased	54,000
Wages	48,000
Outstanding wages	12,000
Plant Purchased for this contract	50,000
Indirect Charges	10,000
Outstanding Indirect Charges	2,000

Materials worth ₹ 2,000 and plant costing ₹ 2,500 were returned to stores at the end of the year. Materials costing ₹ 4,000 and plant costing ₹ 1,500 were stolen. Materials worth ₹ 500 and plant costing ₹ 500 were destroyed by fire. Materials and plant transferred to Contract No. 96 were ₹ 5,250 and ₹ 4,000 respectively. Materials costing ₹ 4,200 were sold for ₹ 6,000 and plant costing ₹ 1,000 were sold for ₹ 1,250. Materials at site were ₹ 2,600. Providing depreciation on plant @ 10%, open Contract Account and find out the cost of work done on the contract. The contract is not completed.

Solution:

Dr. Contract No. 103 Account Cr.

Particulars	₹	*Particulars*	₹
To Materials issued:		By Materials returned to stores	2,000
Purchases	54,000	By Plant returned to stores less Dept.	2,500
From Contract 106	6,000	By Materials stolen	4,000
From Stores	60,000	By Plant stolen	1,500
To Wages	48,000	By Materials destroyed	500
To Outstanding wages	12,000	By Plant destroyed	500
To Plant issued	50,000	By Material transferred to	
To Indirect charges	10,000	Contract 96	5,250
To Outstanding Indirect Charges	2,000	By Plant transferred to	
		Contract 96	4,000
		By Materials sold (Cost)	4,200
		By Plant Sod (Cost)	1,000
		By Materials at site	2,600
		By Plant at site[1]	36,450
		By Balance being cost of contract done	1,77,500
₹	2,42,000	₹	2,42,000

Working Note:

1. Plant at site has been calculated as below:

	₹	₹
Cost of Plant		50,000
Less: Plant returned to stores	2,500	
Plant stolen	1,500	
Plant destroyed	500	
Plant transferred to Contract No. 96	4,000	
Plant sold	1,000	9,500
Cost of Plant at site		40,500
Less: Depreciation 10% of 40,500		4,050
		36,450

Illustration 20:

The following is the summarised record as on December 31, 2021 of all transactions relating to Contract No. 80 which was commenced on January 1, 2021, and completed during the year:

	₹
Material purchased directly	12,700
Materials supplied from stores	5,200
Wages	21,440
Expenses directly chargeable	2,940
Indirect expenses	3,000
Plant installed	18,000
Total Contract Price	60,000
Value of plant at site on Dec. 31, 2021	10,000
Materials at site on Dec. 31, 2021	900

Prepare Contract Account.

Solution:

Dr. Contract No. 80 Account Cr.

Particulars	₹	*Particulars*	₹
To Direct Materials	12,700	By Value of Plant at site	10,000
To Materials supplied from stores	5,200	By Materials at site	900
To Wages	21,440	By Contractee's A/c	60,000
To Expenses directly Chargeable	2,940		
To Indirect expenses	3,000		
To Plant	18,000		
To P&L A/c	7,620		
	70,900		70,900

Certificate of Work Completed and Payment Received from the Contractees

It is usual for the contractee to pay a certain percentage (say 80%, 75% or 90%) of the value of a definite stage of work completed. The payment is made after the contractee is satisfied that such stage has been completed. Surveyors or architects issue certificates for this purpose. Suppose the architect certifies that work of the value of ₹ 2,00,000 (out of the total contract price of ₹ 5,00,000) has been completed. Then if the contractee has agreed to pay 80%, he will pay ₹ 1,60,000. The balance of ₹ 40,000, known as Retention Money, will be paid when the whole contract is complete. Retention money is a sort of guarantee that the contractor will not run away in the middle of the job, as he might have the temptation to do if he sees nothing but loss in the completion of the contract.

Payment received can be dealt with in two ways. The value of the work done can be debited to the Contractee's Account and credited to the Contract Account. Cash received will, of course, stand to the credit of the Contractee's Account. Thus, in the above example the following entries may be passed:

Particulars		*Lf*	*Dr.* (₹)	*Cr.* (₹)
Contractee's Account	Dr.		2,00,000	
To Contract Account				2,00,000
(Being the value of work certified as per architect's certificate)				
Bank Account	Dr.		1,60,000	
To Contractee's Account				1,60,000
(Being cash received being 80 % of value of work certified)				

In the Balance Sheet the Contractee's Account will be shown at ₹ 40,000 on the assets side. Care will have to be exercised to see that in the following year the value of work certified for the purpose of passing entries does not include ₹ 2,00,000 in respect of which entry has already been passed.

The second and more popular method to deal with the payment received is to credit the amount to the account of the contractee. The value of the work completed is debited to the Work- in-Progress Account and credited to the Contract Account. Or, it may be carried down as a balance in the Contract Account itself. In the Balance Sheet, the credit to the contractee is deducted from the value of the work completed, the balance being shown as an asset. In the following year, the Work-in-Progress Account will be transferred to the debit of the Contract Account and the entries to be passed in respect

of work done at the end of the next year will be for the amount of total work done, including the amount already certified at the end of the previous year.

Cost of Work Uncertified

Work-in-Progress uncertified shall have to be costed for materials used and labour spent. Uncertified Work-in-Progress arises from the fact that at the end of the financial year certain work may not have reached a stipulated stage and in respect of such work there will be no certificate by the architect and there will be no payment from the contractee. The amount for such work is debited to Work-in-Progress Account and credited to the Contract Account and is transferred to the debit of Contract Account at the beginning of next year. Alternatively, the amount is carried down as a balance in the Contract Account.

Materials and other stores at site are dealt with similarly. Materials at Site Account is debited and Contract Account is credited. Next year the Materials at Site Account will be transferred to the Contract Account. Alternatively, materials and plant site may be treated as a part of work-in- progress and debited to that account.

Work-in-Progress uncertified (as well as Work-in-Progress certified and materials and plant at site) will appear on the asset side of the Balance Sheet at the close of the financial year after deducting the amount received from the contractee and after deducting the provision as discussed in the next paragraph.

Calculation of work uncertified : Usually any cost incurred after the date of work certified by the architect or engineer is included in the work uncertified. It may also be equal to proportionate cost. Suppose total cost incurred is ₹ 60,000 which is estimated to be the cost of 2/3 contract, but the architect has certified only 1/2 of the contract price as work completed. The cost of work uncertified will be proportionate cost as calculated below:

	₹
Cost of work uncertified	60,000
Less: Cost of 1/3 Contract 60,000 × 3/2 × 1/2	45,000
Cost of work uncertified	15,000

Profit on Incomplete Contracts

In contract accounts there would be no difficulty in dealing with profits if the contracts were completed in the course of the financial year. Then the profit would be credited to the Profit and Loss Account. But difficulty arises when we have to deal with profits arising on contracts which are not complete at the end of the year. We cannot afford to credit the entire profit shown to the Profit and Loss Account. There is the possibility that next year due to rise in prices or wages or due to fines, there may be a loss. A provision has to be kept against such a contingency. Nor is it desirable that profit on a contract should be taken into account only when the contract is complete. In that case, the year in which the contract is completed, will show an abnormally high figure for profit. The following rules may be followed for taking credit for profits earned on unfinished contracts:

(a) If a contract has not advanced to a sufficiently high stage, no credit for profit should be taken. Generally, no credit is taken unless the contract is at least one-fourth complete.

(b) In case the contract is 1/4 but less than 1/2 complete, one-third of the profit disclosed as reduced to the percentage of cash paid by the contractee should be transferred to the Profit and Loss Account, the balance being treated as a provision.

(c) In case the contract is one-half or more complete, two-thirds of profit (disclosed by the Contract Account) as reduced to the percentages of cash paid by contractee should be transferred to the P&L A/c, the remaining profit being treated as a provision.

(d) The whole of the loss, if any, should be transferred to the P&L A/c.

Suppose, a contract not yet complete *(i)* discloses a profit of ₹ 54,000, *(ii)* Work-in-Progress certified is ₹ 2,00,000, *(iii)* total value of contract is ₹ 5,00,000 and *(iv)* the contractee pays 90% of work certified. Then, according to above rules, the transfer to P&L A/c should be

$$\text{Total Profit} \times \frac{1}{3} \times \frac{\text{Cash received}}{\text{Value of work certified}}$$

$$54{,}000 \times \frac{1}{3} \times \frac{90}{100} \text{ or } ₹\ 16{,}200$$

Supposing in the above case, the total value of the contract (Contract Price) was only ₹ 4,00,000, the transfer to P&L A/c would have been

$$\text{Total Profit} \times \frac{2}{3} \times \frac{\text{Cash received}}{\text{Value of work certified}} = 54{,}000 \times \frac{2}{3} \times \frac{90}{100} \text{ or } ₹\ 32{,}400.$$

However, one should note that the rules are not hard and fast. Different proportions of profit may be transferred to the P&L A/c by different people.

Of course, the actual profit will be ascertained by debiting the Contract Account with all the relevant expenditure and crediting it with the value of work-in-progress certified and uncertified and materials and plant *etc*., at site. No abnormal loss should be debited and no abnormal gain should be credited to the Contract Account.

Profit on Cash Basis: The rules discussed above show that in each case the profit to be transferred to the P&L A/c has to be reduced by the margin retained by the contractee. This is what is meant by calculating profits on cash basis.

Estimated Profit: Some people, however, prefer to take credit for profit on the basis of total estimated profit likely to arise when the contract will be complete. Suppose, for a contract of ₹ 4,00,000, it is estimated that the total cost of completing the contract will be ₹ 3,20,000, thus giving a profit of ₹ 80,000. The value of work done already is ₹ 2,50,000 and therefore, the credit to Profit and Loss Account in respect of work done so far would be ₹ 80,000 × 2,50,000/4,00,000 or ₹ 50,000. If profit on realised basis is desired, ₹ 50,000 will be multiplied by proportion of cash received (say 80%) and thus ₹ 40,000 will be transferred to P and L A/c. It is desirable that, to be on the safe side, if two-thirds of the realised profit shown by the Contract Account is less than the profit on work done as proportion of total estimated profit (on cash basis), the lower figure should be taken to the Profit and Loss Account. This technique has been explained with example later on in this chapter.

Illustration 21:

[Work Certified *Less* than 1/4].

Following expenses were incurred by a contractor on a contract which he started on 1st January, 2022:

Materials ₹ 40,000; Wages ₹ 50,000; Other expenses ₹ 15,000; Plant at cost ₹ 50,000; Work certified ₹ 1,20,000; Work not certified ₹ 60,000; Materials in hand on 31st Dec. 2022 ₹ 11,000; Plant at close ₹ 43,000; Cash received from contractees ₹ 1,00,000. Materials returned to stores ₹ 2,000.

Prepare Contract Account assuming contract price to be ₹ 6,50,000 and showing profit to be taken to P&L A/c.

Solution:

Dr. **Contract Account** **Cr.**

Particulars	₹	*Particulars*	₹
To Materials	40,000	By Work Certified	1,20,000
To Wages	50,000	By Work Uncertified	60,000
To Other expenses	15,000	By Materials returned to stores	2,000
To Plant at Cost	50,000	By Materials at site	11,000
To Balance (Reserved Profit)	81,000	By Plant at site	43,000
	2,36,000		2,36,000

Note : Value of work certified is less than 1/4 of the contract price, hence no profit is carried to Profit and Loss Account and entire balance ₹ 81,000 is provision or reserved profit.

Illustration 22:

[Work Certified *Less* than 1/2]

The contractor accepted a contract for the construction of a building for ₹ 10,00,000, the contractee agreeing to pay 90% of the work certified as completed by the architect. During the first year the amounts spent were :

Materials ₹ 1,20,000, Labour ₹ 1,50,000

Machinery ₹ 30,000, Other Exps. ₹ 90,000.

At the end of the year, the machinery was considered to be of ₹ 20,000, and materials at site of the value of ₹ 5,000. Work certified during the year totalled ₹ 4,00,000. In addition, work-in-progress, but not certified at the end of the year, had cost ₹ 15,000. Prepare Contract Account in the books of the contractor. Also show amount of profit that can reasonably be transferred to the Profit & Loss Account.

Solution:

Dr. **Contract Account** **Cr.**

Particulars	₹	*Particulars*	₹
To Materials	1,20,000	By Work Certified	4,00,000
To Labour	1,50,000	By Work Uncertified	15,000
To Machinery	30,000	By Plant at site	20,000
To Other Exps.	90,000	By Materials at site	5,000
To Total Profit c/d	50,000		
	4,40,000		4,40,000
To Profit & Loss A/c	15,000	By Total Profit b/d	50,000
To Balance (Reserve or Provision)	35,000		
	50,000		50,000

Note: Profit to P&L A/c = Total profit $\times \frac{\text{Cash received}}{\text{Work certified}} \times 1/3 = 50{,}000 \times \frac{90}{100} \times \frac{1}{3}$ = ₹ 15,000.

Work-in-Progress Account

When work is not complete at the end of the accounting period, this account is opened. Work-in-Progress Account shows value of work certified and cost of work uncertified. The entry will be

Work-in-Progress A/c .... Dr
[*(i)* Value of work certified
(ii) Cost of work uncertified]
To Contract Account
For profit not transferred to P&L A/c
(Reserved profit)
Contract A/c .... Dr
To Work-in-Progress A/c

Dr. **Work-in-Progress Account** **Cr.**

Particulars	₹	*Particulars*	₹
To Contract Account *(i)* Value of work certified *(ii)* Cost of work uncertified		By Contract A/c (Reserved profit) By Balance c/d	

Work-in-Progress is shown in the asset side of the Balance Sheet. Cash received from the contractee is deducted therefrom. Plant at site and materials at site will also appear as assets in the B/S.

Balance Sheet

Liabilities		*Assets*	
		Work-in-Progress *Less:* Cash received Plant at site Materials at site	

Work-in-Progress along with material and plant at site are carried to the next year's Contract Account as opening balance.

Note : Some Cost Accountants are of opinion that Work-in-Progress should also include Plant at site and Material at site at end as shown below:

Dr. **Work-in-Progress Account** **Cr.**

Particulars	₹	*Particulars*	₹
To Contract A/c Value of work certified Cost of work unratified Plant at site Materials at site		By Contract A/c (Profit not tfd. to P&L A/c) By Balance c/d	

Now plant at site and materials at site will not appear in the Balance Sheet separately.

Contractee's Account

The contractor opens a personal account of the contractee and credits cash received from him.

Cash/Bank A/c .... Dr.
To Contractee's Account

Dr. **Contractee's Account** **Cr.**

Particulars	₹	*Particulars*	₹
To Balance c/d		By Cash/Bank	

Illustration 23:

From the information given below, relating to an incomplete contract, prepare Contract Account and Work-in-Progress Account:

	₹
Materials sent to site	86,000
Labour engaged at site	65,000
Plant issued at cost	80,000
Direct expenses	8,000
Establishment charges	4,000
Materials returned to stores	600
Work certified	1,90,000
Work uncertified	7,700
Materials in hand	2,000
Cash Received	1,61,500
Wages Accrued	300
Depreciation on plant	7,000

Solution:

Dr. **Contract Account** **Cr.**

Particulars	₹	*Particulars*	₹
To Materials issued	86,000	By Materials returned to stores	600
To Wages	65,000	By Work-in-Progress A/c	
To Outstanding wages	300	Certified work	1,90,000
To Plant at cost	80,000	Uncertified work	7,700
To Direct expenses	8,000	By Plant at site	73,000
To Establishment charges	4,000	By Materials at site	2,000
To Balance c/d	30,000		
	2,73,300		2,73,300
To P&L A/c	17,000	By Balance b/d	30,000
To Work-in-Progress	13,000		
	30,000		30,000

Note.

1. Profit to P&L A/c = $30,000 \times \frac{2}{3} \times \frac{1,61,500}{1,90,000} = 17,000$
2. It has been presumed that work certified is more than half of the contract price.

Dr. **Work-in-Progress Account** **Cr.**

Particulars		₹	*Particulars*	₹
To Contract A/c:			By Contract A/c (Reserved Profit)	13,000
Certified work	1,90,000		By Balance c/d	1,84,700
Uncertified work	7,700	1,97,700		
		1,97,700		1,97,700

Balance Sheet (Extract only)

Liabilities	₹	*Assets*	₹
P&L A/c	17,000	Work-in-Progress	1,84,700
Wages accrued	300	*Less:* Cash received	1,61,500
			23,200
		Materials at site	2,000
		Plant at site	73,000

Illustration 24:

[Contractee's Account].

Thakur Dass & Sons took a contract of constructing library building of Rohil Khand University, Bareilly. The Contract Price was ₹ 6 lakhs. It was agreed that 75% of the value of work certified shall be paid in advance at the end of each year.

The value of work certified separately for the first two years was:

First year ₹ 2,50,000 Second year ₹ 3,00,000

The entire work was finished by the end of third year and contractee paid the balance of amount through cheque. Open Contractee's A/c in books of the contractor.

Solution:

Dr. **Contractee's Account** **Cr.**

Particulars		₹	*Particulars*		₹
To Balance c/d		1,87,500	I yr. By Bank A/c		1,87,500
	₹	1,87,500		₹	1,87,500
To Balance c/d		4,12,500	II yr. By Balance b/d		1,87,500
			By Bank A/c		2,25,000
	₹	4,12,500		₹	4,12,500
To Contract A/c		6,00,000	III yr. By Balance b/d		4,12,500
			By bank A/c		1,87,500
	₹	6,00,000		₹	6,00,000

Escalation Clause

Escalation clause is often provided in long-term contracts under which the settled contract price is subject to enhancement on any likely increase in price or utilisation of materials and labour *etc*. Following are circumstances when this safeguard is provided to the contractor that the contract price would be suitably enhanced:

(i) When the market price of materials used for the contract work are anticipated higher beyond a limit in the future.

(ii) When quantity of materials used for the contract are anticipated more than estimated quantity due to the nature of the contract, the correct estimate was not possible unless the work has been sufficiently progressed. It may also be due to availability of inferior grades of raw materials resulting in more scraps and spoilage.

(iii) When labour rates are anticipated to increase or where labour usages cannot be correctly estimated on account of the nature of the contract.

Thus, an escalation clause is meant to safeguard the interest of the contractor against unforeseen rise in cost. There may be a De-escalation Clause or Reserve Clause to provide for any future decrease in price *etc.*, so that benefit may be passed on to the contractee.

Illustration 25:

A contractor has entered into a long term contract at an agreed price of ₹ 1,75,000 subject to an escalation clause for materials and wages as spelt out in the contract and corresponding actuals are as follows:

	Standard		**Actual**	
Materials	*Qty (tonnes)*	*Rate (₹)*	*Qty (tonnes)*	*Rate (₹)*
A	5,000	5	5,050	4.80
B	3,500	8	3,450	7.90
C	2,500	6	2,600	6.60
Labour	*Hours*	*Hourly Rate (₹)*	*Hours*	*Hourly Rate (₹)*
X	2,000	7.00	2,100	7.20
Y	2,500	7.50	2,450	7.50
Z	3,000	6.50	3,100	6.60

Reckoning the full actual consumption of material and wages the company has claimed a final price of ₹ 1,77,360. Give your analysis of admissible escalation claim and indicate the final price payable.

Solution:

Statement Showing Final Claim

	Standard Qty. / Hrs.	*Standard Rate (₹)*	*Actual Rate (₹)*	*Variation in Rate (₹)*	*Escalation Claim (₹)*
Materials	*(a)*	*(b)*	*(c)*	*(d) = (c) – (b)*	*(e) = (a) × (d)*
A	5,000	5.00	4.80	(–) 0.20	(–) 1,000
B	3,500	8.00	7.90	(–) 0.10	(–) 350
C	2,500	6.00	6.60	(+) 0.60	1,500
Materials escalation claim : (*P*)					150
Labour					
X	2,000	7.00	7.20	(+) 0.20	400
Y	2,500	7.50	7.50	–	–
Z	3,000	6.50	6.60	(+) 0.10	300
Wages escalation claim : (*Q*)					700
Final claim: (*P*) + (*Q*)					850

Statement Showing Final Price Payable

Agreed Price		₹ 1,75,000
Agreed escalation :		
Materials cost	₹ 150	
Labour cost	₹ 700	₹ 850
Final Price payable		₹ 1,75,850

The claim of ₹ 1,77,360 is based on the total increases in cost. This can be verified as shown below:

Statement Showing Total Increase in Cost

	Standard Cost			*Actual Cost*			*Increase/*
	Qty/hrs	*Rate* (₹)	*Amount* (₹)	*Qty/hrs*	*Rate* (₹)	*Amount* (₹)	*(Decrease)*
	(a)	*(b)*	*(c) = (a) × (b)*	*(d)*	*(e) (f) = (d)*	*× (e)*	*(y) = (f) – (c)*
I. Materials							
A	5,000	5.00	25,000	5,050	4.80	24,240	(760)
B	3,500	8.00	28,000	3,450	7.90	27,255	(745)
C	2,500	6.00	15,000	2,600	6.60	17,160	2,160
II. Labour			68,000			68,655	655
X	2,000	7.00	14,000	2,100	7.20	15,120	1,120
Y	2,500	7.50	18,750	2,450	7.50	18,375	(375)
Z	3,000	6.50	19,500	3,100	6.60	20,460	960
			52,250			53,955	1,705
						Total (I + II)	2,360
The final price claimed by the company is contracts price							₹ 1,75,000
Add: Increase in cost							₹ 2,360
							₹ 1,77,360

This claim is not admissible because escalation clause covers only that part of increase in cost, which has been caused by inflation.

Note: It is fundamental principle that the contractee would compensate the contractor for the increase in costs which are caused by factors beyond the control of contractor and not for increase in costs which are caused due to inefficiency or wrong estimation.

Illustration 26:

[Escalation Clause].

Deluxe Limited undertook a contract for ₹ 5,00,000 on 1st April 2020. On 31st March 2021 when the accounts were closed, the following details about the contract were gathered:

	₹
Materials Purchased	1,00,000
Wages paid	45,000
General Expenses	10,000
Plant purchased	50,000
Materials in hand 31-3-21	25,000
Wages accrued 31-3-21	5,000
Works certified	2,00,000
Cash received	1,50,000
Works uncertified	15,000
Depreciation of plant	5,000

The contract contained an escalation clause which read as follows:

'In the event of increase(s) of prices of materials and rates of wages by more than 5%, the contract price would be increased accordingly by 25% of the rise of the cost of materials and wages beyond 5% in each case.'

It was found that since the date of signing the agreement, the prices of materials and wage rates increased by 25%. The value of the work certified does not take into account the effect of the above clause.

Prepare the Contract Account. *[CS Inter}*

Solution:

Deluxe Limited

Dr. Contract Account for the year ended 31st March 2021 Cr.

Particulars		₹	*Particulars*	₹	₹
To Materials Purchased		1,00,000	By Work certified	2,00,000	
To Wages Paid	45,000		Work uncertified	15,000	
Add: Accrued	5,000	50,000	Effect of escalation		
To General expenses		10,000	clause	5,000	2,20,000
To Depreciation of Plant		5,000	By Materials in hand		25,000
To Total Profit c/d		80,000			
		2,45,000			2,45,000
To Profit & Loss A/c		20,000	By Total Profit b/d		80,000
To Balance					
(Reserved Profit)		60,000			
		80,000			80,000

Working Notes:

1. Calculation of Escalation

	Total Increase ₹	*Up to 5 %* ₹	*Beyond 5%* ₹
(a) Materials (increase in price) (₹ 1,00,000 – 25,000) × 25/125	15,000	3,000	12,000
(b) Wages (increase in rate) (₹ 50,000 × 25/125)	10,000	2,000	8,000
Total increase	25,000	5,000	20,000

Increase in contract price = 25% of increase in materials and wages beyond 5%

= 25% of ₹ 20,000 = ₹ 5,000

2. Profit to be transferred to Profit & Loss Account (Contract is complete between 1/4 and 1/2, hence, 1/3 profit received)

= Total Profit × 1/3 × Cash received/Work certified

= 80,000 × 1/3 × 1,50,000/2,00,000

= ₹ 20,000

Cost-plus Contract

Cost-plus contracts provide for the payment by the contractee of the actual cost of the contract plus a stipulated or agreed profit. Thus, under cost-plus contract the contract price is determined by adding to the actual cost of direct material, direct labour and direct expenses, a certain amount to cover the overhead costs of the contractor and an agreed profit.

Cost-plus contracts are entered into *(i)* when it is not possible to estimate its cost with reasonable accuracy due to unstable prices at the time the contract is undertaken or when the work is spread over a long period of time and prices of materials, rates of labour *etc*., are likely to fluctuate,*(ii)* when there is an emergency and no time to negotiate a contract price and the work is more important than its cost, *(iii)* where contract is with a government department. In such cases cost-plus contracts are advantageous both to the contractor and contractee as neither party stands to lose; a fair price is offered by the contractee and a reasonable profit accrues to the contractor.

Advantages of cost-plus contract to the contractor: (i) There is no risk of loss arising from changing prices, wrong estimates and underestimated quotation. All agreed costs are recovered; *(ii)* It provides an automatic or ready escalation clause, so that increase in cost is automatically adjusted and recovered; *(iii)* There is no bargaining problem. The work of offering quotation is simplified.

Advantages to contractee: (i) The contract is settled at reasonable price;*(ii)* There is no problem of bargaining. Time is saved; *(iii)* Contractee is also benefited by the fall in prices of material and labour.

Disadvantages to the contractor: (i) Advantage on account of favourable market price is denied; *(ii)* The profit earned is usually low; *(iii)* The books and records are confidentially maintained; *(iv)* Profit usually based as a percentage of cost, an efficient working which reduces cost shall not accrue any benefit.

Disadvantages to the contractee: (i) The final contract price is uncertain, with the result, the budget of cost cannot be set; *(ii)* Contractor may deliberately incur higher prime cost in order to increase profit.

Moreover in cost-plus contract, no clear-cut line can be laid down regarding the items of cost to be included or excluded from the cost-plus calculations. The other difficulty is to decide the rate of reasonable profit to be added in the cost.

Illustration 27:

The following information relate to Contract No. 123. You are required to prepare the Contract Account and Contractee Account assuming the balance of the contract was duly received

		₹
Direct Materials		20,250
Direct Wages		15,500
Stores Issued		10,500
Loose Tools		2,400
Tractor Expenses		
Running Material	2,300	
Wages of Driver	3,000	5,300
Other Direct Charges		2,650

The contract took 13 weeks in its completion. The values of loose tools and stores returned at the end of the period were ₹ 200 and ₹ 3,000 respectively. The plant was also returned at a value of ₹ 16,000 after charging depreciation at 20%. The value of tractor was ₹ 20,000 and the depreciation was to be charged to the tractor @ 15% per annum. The administration and office expenses are to be provided at 10% on works cost. Profit to be charged at 20% of the total cost.

Solution:

Dr. **Contract No. 123 Account** **Cr.**

Particulars		*Amount*	*Particulars*	*Amount*
		₹		₹
To Direct Materials		20,250	By Stores returned	3,000
To Direct Wages		15,500	By Loose tools returned	200
To Stores Issued		10,500	By Plant returned	16,000
To Plant (original cost)		20,000	By Balance being Works Cost c/d	58,150
To Loose tools		2,400		
To Tractor expenses:				
Running materials	2,300			
Wages to driver	3,000	5,300		
To Depreciation on Tractor @ 15 % on ₹ 20,000 for 13 weeks		750		
To Other Direct Charges		2,650		
	₹	77,350	₹	77,350
To Balance being Works Cost b/d		58,150	By Contractee's A/c	76,758
To Administration and office expenses @ 10 % on works cost		5,815		
To Profit & Loss A/c [20% of (58,150 + 5,815)]		12,793		
	₹	76,758	₹	76,758

Dr. **Contractee's Account** **Cr.**

Particulars	₹	*Particulars*	₹
To Contract A/c	76,758	By Bank	76,758
₹	76,758	₹	76,758

Note : The plant was depreciated @ 20% (not @ 20% per annum). The depreciated value is 16,000. So the original cost of the plant comes to ₹ 20,000.

Illustration 28:

From the following particulars, write up the Contract Account No. 57 and find out the tender price:

	₹
Materials used	3,000
Productive wages	2,300
Direct expenses	250

Provide 60% on productive wages for works overheads and 12.5% on Works Cost for office overheads. Profit to be realised is 15% on the tender price.

Solution:

Contract No. 57 Account

Particulars	₹	*Particulars*	₹
To Materials used	3,000.00	By Contractee's Account	9,172.06
To Productive Wages	2,300.00		
To Direct Expenses	250.00		
Prime Cost	5,550.00		

To Work Overheads (60% on Productive Wages)	1,380.00		
Works Cost	6,930.00		
To Office Overheads (12.5% on Works Cost)	866.25		
Total Cost	7,796.25		
To Profit and Loss Account (15 % on tender price or 7796.25 × 15/85)	1,375,81		
	9,172.06		9,172.06

Illustration 29:

A firm of contractors undertook a contract on 1st April, 2022. The following was the expenditure on the contract which was for ₹ 4,00,000.

	₹
Materials issued to contract	60,000
Plant used for contract	20,000
Wages incurred	80,000
Other Expenses	5,000

Cash received on account up to 31st March, 2023. amounted to ₹ 1,60,000 being 80% of work certified.

Of the plant and materials charged to the contract, plant which costs ₹ 4,000 and materials which cost ₹ 3,000 were lost.

On 31st March, 2023, plant which costs ₹ 5,000 was returned to stores; the cost of work done but uncertified was ₹ 2,000 and materials costing ₹ 3,000 were in hand on site.

Charge 10% depreciation on plant and prepare Contract Account, Work-in-Progress Account and Contractee's Account from the above particulars. Show how Work-in-Progress would appear in the Balance Sheet.

Solution:

Contract Account

Dr. **(For the year ended 31 st March, 2023)** **Cr.**

Particulars	₹	*Particulars*		₹
To Materials issued	60,000	By P&L A/c Plant Lost	4,000	
To Plant	20,000	Materials Lost	3,000	7,000
To Wages	80,000	By Plant returned	5,000	
To Other Expenses	5,000	*Less:* 10 % depreciation	500	4,500
To Balance being Profit c/d	61,400	By Materials in hand		3,000
		By Plant at site (20,000 – 4,000 – 5,000)	11,000	
		Less: 10% depreciation	1,100	9,900
		By Work-in-Progress		
		Work certified (1,60,000 × 100/80)		2,00,000
		Work uncertified		2,000
	2,26,400			2,26,400
To Profit transferred to P&L A/c	32,747	By Balance b/d		61,400
To Work-in-Progress A/c	28,653			
	61,400			61,400

Dr. **Work-in-Progress Account** **Cr.**

Particulars	₹	*Particulars*	₹
To Contract A/c		By Contract A/c	
Work certified	2,00,000	Balance of Profit	
Work uncertified	2,000	to P&L A/c	28,653
		By Balance	1,73,347
	2,02,000		2,02,000

Balance Sheet
(As at 31st March, 2023)

Liabilities	*Assets*		₹
	Materials in hand		3,000
	Plant at site		9,900
	Work-in-Progress	₹ 1,73,347	
	Less: Advance	1,60,000	13,347

Dr. **Contractee's Account** **Cr.**

Particulars	₹	*Particulars*	₹
To Balance c/d	1,60,000	By Bank	1,60,000
	1,60,000		1,60,000

Illustration 30:

The following is a summary of the entries in a Contract Ledger as on 31st Dec., 2022, in respect of Contract No. 27.

	₹
Materials (direct)	30,000
Materials (from stores)	6,500
Wages	17,210
Direct Expenses	6,710
Establishment charges	8,000
Plant	34,200
Sale of Scrap	1,820
Sub-contract costs	7,210

You obtain following information:

(a) Accruals on 31st December, 2022, are : Wages ₹ 800; Direct Exps. ₹ 1,120.

(b) Depreciation of Plant up to 31st December, 2022, is ₹ 8,550.

(c) Included in the above summary of entries are wages ₹ 1,000 and other expenses ₹ 1,500 since certification. The value of materials used since certification is ₹ 2,080.

(d) Materials on site on 31st December 2022 cost ₹ 10,000.

(e) ₹ 62,500 had been certified up to 31st December 2022 when three-eighths of the contract remained incomplete.

(f) The total contract price is ₹ 1,00,000.

You are required to show what profit or loss would be taken into the accounts for the year ended 31 st December 2022 in respect of this contract.

Solution:

Dr. **Contract No. 27 Account** **Cr.**

Particulars		₹	*Particulars*		₹
To Materials (direct)		30,000	By Sales of Scrap		1,820
To Materials (from stores)		6,500	By Work certified		62,500
To Wages	17,210		By Work uncertified		
Add: Accrued	800	18,010	Wages	1,000	
To Direct Expenses	6,710		Exps.	1,500	
Add: Accrued	1,120	7,830	Materials	2,080	4,580
To Establishment charges		8,000	By Value of Plant		
To Plant		34,200	(34,200 – 8,550)		25,650
To Sub- contract cost		7,210	By Materials on site		10,000
			By P&L A/c — Loss to date		7,200
	₹	1,11,750		₹	1,11,750

Note: Cost of work uncertified is expenses incurred after the date of work certified.

Illustration 31:

A contractor who prepares his accounts on 31st December each year commenced a Contract No. 51 on 1st April, 2022. The costing records concerning the said contract yield the following information at 31st December, 2022.

	₹
Materials charges out to site	21,500
Labour	50,110
Foremen	6,310

A machine costing ₹ 15,000 has been on the site for 73 days. Its working life is estimated at 5 years and its final scrap value at ₹ 1,000.

A supervisor, who is paid ₹ 1,000 per mensem, has devoted approximately one-half of his time to this contract.

All other expenses and administration amount to ₹ 12,610.

Materials in hand at site on 31st Dec., 2022 cost ₹ 2,480.

The contract price is ₹ 2,00,000. On 31st December, 2022, two-thirds of the contract was completed; architect's certificates had been issued covering ₹ 1,00,000; ₹ 80,000 has so far been paid on account.

Prepare Contract Account.

Solution:

Dr. **Contract No. 51 Account** **Cr.**

Particulars	₹	*Particulars*	₹
To Materials	21,500	By Plant in hand (15,000 – 560)	14,440
To Labour	50,110	By Materials in hand	2,480
To Foremen	6,310	By Work certified	1,00,000
To Supervision	4,500	By Work uncertified	
To Plant	15,000	(see note below)	23,278
To Sundry and Administration Exps.	12,610		
To Balance c/d	30,168		
₹	1,40,198	₹	1,40,198
To P&L A/c	16,090	By Balance b/d	30,168
To Bal. c/d	14,078		
	30,168		30,168

Notes :

1. Depreciation on Plant = $\frac{(15,000 - 1,000) \times 73 \text{ days}}{5 \times 365}$ = ₹ 560

   Plant at site = 15,000 – 560 = 14,400

2. Calculation of cost of work uncertified

   (*a*) *First method*

   (i) Contract Completed = 2/3

   (ii) Total Cost of 2/3 Contract = 1,10,030 – 16,920 = 93,110

   (iii) Total estimated cost of whole contract = 93,110 × 3/2 = 1,39,665

   (iv) Ratio of value of work certified to Contract Price 1,00,000/2,00,000 = 1/2

   (v) Cost of work certified 1,39,665 × 1/2 = 69,832

   (vi) Cost of work uncertified:

	₹
Cost of work done	93,110
Less: Cost of work certified	69,832
	23,278

   (b) Second Method

   Work done = 2/3

   Work certified =1/2

   Work uncertified = 2/3 – 1/2 = 1/6

   Cost of 2/3 contract = ₹ 93,110

   Therefore cost of 1/6 work = 93,110 × 3/2 × 1/6 = ₹ 23,278

Illustration 32:

The following figures are disclosed by the books of a contractor for the year ending 31st December 2022.

	₹	₹
Work-in-progress as on 31st Dec., 2021	3,40,000	
Less: Advances from contractees as on 31-12-2021	2,20,000	1,20,000
Transactions during the year :		
Materials supplied to contract directly by merchant		20,000
Materials issued from stores		40,000
Wages		40,000
Working Expenses		6,000
Administration Expenses (of which ₹ 2,000 are chargeable to General Profit and Loss Account)		6,000
Plant issued		10,000
Materials returned from contracts directly to merchant		2,000
Materials returned to stores		2,000
Contract finished		90,000
Work certified		60,000
Profit taken upon contracts		46,000
Advances from contractees		1,60,000

Prepare the Contract Ledger Account and the Total Contractee's Account and show how the Work-in- Progress would appear in the Balance Sheet.

Solution:

Contract Ledger Account

Dr. **(For the year ending 31st Dec., 2022)** **Cr.**

Particulars	₹	*Particulars*	₹
To Work-in-Progress	3,40,000	By Materials returned to suppliers	2,000
To Materials direct	20,000	By Materials returned to store	2,000
To Materials from store	40,000	By Contractee's A/c	
To Wages	40,000	(For contract finished)	90,000
To Working Expenses	6,000	By Work certified	60,000
To Administration Exps.	4,000	By Work uncertified	
To Plant	10,000	(balancing figure)	3,52,000
To Profit & Loss A/c (Profit taken upon contract)	46,000		
	5,06,000		5,06,000

Dr. **Total Contractee's Account** **Cr.**

Particulars	₹	*Particulars*	₹
To Contract A/c		By Balance b/d	2,20,000
(For contract finished)	90,000	By Bank	1,60,000
To Balance c/d	2,90,000		
	3,80,000		3,80,000

Balance Sheet
(As at 31st Dec., 2022)

	Assets		₹
	Work-in-Progress :		
	Work certified	60,000	
	Work uncertified	3,52,000	
		4,12,000	
	Less: Advances (balance of Contractee's A/c)	2,90,000	1,22,000

Note: Since profit carried to Profit and Loss Account has been given, the balance in the account will be cost of work uncertified.

Illustration 33:

The Enterprising Contractors Ltd. having an authorised capital of ₹ 90,000 divided into 400 6% Cumulative Pref. Shares of ₹ 100 each and 5,000 Equity Shares of ₹ 10 each, commenced operations on 1st January 2021 and during 2022 were engaged on one contract of ₹ 4,00,000. The trial balance extracted from their books on 31st Dec., 2022, stood as follows:

Particulars		₹	₹
Share Capital :	Preference fully paid		40,000
	Equity ₹ 8 paid		40,000
Sundry Creditors			8,000
Land and Buildings		34,000	
Cash at Bank		9,000	
Contract Account :	Materials	75,000	
	Plant	20,000	

Wages	1,05,000	
Expenses	5,000	
Cash Received , being 80% of Work certified		1,60,000
	2,48,000	2,48,000

Of the plant and materials charged to contract, plant cost in ₹ 3,000 and materials costing ₹ 2,400 were destroyed by an accident. On 31st December, plant which cost ₹ 4,000 was returned to store, the value of materials on site was ₹ 3,000 and the cost of work done but not certified was ₹ 2,000. Charge 10% depreciation on plant. Prepare Contract Account and the Balance Sheet.

Solution:

Dr.Contract Account.

Dr. (For the year ending on 31st Dec 2022) Cr.

Particulars	₹	*Particulars*		₹
To Materials	75,000	By P&L A/c		
To Wages	1,05,000	Plant lost	3,000	
To Plant	20,000	Materials lost	2,400	5,400
To Expenses	5,000	By Work Certified		
To Balance of Profit c/d	20,700	(1,60,000 × 100/80)		2,00,000
		By Work Uncertified		2,000
		By Plant Returned to Store	4,000	
		Less: Depreciation 10%	400	3,600
		By Plant at site	13,000	
		Less: Depreciation 10%	1,300	11,700
		By Materials at site		3,000
	2,25,700			2,25,700
To P&L A/c	11,040	By Balance of profit b/d		20,700
To Balance c/d	9,660			
	20,700			20,700

Working Notes:

(i) Work certified = Cash received × 100/80 = ₹ 2,00,000

(ii) Plant at site = Plant debited – Plant lost – Plant returned

= 20,000 – 3,000 – 4,000 = ₹ 13,000

(iii) Profit to Profit & Loss Account

$$= \text{Total Profit} \times 2/3 \times \frac{\text{Cash received}}{\text{Work certified}} = ₹\ 11{,}040$$

Enterprising Contractors Ltd.
Balance Sheet as at 31st Dec., 2022

Liabilities	₹	*Assets*	₹
Share Capital		Fixed Assets	
400 6 % Cum. Pref. Shares	40,000	Land and Building	34,000
5,000 Equity Shares ₹ 8 paid	40,000	Plant in stores	3,600
Reserve & Surplus		Plant at site	11,700

Profit & Loss A/c	11,040		Current Assets		
Less: Loss on Plant & Materials	5,400	5,640	Cash at Bank		9,000
Current Liabilities			Materials at site		3,000
Sundry Creditors		8,000	Work-in-Progress	1,93,340	
			Less: Advances	1,60,000	32,340
		93,640			93,640

Note : Work-in-Progress has been calculated as below:

	₹
Work certified	2,00,000
Work uncertified	2,000
	2,02,000
Less: Profit not taken to P&L A/c	9,660
Work-in-Progress	1,92,340

CONTRACTS TO RUN FOR MORE THAN ONE YEAR

Usually when contract work is to complete in two years, the first year's contract account will be prepared as incomplete contract and the Work-in-Progress (value of work certified and cost of work uncertified less profit not transferred to P&L A/c) and materials and plant at site at end will be carried as opening balance in the second year's contract account. In the second year work will be complete, therefore, total contract price will be credited to find out profit. If contract is to run for 3 years or more, normally no profit is ascertained in the first year if work done is less than 1/4 of the contract price. Second year's contract account will be of incomplete work. The Work-in-Progress at end will be carried to next year as opening balance. The last year's Contract Account will be credited by total contract price.

Illustration 34:

A firm of contractors undertook a contract for ₹ 6,00,000 on 1st July, 2021. The following expenses were incurred up to December, 2021.

	₹
Materials charged directly	7,500
Materials issued from stores	52,500
Wages	30,000
Direct charges	3,000

The amount of work certified was ₹ 1,20,000 of which the contractors received 3/4th in cash. The transactions for the year 2022 were as under:

Materials issued from stores	1,35,000
Direct charges	6,000
Wages	60,000

The cost of special plant issued on January 1, 2022 for the contract was ₹ 1,20,000 Further work certified during the year amounted to ₹ 3,30,000, 75% of which was received. Work done and not certified as on 31-12-22 was valued at ₹ 22,500. Special Plant is to be depreciable at 25% per annum on the original cost. Materials on site were valued at ₹ 15,000. The general overhead is to be taken at 5% of the Materials consumed and wages paid during the year. Prepare Contract Accounts for 2021 and 2022.

Solution:

Dr. **Contract Account for 2021** **Cr.**

Particulars	₹	*Particulars*	₹
To Materials — Direct	7,500	By Balance c/d	97,500
— Stores	52,500	(Work-in-Progress)	
To Wages	30,000		
To Direct Charges	3,000		
To General overheads			
5% of (7,500 + 52,500 + 30,000)	4,500		
	97,500		97,500

Note: Since work done is less than 1/4 of the contract price, no profit is transferred to P&L A/c. Balance of the account is work-in-progress.

Dr. **Contract Account for 2022** **Cr.**

Particulars	₹	*Particulars*	₹
To Balance b/d	97,500	By Plant less depreciation	90,000
To Plant (special)	1,20,000	By Materials at sites	15,000
To Materials	1,35,000	By Work uncertified	22,500
To Wages	60,000	By Work certified (total)	
To Direct charges	6,000	(1,20,000 + 3,30,000)	4,50,000
To General overheads			
5% of (1,35,000 – 15,000 + 60,000)	9,000		
To Balance c/d	1,50,000		
	5,77,500		5,77,500
To Profit to P&L A/c		By Total Profit b/d	1,50,000
(1,50,000 × 2/3 × 75/100)	75,000		
To Balance c/d	75,000		
	1,50,000		1,50,000

Illustration 35:

Shastri & Co. undertook a contract on 1st January 2020 for ₹ 3,00,000 and completed the same on 30th April 2022. The contract books showed the following at 31st December of each year:

The amount of work certified at the end of the year 2020 was ₹ 75,000 and at the end of 2021 ₹ 2,25,000, 80% of the certified work was received in cash.

Prepare accounts in respect of the contract at the end of each year showing the proportion of profit the company would be justified to take to the credit of Profit & Loss Account. Show also how the Work-in-Progress will appear in the Balance Sheet from year to year. Depreciate plant at 10% on the original cost annually.

On 31st December 2020: Materials issued were valued at ₹ 35,000; Wages ₹ 25,000; Other direct charges ₹ 2,000; Materials on site ₹ 5,000.

On 31st December, 2021: Materials issued were valued at ₹ 75,000; Wages ₹ 4,500; Other direct charges ₹ 4,000; Special plant ₹ 90,000; Materials on site ₹ 15,200 and Work completed but not certified was estimated at ₹ 25,000.

On 30th April 2022: Materials issued were valued at ₹ 5,000; Wages ₹ 12,250; Direct charges ₹ 1,270.

Solution:

Dr. Contract Account Cr.

Particulars	₹	*Particulars*	₹
2020		2020	
To Materials issued	35,000	By Materials on site c/d	5,000
To Wages	25,000	By Balance c/d	57,000
To Other direct charges	2,000		
	62,000		62,000
2021		2021	
To Balance b/d	57,000	By Work Certified c/d	2,25,000
To Materials on site b/d	5,000	By Work Uncertified c/d	25,000
To Materials issued	75,000	By Materials on site c/d	15,200
To Wages	4,500	By Special Plant c/d 90,000	
To Other direct charges	4,000	*Less:* Depr. 9,000	81,000
To Special Plant	90,000		
To Total Profit c/d	1,10,700		
	3,46,200		3,46,200
To P&L A/c		By Total b/d	1,10,700
(1,10,700 × 2/3 × 80/100)	59,040		
To Balance of Profit c/d	51,660		
	1,10,700		1,10,700
2022		2022	
To Work Certified b/d	2,25,000	By Balance of Profit b/d	51,660
To Work Uncertified b/d	25,000	By Special Plant	
To Materials on site b/d	15,200	(depreciated value)	78,000
To Special Plant b/d	81,000	By Contractee's Account	3,00,000
To Materials issued	5,000		
To Wages	12,250		
To Direct charges	1,270		
To P&L A/c	64,940		
₹	4,29,660	₹	4,29,660

Balance Sheets

Assets Side		₹
2020		
Work-in-Progress :		
Materials on site	5,000	
Balance of Contract A/c	57,000	
	62,000	
Less: Cash Received (80 % of 75,000)	60,000	2,000
2021		
Work-in-Progress:		
Work certified	2,25,000	
Work uncertified	25,000	
Materials on site	15,200	
Special Plant	81,000	
	3,46,200	
Less: Profit not trfd. to P&L A/c	51,660	
	2,94,540	
Less: Cash Received (80 % of 2,25,000)	1,80,000	1,14,540

Dr. **Contractee's Account** **Cr.**

Particulars	₹	*Particulars*	₹
2020 To Balance c/d	60,000	2020 By Bank	60,000
2021 To Balance c/d	1,80,000	2021 By Balance b/d	60,000
		By Bank	1,20,000
	1,80,000		1,80,000
2022 To Contract A/c	3,00,000	2022 By Balance b/d	1,80,000
		By Bank	1,20,000
	3,00,000		3,00,000

CONTRACTS NEAR COMPLETION

If by the end of the year contract is very near to completion, the further expenses to complete it are estimated and added to cost. The excess of contract price over this total estimated cost will be expected or estimated profit on completion. The profit to be transferred to Profit and Loss Account on incomplete contract may be calculated on the basis of estimated profit.

$$\text{Profit to P\&L A/c} = \text{Total Estimated Profit} \times \frac{\text{Value of Work Certified}}{\text{Contract Price}}$$

$$\text{or Total Estimated Profit} \times \frac{\text{Value of Works Certified}}{\text{Contract Price}} \quad \frac{\text{Cash Received}}{\text{Value of Work Certified}}$$

Illustration 36:

On 31st December 2022 ₹ 1,13,000 has been expended upon a contract and certificates have been received to date to the value of ₹ 1,50,000. The cost of work performed but not yet certified is ₹ 3,000. It is estimated that the contract will take a further three months to complete and that it will necessitate the additional expenditure of ₹ 20,000. The total estimated expenditure upon the contract is to include a provision of 5 per cent of the total cost of the contract for contingencies. The contract price is ₹ 1,75,000 and ₹ 1,20,000 has been received in cash to date.

You are required to calculate profit earned to date, estimated total profit and the proportion of profit to be taken to the credit of Profit & Loss Account for the period ended 31st December 2022.

Solution:

	₹
1. Total expenditure to date	1,13,000
Less: Cost of work uncertified	3,000
Cost of work certified	1,10,000
Value of work certified	1,50,000
Profit (1,50,000 – 1,10,000)	40,000
2. Total Expenditure	1,13,000
Estimated Additional Exps.	20,000
	1,33,000
Provision for contingencies 5% of total estimated expenditure (*i.e.*, 1,33,000 × 5/95)	7 000
Total Cost	1,40,000
Total Contract Price	1,75,000
Total Estimated Profit	35,000

3. Profit to be transferred to P&L A/c

$$= \text{Total Estimated Profit} \times \frac{\text{Work certified}}{\text{Contract Price}}$$

$$= 35{,}000 \times \frac{1{,}50{,}000}{1{,}75{,}000} = ₹\ 30{,}000$$

Dr. **Contract Account** **Cr.**

Particulars	₹	*Particulars*	₹
To Total Exps.	1,13,000	By Work Certified	1,50,000
To Total Profit c/d	40,000	By Cost of Uncertified	3,000
	1,53,000		1,53,000
To P&L Ac	30,000	By Total Profit b/d	40,000
To Balance of profit	10,000		
	40,000		40,000

Illustration 37:

Block Construction Ltd. commenced a contract on November 1, 2013. The total contract was for ₹ 39,37,500. It was decided to estimate the total profit on the contract and to take to the credit of P&L A/c that proportion of estimated profit on cash basis, which work completed bore to the total contract. Actual expenditure for the period of November 1, 2013 to October 31, 2014 and estimated expenditure for November 1, 2014 to March 31, 2015 are given below:

	November 1, 2013 to October 31, 2014 (Actuals) ₹	*November 1, 2014 to March 31, 2015 (Estimated)* ₹
Materials issued	6,75,000	12,37,500
Labour : Paid	4,50,000	5,62,500
Prepaid	25,000	—
Outstanding	—	2,500
Plant purchased	3,75,000	—
Expenses : Paid	2,00,000	4,50,000
Outstanding	50,000	25,000
Plant returned to store	75,000	3,00,000
(historical cost)	(on March 31, 2014)	(on March 31, 2015)
Work Certified	20,00,000	Full
Work Uncertified	75,000	
Cash received	17,50,000	
Material at site	75,000	37,500

The plant is subject to annual depreciation @ $33\frac{1}{3}\%$ on written down value method. The contract is likely to be completed on March 31, 2015.

Required :

(i) Prepare the Contract A/c. Determine the profit on the contract for the year November, 2013 to October, 2014 on prudent basis, which has to be credited to P&L A/c.

[CA]

Solution:

Block Construction Ltd.
Contract Account
(Nov., 2013 to Oct. 31, 2014)

Dr. **Cr.**

Particulars		₹	*Particulars*		₹
To Materials issued		6,75,000	By Plant returned on		
To Labour paid	4,50,000		31-3-04- cost	75,000	
Less: prepaid	25,000	4,25,000	*Less*: Dep. for 5 months	10,417	64,583
To Plant purchased		3,75,000	By Plant at site	3,00,000	
To Exps. paid	2,00,000		*Less*: Depreciation	1,00,000	2,00,000
Add: outstanding	50,000	2,50,000	By Materials at site		75,000
To Notional Profit c/d		6,89,583	By Work-in-Progress		
			Value of work certified		20,00,000
			Cost of work uncertified		75,000
		24,14,583			24,14,583
To Profit & Loss A/c		1,04,135.6	By Notional Profit b/d		6,89,583
To Work-in-Progress (Reserved profit)		5,85,447.4			
		6,89,583			6,89,583

Computation of Estimated Profit
Contract Account
(1st Nov. 2003 to March 31, 2015)

Dr. **Cr.**

Particulars	₹	*Particulars*		₹
To Materials		By Materials at site		37,500
[6,75,000 + 12,37,500]	19,12,500	By Plant returned on		
To Labour [4,25,000 + 25,000		31-3-14		64,583
+ 5,62,500 + 2,500]	10,15,000	By Plant at site (cost)	3,00,000	
To Plant	3,75,000	*Less:* Dep. (12 months)	1,00,000	
To Exps. [2,50,000 + 4,25,000]	6,75,000		2,00,000	
To Estimated Profit	2,34,305	*Less:* Dep. (5 months)	27,778	1,72,222
		By Contractee's A/c		39,37,500
	42,11,805			42,11,805

Profit transferred to P&L A/c on Oct. 31, 2014

$$\text{Total Estimated Profit} \times \frac{\text{Cash Received}}{\text{Contract Price}}$$

$$2,34,305 \times \frac{17,50,000}{39,37,500} = 1,04,135.6$$

Illustration 38:

A contractor secured a contract to supply and erect machinery for the sum of ₹ 7,50,000. He was to receive payments on account from time to time equal to 90% of the certified value of work done.

He commenced work on 1st Jan., 2021, and incurred the following expenditure during the year— Plant and Tools ₹ 70,000; Machinery and Stores ₹ 2,00,000; Wages ₹ 1,50,000; Sundry Exps. ₹ 30,000; and Establishment Charges ₹ 40,000.

A part of the machinery costing ₹ 20,000 was unsuited to the contract and was immediately sold at a profit of ₹ 5,000.

The value of Plant and Tools on 31st December, 2021, was ₹ 40,000 and the value of Machinery and Stores then on hand was ₹ 30,000.

By 31st January, 2022, he had received payments on account amounting to ₹ 4,38,750, being 90 per cent of the certified value of work done up to the previous year 31st December.

In order to calculate the profit made on the contract to 31st December, 2021, the contractor estimated the further expenditure that would be incurred in completing the contract, and took to the credit of Profit and Loss Account for the year that proportion of the estimated net profit to be realised on the contract, which the certified value of work done bore to the contract price. He estimated:

1. That the contract would be completed in a further six months.
2. That plant and tools would have a residual value of ₹ 10,000 upon the completion of the contract.
3. That the cost of machinery and stores required in addition to those in stock on 31st December, 2021, would be ₹ 1,00,000 and that further sundry expenses of ₹ 20,000 would be incurred.
4. That the wages on the contract for the six months to 30th June, 2022, would amount to ₹ 80,000.
5. That establishment expenses would cost the same sum per month as in the previous year.
6. That 2.5% of the total cost of contract (excluding this percentage) should be provided for contingencies.

Prepare the Contract Account for the year ended 31st December, 2021. Show your calculations of the profit to be credited to Profit and Loss Account for the year.

Solution:

Contract Account

Dr. **(For the year ending on 31st Dec., 2021)** **Cr.**

Particulars	₹	*Particulars*	₹
To Plant and Tools	70,000	By Bank (Sales of Plant)	25,000
To Machinery and Stores	2,00,000	By Work certified (4,38,750 × 100/90)	4,87,500
To Wages	1,50,000	By Plant and tools in hand	40,000
To Sundry Expenses	30,000	By Machinery and stores in hand	30,000
To Establishment Charges	40,000		
To P&L A/c---Profit on plant sold	5,000		
To Balance being Profit c/d	87,500		
	5,82,500		5,82,500
To Profit transferred to Profit & Loss A/c (see note)	34,450	By Balance b/d	87,500
To Balance c/d	53,050		
	87,500		87,500

Note: Calculation of Profit to be credited to Profit and Loss A/c

(A) Cost to date (gross : including the Plant and Materials and Stores in hand):	₹
Plant and Tools	70,000
Machinery and Stores	2,00,000
Wages	1,50,000
Sundry Exps.	30,000

Establishment Charges	40,000
	4,90,000
Less: Cost of Plant Sold	20,000
	4,70,000
(B) Estimated further expenditure:	
Machinery and Stores	1,00,000
Sundry Expenses	20,000
Wages	80,000
Establishment Charges for 6 months	20,000
	2,20,000
Total Cost (Estimated):	
(A) Cost to date	4,70,000
(B) Estimated further Exps.	2,20,000
	6,90,000
Less: Residual value of plant	10,000
	6,80,000
Add: Reserved for Contingencies 2.5%	17,000
	6,97,000
Estimated Total Profit on Contract :	
Contract Price	7,50,000
Less: Estimated Total Cost	6,97,000
	53,000

Profit to be transferred to P&L A/c

$$\text{Estimated Total Profit} \times \frac{\text{Work Certified}}{\text{Total Contract Price}} = 53{,}000 \times \frac{4{,}87{,}500}{7{,}50{,}000} = ₹\ 34{,}450$$

Illustration 39:

Kapoor Engineering Company undertakes a long-term contract which involves the fabrication of prestressed concrete blocks and erection of the same at the customer's site.

The following information is supplied regarding the contract which is incomplete on 31st March 2021.

	₹
Cost incurred:	
Fabrication cost to date	
Direct Materials	28,00,000
Direct Labour	9,00,000
Overheads	7,50,000
	44,50,000
Erection cost to date	1,50,000
Total	46,00,000
Contract price	81,90,000
Cash received on account (80% of work certified)	60,00,000
Technical estimate of work completed to date:	
Fabrication: Direct Material 80%	
Direct Labour and Overheads 75%	
Erection 25%	

You are required to prepare a statement for submission to the management indicating the estimated profit to date and on completion of the contract. *[CA Inter]*

Solution:

Statement Showing the Estimated Profit to date and on completion of contract

Particulars	*Cost to date*		*Further cost*		*Total Cost* ₹
	% of Completion	*Amount* ₹	*% of Completion to be done*	*Amount* ₹	
Fabrication					
Direct Materials	80%	28,00,000	20%	7,00,000	35,00,000
Direct Labour	75%	9,00,000	25%	3,00,000	12,00,000
Overheads	75%	7,50,000	25%	2,50,000	10,00,000
Total		44,50,000		12,50,000	57,00,000
Erection cost	25%	1,50,000	75%	4,50,000	6,00,000
Estimated cost		46,00,000		17,00,000	63,00,000
Profit		13,80,000		5,10,000	18,90,000
		58,80,000		22,10,000	81,90,000

Profit on the contract to date is based on estimated total profit on completion *i.e.,* total contract price – total cost (₹ 81,90,000 – 63,00,000) = ₹ 18,90,000

Profit to date will be

$$\frac{\text{Estimated Total Profit} \times \text{Cost to date}}{\text{Total cost}} = \frac{18,90,000 \times 46,00,000}{63,00,000} = ₹\ 13,80,000$$

Alternatively, it can be calculated as below:

$$\frac{\text{Estimated Total Profit} \times \text{Cash Received}}{\text{Contract Price}} = \frac{18,90,000 \times 60,00,000}{81,90,000} = ₹\ 13,84,615$$

Illustration 40:

A construction company has undertaken to construct a bridge. The following particulars relate to this bridge for the year ended 31st December, 2021.

	₹
Materials	
Direct purchases	50,000
Issued from Stores	10,000
Wages for Labour	45,000
General plant in use:	
Written down value	1,00,000
Depreciation thereon	10,000
Direct Expenses	3,500
Share of General Overheads	2,000
Materials on hand on Dec. 31	1,000
Materials lost by fire	500
Salvage value thereof	150
Wages accrued on Dec. 31	5,000
Direct Exps. accrued on Dec. 31	500
Value of Work Certified	1,59,000
Cost of Uncertified Work	4,500

The value of the contract is ₹ 2,15,000 and it is the practice of the contractee, as per terms of the contract, to retain 10% of work certified. Prepare Contract and Work-in-Progress Accounts.

Solution:

Dr. Contract Account Cr.

Particulars	₹	*Particulars*		₹
To Materials Purchased	50,000	By Materials at site		1,000
from Stores	10,000	By P&L A/c		
To Wages	45,000	Materials Lost	500	
To Direct Exps.	3,500	*Less:* Salvage	150	350
To Plant	1,00,000	By Salvage value of materials	—	150
To Share of General Overheads	2,000	By Plant	1,00,000	
To Wages accrued	5,000	*Less*: Depr.	10,000	90,000
To Direct Exps. accrued	500	By Value of Work Certified		1,59,000
To Total Profit c/d	39,000	By Cost of Work Uncertified		4,500
	2,55,000			2,55,000
To P&L A/c		By Total Profit b/d		39,000
(39,000 × 2/3 × 90/100)	23,400			
To Balance c/d	15,600			
	39,000			39,000

Dr. Work-in-Progress (Memorandum) Account Cr.

Particulars	₹	*Particulars*	₹
To Work Certified	1,59,000	By Profit not tfd. to P&L A/c	15,600
To Work Uncertified	4,500	By Balance being Work-in-Progress	1,47,900
	1,63,500		1,63,500

Illustration 41:

The following information is ascertained from the costing department of a firm of contractors for the month of June.

1. *Materials Abstract*:	₹	₹
Balance on 31 st May	61,890	
Purchases	16,250	
From Job 36	1,075	79,215
To Job 42		10,685
Balance on 30th June		68,530
2. *Wages Abstract* :		
Job 36	1,100	
Job 42	11,590	12,690
Administrative and General Charges		1,160
		13,850

The following balances were shown in the Contract Ledger on 31 st May:

Job 36	₹ 3,62,105
Job 42	₹ 1,65,930

Job 36 was certified as completed; the balance on 31st May included ₹ 67,600 in respect of cost of Plant and Machinery, the rest consisted of Wages and Materials, One apparatus, which had been specially purchased for this Contract at ₹ 7,600, was sold during the month of June for ₹ 2,550. Of the remainder, ₹ 47,800 worth had been on the job for eight months and the balance for six months. Depreciation is to be charged at the rate of 15% per annum. Half of the Machinery which had been on the Job for eight months was transferred to Job 42 and the balance was returned to store.

You are required to write up the Contract Accounts and to ascertain the profit of Job 36, the Contract Price being ₹ 4,60,000; 10% on cost of wages and materials consumed being taken as Administrative and General Charges.

Solution:

Dr. Contract No. 36 Account Cr.

Ju.1	*Particulars*	₹	*Ju.30*	*Particulars*		₹
" 30	To Balance b/d	3,62,105		By Contractee's Account		4,60,000
	To Wages	1,100		By Materials returned		1,075
	To Administration and General Charges (10 % of ₹ 2,94,530)	29,453		By Proceeds of sale of machine		2,550
	To P&L Account (Profit on the contract)	1,30,322		By P&L Account (Loss on the sale of machine)		5,050
				By Machinery used for 8 months:		
				Cost	47,800	
				Less: Depreciation	4,780	
					43,020	
				To Job 42	21,510	
				To Store	21,510	43,020
				By Machinery used for 6 months:		
				Cost	12,200	
				Less: Depreciation	915	11,285
		5,22,980				5,22,980

Dr. Contract No. 42 Account Cr.

	Particulars	₹	*Ju. 30*	*Particulars*	₹
Ju. 1	To Balance b/d	1,65,930		By Balance b/d	2,09,715
	To Materials	10,685			
	To Wages	11,590			
	To Machinery from Contract No. 36	21,510			
		2,09,715			2,09,715

Notes:

1. *Administrative and General Charges in respect of Contract No. 36 have been calculated as under:*

	₹
Opening Balance on 1st June	3,62,105
Less: Cost of plant and machinery included in the above balance	67,600
Wages and Materials on 1st June	2,94,505
Add: Further wages expended as per Wages Abstract	1,100
	2,95,605
Less: Materials returned as per Materials Abstract	1,075
Cost of Wages and Materials consumed	2,94,530

10% of the above = ₹ 29,453

2. *Depreciation of Machinery and how it has been dealt with is shown below:*

Cost of Plant and Machinery on 1st July	67,600
Less: Cost of apparatus sold	7,600
Balance of machinery used on the Contract	60,000

Depreciation on ₹ 47,800 for 8 months @ 15% = ₹ 4,780. Depreciation on the balance of ₹ 12,200 (₹ 60,000 – ₹ 47,800) for 6 months @ 15% = ₹ 915.

The depreciated value of machinery used for eight months is ₹ 43,020 (₹ 47,800 – 4,780) of which ₹ 21,510 is transferred to Contract No. 42 and ₹ 21,510 is transferred to the store.

3. Profit or loss in respect of work completed on Contract 42 cannot be ascertained as the certified value of work done *etc.*, have not been given in the question.
4. Loss on the sale of machine has been charged to the General Profit and Loss Account.

Illustration 42:

The following relate to contract No. 200 undertaken by R.V. Ltd. in the beginning of 2021:

	Work Certified	*Work Uncertified*
	₹	₹
Materials	1,80,000	20,000
Wages	3,70,000	30,000

Special plant was purchased for the contract ₹ 1,60,000. At the end of the year, it was estimated to be worth ₹ 1,30,000. Overheads other than depreciation amount to 20% of wages. The value of the work certified was ₹ 8,40,000 against which the contractee paid ₹ 7,56,000. The total value of the contract was ₹ 16,00,000. Prepare Contract Account.

Solution:

Contract Account

Dr. **(For the year ended 31st Dec. 2021)** **Cr.**

Particulars		₹	*Particulars*		₹
To Materials:			By Plant at site		1,30,000
Work Certified	1,80,000		By Work-in-Progress A/c:		
Work Uncertified	20,000	2,00,000	Work Certified		8,40,000
To Labour:			Cost of Work uncertified		
Work Certified	3,70,000		Materials	20,000	
Work Uncertified	30,000	4,00,000	Labour	30,000	
To Special Plant		1,60,000	Overheads		
To Overheads (@ 20% on wages)		80,000	(@ 20% on wages)	6,000	56,000
To Balance c/d		1,86,000			
		10,26,000			10,26,000
To P&L A/c		1,11,600	By Balance b/d		1,86,000
To Work-in-Progress A/c		74,400			
		1,86,000			1,86,000

Illustration 43:

The data given below are procured from the books of a factory for the year ended 31st Dec.:

The value of executed jobs during the year was ₹ 20,500.

Prepare : 1. Consolidated Completed Jobs Account showing the profit or loss; and

2. Consolidated Work-in-Progress Account.

	Completed Jobs ₹	*Work-in-Progress* ₹
Raw materials supplied from stores	4,500	1,500
Chargeable expenses	500	200
Wages	5,000	2,000
Materials transferred to work-in-progress	100	100
Materials returned to stores	50	

Factory overhead is 80% of wages and office overhead 25% of factory cost.

Solution:

Dr. Consolidated Completed Jobs Account Cr.

Particulars	₹	₹	*Particulars*	₹
To Materials	45,500		By Contractee's A/c	
Less: Transferred to Work-in-Progress	-100		(Job finished)	20,500
Less: Retd, to Stores	-50	4,350		
To Wages		5,000		
To Chargeable exp.		500		
To Factory overheads 80% of wages		4,000		
Factory Cost		13,850		
To Office Overheads 25% of factory cost (13,850)		3,462.50		
To Net profit transferred to Profit and Loss A/c		3,187.50		
		20,500		20,500

Dr. Consolidated Work-in-Progress Account Cr.

Particulars	₹	*Particulars*	₹
To Raw material	1,500	By Balance c/d	6,750
Transferred from completed jobs	100		
To Wages	2,000		
To Chargeable Expenses	200		
To Factory Overheads 80% of wages	1,600		
Factory Cost	5,400		
To Office Overheads 20% of Factory Cost *i.e.*, ₹ 5,400	1,350		
	6,750		6,750

Illustration 44:

A Contractional Engineering Company undertakes long-term contracts which involve the fabrication of the steel work in the Company's Workshops and the erection of the fabricated steel on consumer's sites. The following information is supplied regarding two of their uncompleted contracts as on 30th April 2023:

Costs incurred:	*Contract A*	*Contract B*
Fabrication Costs to date:	₹	₹
Direct Materials	2,00,000	60,000
Direct Labour	75,000	20,000
Overheads	1,05,000	27,500

	3,80,000	1,07,500
Erection Cost to date	15,000	7,500
Total	3,95,000	1,15,000
Contracts Value	7,00,000	2,00,000
Cash received on account	4,00,000	65,000
Technical estimate of work completed to date:	*A*	*B*
Fabrication:	%	%
Direct Materials	80	60
Direct Labour and Overheads	75	50
Erection:	25	25

Solution:

Contract *A*

Particulars	*Cost to date*		*Further Cost*		*Total*
	% Completion	*Amount*	*%*	*Amount*	*Cost*
Fabrication		₹		₹	₹
Direct Materials	80	2,00,000	20	50,000	2,50,000
Direct Labour	75	75,000	25	25,000	1,00,000
Overheads	75	1,05,000	25	35,000	1,40,000
		3,80,000		1,10,000	4,90,000
Erection	25	15,000	75	45,000	60,000
		3,95,000		1,55,000	5,50,000

Contract Value	7,00,000
Total Cost	5,50,000
Estimated profit at the completion of contract	1,50,000

$$\text{Estimated profit to date} = \frac{3,95,000}{5,50,000} \times 1,50,000 = ₹\ 1,07,728$$

Contract *B*

	Cost to date		*Further Cost*		*Total*
	% Completion	*Amount*	*%*	*Amount*	*Cost*
Fabrication		₹		₹	₹
Direct Materials	60	60,000	40	40,000	1,00,000
Direct Labour	50	20,000	50	20,000	40,000
Overheads	50	27,500	50	27,500	55,000
		1,07,500		87,500	1,95,000
Erection	25	7,500	75	22,500	30,000
		1,15,000		1,10,000	2,25,000

	₹
Contract Value	2,00,000
Total Cost	2,25,000
Estimated loss at the completion of the Contract (as far as can be seen)	25,000

In case of Contract *B* there can be no estimated profit to date. Instead, the Company should make provision for the whole amount of the loss estimated. Further provision against probable loss should also the made.

Illustration 45:

The Hindustan Contractors Ltd. formed in January, 2020, with an Authorized Capital of ₹ 16,00,000, divided into 6,000 6% Preference Shares of ₹ 100 each, and 10,000 Equity shares of ₹ 100 each started business on 1st April. Their Trial Balance on 31st March, 2020, stood as follows:

Particulars	₹	₹
4,000, 6% Preference Shares of ₹ 100 each		4,00,000
8,000 Equity Shares of ₹ 100 each		8,00,000
Land and Buildings	1,00,000	
Plant and Stores	1,20,000	
Sundry Debtors	9,000	
Sundry Creditors		36,000
Investments	8,00,000	
Contract Account No. 1:		
Materials	1,60,000	
Wages	1,50,000	
Plant (specially acquired)	24,000	
Overhead Expenses	6,000	
Contractee's Account — 80% of work certified realized		3,20,000
Office Salaries and Wages	7,200	
Sundry Expenses	3,000	
Bank Balance	1,70,000	
Cash Balance	6,800	
	15,56,000	15,56,000

Interest on investments amounting to ₹ 25,000 is outstanding. The cost of work done but not certified amounted to ₹ 20,000 and there were materials of the value of ₹ 4,000 lying unconsumed on site. Of the plant acquired for the contract ₹ 3,000 was returned to the store unused, which remains to be adjusted, and the balance is to be depreciated by 12.5%. You are to depreciate Land and Buildings by 2% and the Plant and Stores by 5%. As the entire contract is for ₹ 6,00,000 you are required to bring into credit only three- fourths of the profit ascertained on the work done and that too on the cash basis.

Show the Contract Account, Work-in-Progress Account, the Profit and Loss Account and the Balance Sheet as at 31st March, 2020.

Solution:

Dr. **Contract Account** **Cr.**

Particulars	₹	*Particulars*		₹
To Materials	1,60,000	By Work-in-Progress A/c		
To Wages	1,50,000	Work certified		4,00,000
To Plant (Specially acquired)	24,000	Work done but not certified		20,000
To Overhead Expenses	6,000	By Materials lying unconsumed		
To Balance being profit c/d	1,05,375	on site		4,000
		By Plant at cost	21,000	
		Less: 12.5% depreciation	2,625	18,375
		By Plant returned to store		3,000
	4,45,375			4,45,375
To P&L Account		By Balance b/d		1,05,375
(Total Profit × 3/4 × 80/100)	63,225			
To Work-in-Progress A/c	42,150			
	1,05,375			1,05,375

Dr. **Work-in-Progress Account** **Cr.**

Particulars	₹	*Particulars*	₹
To Contract Account		By Contract Account	
Work certified	4,00,000	Profit not taken credit for	42,150
Work done but not certified	20,000	By Balance c/d	3,77,850
	4,20,000		4,20,000

Profit and Loss Account for the year ended 31st March, 2020

Particulars	₹	*Particulars*	₹
To Office Salaries and Wages	7,200	By Profit from Contract Account	63,225
To Sundry Expenses	3,000	By Outstanding Interest on	
To Depreciation on Land and		Investments	25,000
Building	2,000		
To Depreciation on Plant and Stores			
(5% of ₹ 1,23,000)	6,150		
To Balance carried to			
Balance Sheet	69,875		
	88,225		88,225

Balance Sheet as at 31st March, 2020

Liabilities	₹	*Assets*	₹	
Share Capital		***Fixed Assets:***		
Authorized Capital		Land and Buildings	1,00,000	
6,000 6% Preference Shares of		*Less:* Depreciation	2,000	98,000
₹ 100 each	6,00,000	Plant and Stores	1,20,000	
10,000 Equity Shares of		*Add:* Plant ret. to stores	3,000	
of ₹ 100 each	10,00,000		1,23,000	
	16,00,000	*Less:* Depreciation @ 5%	6,150	1,16,850
Subscribed Capital		Investments		8,00,000
4,000 6% Preference Shares of		***Current Assets:***		
₹ 100 each fully paid	4,00,000	Outstanding Interest on		
8,000 Equity Shares of ₹ 100 each		Investment		25,000
fully paid	8,00,000	Work-in-Progress	3,77,850	
Reserve & Surplus		*Less:* Cash received		
Profit & Loss Account	69,875	from the Contractee's	3,20,000	57,850
Current Liabilities:		Plant at site		18,375
Sundry Creditors	36,000	Materials at site		4,000
		Sundry Debtors		9,000
		Cash at Bank	1,70,000	
		Cash in Hand	6,800	1,76,800
	13,05,875			13,05,875

Illustration 46:

Work out in a suitable cost account form the financial result of a contract for construction of a temporary building undertaken by a firm. Your answer should be based on following figures extracted from the financial books of the firm.

The term of the contract is ₹ 10 per sq. foot of the covered floor area as accepted and certified to be correct by the engineers of the contractee.

(a) Materials

Building materials in stock at the commencement of work ₹ 10,000. Purchases during the currency of the contract:

(i) Cement 9,000 bags @ ₹ 5 per bag.
(ii) Bricks 1,00,000 @ ₹ 50 per thousand.
(iii) Sand 10,000 c. ft. @ ₹ 10 per 100 c. ft.
(iv) Wood work 900 c. ft. @ ₹ 10 c. ft.

Value of balance of various materials in hand after completion of work is ₹ 10,000.

(b) Labour 100 Masons @ ₹ 2.50 per day for 40 days.
500 Mazdoors @ ₹ 1 per day for 40 days

(c) Tools and Plants

Two new concrete mixtures were purchased at ₹ 10,000 each at the commencement of the contract.

Residual value as assessed after completion of the contract at ₹ 3,500 each concrete mixture.

(d) Supervision

50% of 4 Engineers' pay @ ₹ 500 per month for each engineer – 2 months.

50% of 10 Overseers' pay @ ₹ 200 per month for each overseer – 4 months.

(e) Administration Overhead

20% of head office expenses for the period of the contract. The total head office expenses amounted to ₹ 5,000.

(f) Quantity of work done

Quantity of work certified and accepted by the engineering authority of project : 12,000 sq. ft. of covered floor area.

Solution:

Dr. Contract Account Cr.

Particulars		₹	*Particulars*	₹
To Materials consumed			By Materials in hand after	
Building materials			completion of work	10,000
in stock at commencement	10,000		By Residual value of two concrete mixtures @ ₹ 3,500 each	7,000
Add: Purchases:			By Value of Work	
Cement – 9,000 bags @ ₹ 5 per bag	45,000		Certified (12,000 sq. ft. of covered floor area at ₹ 10 per sq. ft.)	1,20,000
Bricks–1,00,000 @ ₹ 50 per 1,000	5,000			
Sand – 10,000 c. ft. @ 10 per 100 c. ft.	1,000			
Woodwork— 900 c. ft. @ ₹ 10 per c. ft.	9,000	70,000		
To Labour				
100 Masons @ ₹ 2.50 per day for 40 days	10,000			
500 Mazdoors @ ₹ 1.00 per day for 40 days	20,000	30,000		
To Tools and Plants				
2 new concrete mixtures @ ₹ 10,000 each		20,000		

To Supervision charges			
(i) 50% of (4 Engineers' pay @ ₹ 500 per month for each engineer for 2 months) ₹ 4,000	2,000		
(ii) 50% of (10 overseers' pay @ ₹ 200 per month for each overseer for 4 months) ₹ 8,000	4,000	6,000	
To Administration overhead 20% of (total head office expenses for the period) ₹ 5,000		1,000	
To Profit on Contract (transferred to Profit and Loss A/c)		10,000	
		1,37,000	1,37,000

ACCOUNTING STANDARD (*AS-7*) (REVISED) AND *IND AS-11*

Accounting for Construction Contracts

Methods of Accounting

Percentage of Completion Method: Under this method, revenue is recognised by reference to the stage of completion of the contract activity at the end of each accounting period. The stage of completion may be measured in proportion the cost incurred to date bear to the estimated total costs of the contract. The costs incurred in reaching the stage of completion are matched with this revenue. Although as per principle of prudence, revenue is recognised only when realised, under this method, the revenue is recognised as the activity progresses even though in certain circumstances it may not be realised. Progress payments and advances received from customers will not be treated as revenue earned.

Normally, the profit is not recognised in fixed price contracts unless the work on a contract has progressed to a reasonable extent. This extent, ordinarily, is 20% to 25% of the work.

While recognizing profit under this method, an appropriate allowance for future unforeseeable factors, which may affect the ultimate quantum of profit, is generally made on either a specific or a percentage basis.

Provisions for Foreseeable Losses: When current estimates of total contract costs and revenues indicate a loss, provision is made for the entire loss on the contract irrespective of the amount of work done and method of accounting followed. Such provision will be made even if work has not commenced on the contract.

Claims under Construction Contracts: Amounts due in respect of claims made by the contractor and of variations in contract work approved by the customer are recognised as revenue only when the contractor has evidence of the final acceptability of the amount of **the claim or variation**.

Claims or penalties payable by the contractor arising out of delays in completion or from other causes are provided in full. Claims in the nature of contingency are treated in accordance with *AS-4.*

Disclosures: Following disclosures should be made in the financial statements:

(i) The amount of construction Work-in-Progress.

(ii) Progress payments received and advances and retention on account of contracts included in construction Work-in-Progress.

(iii) Amount receivable in respect of income accrued under cost-plus contracts not included in construction Work-in-Progress.

(iv) Changes in accounting policy giving the effect of change and its amount.

Illustration 47:

A firm of contractors obtained a contract for construction of roads. The following details are available in the records kept for the year ended 31st March, 2020:

	(₹ in lakhs)
Total Contract Price	2,000
Work Certified (Cost)	1,000
Work not Certified	210
Estimated further Cost to Completion	990
Progress Payment Received	1,080

The firms seeks your advice and assistance in the presentation of account keeping in view the requirement of *AS-7*

Solution:

(a) Amount of foreseeable loss

	(₹ in lakhs)
Total costs of construction (1,000 + 210 + 990)	2,200
Less: Total contract price	2,000
Total foreseeable loss	200

(b) Contract work-in-progress i.e., costs incurred to date are ₹ 1,210 lakhs.

Work certified	1,000
Work not certified	210
	1,210

This is 55% $\left(i.e., \frac{1,210}{2,200} \times 100\right)$ of total costs of construction.

(c) Proportion of total contract value recognised as revenue as per AS-7

55% of ₹ 2,000 lakhs = ₹ 1,100.

Therefore, in the Profit and Loss Account for the year ended 31st March, 2020, a loss of ₹ 110 lakhs will be recognised, being the difference between the costs incurred and the revenue *i.e.,* (in lakhs) 1,210 – 1,100.

AS-7 states that a forseeable loss on the entire contract should be provided for in the *financial statement irrespective of the amount of work done and the method of accounting followed*. Since the total forseeable loss is ₹ 200 lakhs, a provision of ₹ 90 lakhs (200 – 110) is also required to be made.

(d) Disclosure requirements

	(₹ in lakhs)
(i) Work-in-progress	
Cost incurred till date	1,210
Less: Transfer to Profit and Loss Account as cost of sales	1,210
	Nil
(ii) Profit and Loss Account (Extract):	
Revenue	1,100
Less: Cost of Sales	1,210

Loss	110
Provision for loss on contract	90
Net loss including forceeable loss	200
(iii) Balance Sheet (Extract) :	
Debtors (*i.e.,* revenue recognised)	1,100
Less: Progress Payment received	1,080
	20

Illustration 48:

From the following information in respect of a contract to construct a building for the year 2021-22, calculate the amount of foreseeable loss to be provided for in the financial statement and also show the disclosure requirements as per *Accounting Standard-7* on *"Accounting for Construction Contracts":*

	₹ ('000)
Total Contract Price	558
Cost incurred to date	404
Prudent estimate of costs to completion	293
Progressive payments received	374

Solution:

(a) Calculation of amount of foreseeable loss:

	₹ (000)
Total costs of construction (404 + 293)	697
Less: Total Contract Price	558
Total Foreseeable Loss	139

(b) Contract Work-in-Progress *i.e.,* costs incurred to date are ₹ ('000) 404, which is 58% of total costs of construction.

(c) Proportion of total contract value recognised as turnover as per *AS-7* = 58% of ₹ (000) 558 = ₹ 324.

Therefore, a loss of ('000) 80 will be recognised in the profit and loss account for the year ended 31st March, 2022. This is the difference between cost of sales and turnover *i.e.,* (404 – 324).

Since total foreseeable loss is ₹ ('000) 139, an additional provision of ₹ ('000) 59 is required to be made in accordance with *AS-7*

(d) Disclosure requirements:

(i) Profit and Loss Account (Extract)	₹ ('000)
Turnover	324
Cost of Sales (58% of total cost)	404
Loss	(80)
Additional Provision for loss	(59)
	(139)
(ii) Balance Sheet (Extract)	
Debtors (included as turnover)	324
Less: Payments received	374
Excess payment to be shown as liability.	(50)
(iii) Work-in-Progress:	
Cost incurred till dates.	404
Less: Transfer to Profit and Loss A/c as cost of sales	404
	NIL

Illustration 49:

ABC Ltd. has undertaken bridge construction as per details given below. The bridge will be constructed in 3 years:

(a) Initial contract revenue ₹ 900 crores

(b) Initial contract cost ₹ 800 crores.

	Years		
	1st	*IInd*	*IIIrd*
Estimated contract cost	805		
Increase in contract revenue	—	20	
Estimated additional increase in cost	—	15	
Contract cost incurred up to	161	584	820

At the end of IInd year cost incurred includes ₹ 10 crores for material stored at the sites to be used in IIIrd year to complete the project.

Solution:

(₹ in crores)

Particulars	*Year I*	*Year II*	*Year III*
(a) Initial revenue agreed	900	900	900
(b) Variations	—	20	20
(c) Total Contract Value	900	920	920
(d) Contract cost incurred up to the date of reporting	161	584 (incl. 10 crores of materials)	820
(e) Estimated cost to complete *(f – d)*	644	236	—
(f) Total estimated contract cost	805	820	820
(g) Estimated Profit	95	100	100
(h) Stage of Completion (d/f × 100)	20% (161/805 × 100)	70% (584 – 10)/820 × 100)	100% (820/820 × 100)

Amount of revenue, expenses and profit recognized in statement of Profit and Loss Account in three years.

	Upto reporting date (A)	*Recognized in prior year (B)*	*Recognized in current yr. (A – B)*
Year I			
Revenue (900 × 20/100)	180	–	180
Expenses	161	–	161
Profit	19	–	19
Year II			
Revenue (920 × 70/100)	644	180	464
Expenses (820 × 70/100)	574	161	413
Profit	70	19	51
Year III			
Revenue	920	644	276
Expenses	820	574	246
Profit	100	70	30

MISCELLANEOUS ILLUSTRATIONS

Illustration 50:

A contract is estimated to be 80% complete in its first year of construction as certified. Contractee pay 75% of value of work certified, as and when certified and makes the final payment on the completion of contract. Following information is available for the first year.

	₹
Cost of work-in-progress uncertified.	8,000
Profit transferred to Profit & Loss A/c at the end of year 1 on incomplete contract	60,000
Cost of work to date	88,000

Calculate the value of Work-in-Progress certified and amount of contract price.

[*CA*]

Solution:

As the contract is 80% complete, so 2/3 rd of the notional profit on cash basis has been transferred to Profit & Loss A/c in the first year of contract.

$\therefore$ Amount transferred to Profit & Loss A/c $= \frac{2}{3} \times$ Notional Profit $\times$ % of cash

Received ₹ 60,000, Notional Profit $= \frac{2}{3} \times \text{Notional Profit} \times \frac{75}{100}$

$$= \frac{60,000 \times 3 \times 100}{2 \times 75}$$

$$= ₹\ 1,20,000$$

Computation of Value of Work Certified:

Cost of work to date	₹ 88,000
Add: Notional Profit	₹ 1,20,000
	₹ 2,08,000
Less: Cost of Work Uncertified	8,000
Value of Work Certified	₹ 2,00,000

Since the value of Work Certified is 80% of the Contract Price, therefore

Contract Price $= \frac{\text{Value of work Certified}}{80\%}$

$$= \frac{₹\ 2,00,000}{80\%}$$

$$= ₹\ 2,50,000$$

Dr. **Contract Account** **Cr.**

Particulars	*Amount* ₹	*Particulars*	*Amount* ₹
To Cost to date	88,000	By Work-in-Progress	
To National Profit	1,20,000	Work Certified	2,00,000
		Work Uncertified	8,000
	2,08,000		2,08,000
To P&L A/c	60,000	By Notional Profit	1,20,000
To Work-in-Progress	60,000		
	1,20,000		1,20,000

Illustration 51:

A contract for construction of building is governed by an *escalation clause* in respect of prices of steel, cement and stone aggregate. The prices ruling on the date of tender for the building and the actual prices paid by the contractor were as follows :

	On the date of tender (₹)	Actual ₹
Steel per ton	610	675
Cement per ton	100	105
Stone aggregate per 100 c.f.t.	40	38

3,00,000 c. ft. of reinforced cement concrete was laid in the building. If 100 lbs. of steel, 2,400 lbs of cement and 90 c. ft. of stone are the net quantities required to cast 100 c. ft. of RCC and the wastages are 5, 3 and 10 per cent respectively, calculate the difference in contract price according to the escalation clause (1 ton = 2,240 lbs) (Assume the wastage percentages based on the net quantity of material).

[C.S. Inter]

Solution:

Statement of difference in contract price
According to escalation clause

Particulars	*Steel lbs*	*Cement lbs*	*Stone Aggregate C.ft.*
Net quantities required to cast 100 c.ft. of RCC	100	2,400	90
Net quantities for 3,00,000 c.ft. of RCC	3,00,000	72,00,000	2,70,000
Wastage on net qty.	5% of 3,00,000 = 15,000	3% of 72,00,000 = 2,16,000	10% of 2,70,000 = 27,000
Gross qty. required	3,15,000	74,16,000	2,97,000
Gross quantity required Lbs ÷ 2,240 (tons)	140.625 Tons	3,310.7142 Tons	2,970 units of 100 c.ft.
Rate difference (₹)	675 – 610 = 65	105 – 100 = 5	38 – 40 = (–) 2
Amount Escalation for the gross quantity	140.625 × 65 = ₹ 9,141	3,310.7142 × 5 = ₹ 16,553	2,970 × (–) 2 = ₹ (–) 5,940

According to escalation clause, the difference in contract price is calculated below :

	₹
Steel	9,141
Cement	16,553
Stone Aggregate	(–) 5,940
Total	19,754

According to Escalation Clause the price should be increased by ₹ 19,754.

Illustration 52:

A contractor, who prepares his account on 31st December each year, commenced a contract on 1st April, 2020. The costing records concerning the said contract reveal the following information on 31st December, 2020.

	₹
Materials charged to site	2,58,100
Labour engaged	5,60,500
Foremen's salary	79,300

Plants costing ₹ 2,60,000 had been on site for 146 days. Their working life is estimated at 7 years and their final scrap value at ₹ 15,000. A supervisor, who is paid ₹ 4,000 p.m., has devoted approximately three- fourths of his time to this contract. The administrative and other expenses amount to ₹ 1,40,000. Materials in hand at site on 31st December, 2020, cost ₹ 25,400. Some of the material costing ₹ 4,500 was found unsuitable and was sold for ₹ 4,000 and a part of the plant costing ₹ 5,500 (on 31-12-2020) unsuited to the contract was sold at a profit of ₹ 1,000.

The contract price was ₹ 22,00,000 but it was accepted by the contractor for ₹ 20,00,000. On 31st December 2020 two-thirds of the contract was completed. Architect's certificate had been issued covering 50% of the contract price and ₹ 7,50,000 had so far been paid on account. Prepare Contract Account and state how much profit or loss should be included in the financial accounts to 31st December, 2020. Working should be clearly given. Depreciation is charged on time basis.

Also prepare the Contractee's Account and show how these accounts would appear in the Balance Sheet as on 31st December, 2020.

[CA Inter]

Solution:

Contract Account

Dr. (for the period of 9 months from 1-4-2020 to 31-12-2020) Cr.

Particulars	₹	*Particulars*	₹
To Materials	2,58,100	By Materials at site	25,400
To Labour	5,60,500	By Materials sold	4,000
To Foremen's salary	79,300	By P&L A/c (loss on	
To Supervisor's salary		sale of materials)	500
(9 × 4,000 × 3/4)	27,000	By Value of Work Certified	
To Depreciation		(50 % of 20 lakhs)	10,00,000
$\frac{2,60,000-15,000}{7}\times\frac{146}{365}$	14,000	By Cost of Work not Certified	2,62,250
To Admn. & Other Exp.	1,40,000		
To Total Profit c/d	2,13,250		
	12,92,150		12,92,150
To P&L A/c (profit taken)	1,06,625	By Total Profit b/d	2,13,250
To Reserved Profit	1,06,625		
	2,13,250		2,13,250

Note:

1. Two-thirds contract was completed. Architect's certificate had been issued covering 50% of the Contract Price. That is 2/3—1/2 = 1/6 of the contract was not certified.

   Cost of 2/3 contract = 10,49,000

   Cost of 1/6 contract = 1/6 × 3/2 × 10,49,000

   = ₹ 2,62,250 Cost of work not certified

2. 50% of the work has been certified. Hence, the following formula has been applied for including the profit in the financial accounts to 31-12-2020.

$$\text{Total Notional Profit} \times \frac{2}{3}\times\frac{\text{Cash received}}{\text{Work certified}}$$

$$= 2,13,250 \times \frac{2}{3}\times\frac{7,50,000}{10,00,000} = ₹\ 1,06,625$$

Contractee's Account

Particulars	₹	*Particulars*	₹
Balance c/d	7,50,000	By Bank	7,50,000
	7,50,000		7,50,000

Balance Sheet (Extract)

Particulars	₹	*Particulars*	₹	₹
P&L A/c		Work-in-Progress:		
(1,06,125 + 1,000 – 500)	1,06,625	Value of work certified	10,00,000	
		Cost of work uncertified	2,62,250	
			12,62,250	
		Less: Reserved Profit	1,06,625	
			11,55,625	
		Less: Cash Received	7,50,000	4,05,625
		Materials at site		25,400
		Plant at site		
		(2,60,000 – 14,000 – 5,500)		2,40,500

Illustration 53:

Paramount Engineers are engaged in construction and erection of a bridge under a long-term contract. The cost incurred up to 31.03.2021 was as under:

	₹ in lakhs
Fabrication:	
Direct Materials	280
Direct Labour	100
Overheads	60
	440
Erection costs to date	110
	550

The contract price is ₹ 11 crores and the cash received on account till 31.03.2021 was ₹ 6 crores. A technical estimate of the contract indicates the following degree of completion of work:

Fabrication: Direct Material: 70%, Direct Labour and Overheads: 60%, Erection: 40%.

You are required to estimate the profit that could be taken to Profit and Loss Account against this partly completed contract as at 31.03.2021. *[CA Inter]*

Solution:

Statement Showing Estimated Profit to date and Future Profit on the Completion of the Project

[₹ Lakhs]

Particulars	*Cost to date*		*Further Cost*		*Total cost*
	% completion to date	*Amount (a)*	*% completion to be done*	*Amount (b)*	*(a) + (b)*
Fabrication cost:					
Direct Material	70%	280.00	30%	120.00	400.00
Labour	60%	100.00	40%	66.67	166.67
Overhead	60%	60.00	40%	40.00	100.00
Total fabrication cost *(A)*		440.00		226.67	666.67
Erection cost (B)	40%	110.00	60%	165.00	275.00
Total cost *(A + B)*		550.00		391.67	941.67
Profit		92.48			158.33
Work certified		642.48	Total Contract Price		1,100.00

(i) Profit to date and future profit

$$\text{Profit to date (Notional Profit)} = \frac{\text{Estimated profit on whole project} \times \text{Cost to date}}{\text{Total Cost}}$$

$$= \frac{158.33 \times 550}{941.67} = ₹\ 92.48 \text{ lakhs}$$

Future Profit = ₹ 158.33 – 92.48 = ₹ 65.85

(ii) **Degree of completion of contract to date:**

$$= \frac{\text{Work Certified}}{\text{Contract Price}} \times 100$$

$$= \frac{₹\ 642.48 \text{ lakhs}}{₹1{,}100 \text{lakhs}} \quad 100$$

$$= 58.40\%$$

(iii) When work certified is more than !/2 of the contract price, but it is still not in the final stage, following formula is used to determine the figure of profit to be credited to profit and loss account:

$$2/3 \times \text{Notional Profit} \times \frac{\text{Cash received}}{\text{Work certified}}$$

Profit to be taken to Profit and Loss Account

$$= \frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash received}}{\text{Work certified}}$$

$$= \frac{2}{3} \times ₹\ 92.48 \text{ lakhs} \times \frac{₹\ 600 \text{ lakhs}}{₹\ 642.48 \text{ lakhs}} = ₹\ 57.576 \text{ lakhs}$$

Illustration 54:

One of the building contractors currently engaged in by a construction company commenced 15 months ago and remain unfinished. The following information relating to the work on the contract has been prepared for the year just ended :

	₹ '000
Contract price	2,500
Value of work certified at the end of the year	2,200
Cost of work not yet certified at the end of the year	40
Costs incurred:	
Opening balances:	
Cost of work completed	300
Materials on site (physical stock)	10
During the year:	
Materials delivered to site	610
Wages	580
Hire of Plant	110
Other expenses	90
Closing balance:	
Materials on site (physical stock)	20

As soon as materials are delivered to the site, they are charged to the Contract Account. A record is also kept of materials as they are actually used on the contract, periodically a stock check is made and any discrepancy between book stock and physical stock is transferred to a general contract material discrepancy account. This is absorbed back to each contract, currently at the rate of 0.5% of materials booked. The stock check at the year end revealed a stock shortage of ₹ 5,000.

In addition to the direct charges listed above, general overheads are charged to contracts at 5% of the value of work certified. General overheads of ₹ 15,000 had been absorbed into the cost of work completed at the beginning of the year.

It has been estimated that further costs to complete the contract will be ₹ 2,20,000. This estimate includes the cost of materials on site at the end of the year just finished and also a provision for rectification.

Required:

(a) Determine the profitability of the above contract and recommend how much profit should be taken for the year just ended. (Provide a detailed schedule of costs).

(b) State how your recommendation in *(a)* would be affected if the contract price was ₹ 40,00,000 (rather than ₹ 25,00,000) and if no estimate has been made of costs to completion. (If required, suitable assumption should be made by the candidate.)

[CA Inter]

Solution:

Statement of Cost

		₹
(a)	Cost Incurred: Opening balance	3,00,000
	During year:	
	Materials consumed (10 + 610 – 20)	6,00,000
	Wages	5,80,000
	Hire of Plant	1,10,000
	Other Expenses	90,000
	Material discrepancy 0.5% of 6,00,000	
	= ₹ 3,000. But actual shortage was ₹ 5,000	5,000
	General overheads 5% of 2,200 = 110 thousand	
	(–) 15 thousands absorbed at the beginning of the year	95,000
		17,80,000
	Estimated further costs to complete	2,20,000
	Estimated Total Cost	20,00,000
	Contract Price	25,00,000
	Estimated Total Profit	5,00,000
	Profit to be taken for the year just ended	
	Value of work certified at the end of the year	₹ 22,00,000
	Contract Price	₹ 25,00,000

As the work is nearing completion, the following formula may be applied for the profit to be credited to P&L A/c for the year just ended:

$$\text{Estimated Total Profit} \times \frac{\text{Value of work certified}}{\text{Contract price}}$$

$$5,00,000 \times \frac{22,00,000}{25,00,000} = ₹\ 4,40,000$$

Profit to be credited to P&L A/c: ₹ 4,40,000

(b) If contract price was ₹ 40,00,000

Value of work certified at the end of the year ₹ 22,00,000

i.e., 55% of work has been completed. In such case notional profit has to be calculated instead of estimated total profit.

	₹
Value of work certified	22,00,000
Add: Cost of work not certified	40,000
	22,40,000
Less: Cost of work up to the end of year	17,80,000
Total profit for 15 months	4,60,000

Recommendation in above would be affected as follows if contract price is 40,00,000.

Cash received is assumed as 90% of value of work certified. Then, the following formula is to be applied for the profit to be credited to P&L A/c for the year just ended:

$$\frac{2}{3} \times \text{Total Profit} \times \frac{\text{Cash received}}{\text{Value of work certified}}$$

$$\frac{2}{3} \times 4,60,000 \times \frac{90}{100} = ₹\ 2,76,000$$

Instead of ₹ 4,40,000, ₹ 2,76,000 should be credited to P&L A/c for the year just ended.

Illustration 55:

RST Construction Limited commenced a contract on April 1, 2021. The total contract was for ₹ 49,21,875. It was decided to estimate the total profit on the contract and to take to the credit of Profit and Loss Account that proportion of estimated profit on cash basis, which work completed bore to total contract. Actual expenditure for the period April 1, 2021 to Match 31, 2022 and estimated expenditure for April 1, 2022 to September 30, 2022 are given below:

	April 1, 2021 to March 31, 2022 (Actuals)	*April 1, 2022 to September 30,2022 (Estimated)*
	₹	₹
Materials Issued	7,76,250	12,99,375
Labour : Paid	5,17,500	6,18,750
: Prepaid	37,500	–
: Outstanding	12,500	5,750
Plant Purchased	4,00,000	-
Expenses : Paid	2,25,000	3,75,000
: Outstanding	25,000	10,000
: Prepaid	15,000	–
Plant returns to store (historical cost)	1,00,000 (On September 30, 2021)	3,00,000 (On September 30, 2022)
Work certified	22,50,000	Full
Work uncertified	25,000	–
Cash received	18,75,000	–
Materials at site	82,500	42,500

The plant is subject to annual depreciation @ 25% on written down value method. The contract is likely to be completed on September 30, 2022.

Prepare the Contract A/c. Determine the profit on the contract for the year 2021-22 on prudent basis, which has to be credited to Profit and Loss Account.

[CA]

Solution:

Dr. *(a)* **Contract Account for the year ending March 31, 2022** **Cr.**

Particulars		₹	*Particulars*		₹
To Materials issued		7,76,250	By Work-in-Progress		
To Labour	5,17,500		Certified	22,50,000	
Add: Outstanding	12,500		Uncertified	25,000	22,75,000
Less: Prepaid	(37,500)	4,92,500	By Plant returned to store		
To Plant		4,00,000	on 30.09.2022		
To Expenses	2,25,000		(1,00,000 – 25% × 6/12)		87,500
Add: Outstanding	25,000		By Plant at site		
Less: Prepaid	(15,000)	2,35,000	(3,00,000 – 25%)		2,25,000
To Notional Profit c/d		7,66,250	By Materials at site		82,500
		26,70,000			26,70,000
To Profit and Loss A/c			By Notional Profit b/d		7,66,250
$10,21,125 \times \frac{22,50,000}{49,21,875} \times \frac{18,75,000}{22,50,000}$		3,89,000			
To W/P (Reserve)		3,77,250			
		7,66,250			7,66,250

(b) **Contract Account for entire life period**

Dr. **from April, 1, 2021 to Sept 30, 2022.** **Cr.**

Particulars	₹	*Particulars*	₹
To Materials issued		By Contractee's A/c	49,21,875
(7,76,250 + 12,99,375)	20,75,625	By Materials at site	42,500
To Labour		By Plant returned on	
(5,17,500 – 37,500 + 12,500		Sept. 30, 2021	
+ 6,18,750 + 37,500 –12,500		(1,00,000 – 12,500)	87,500
+ 5,750)	11,42,000	By Plant returned on	
To Plant	4,00,000	Sept. 30, 2022	
To Expenses		(3,00,000 *Less* Dep. for 2021	
(2,25,000 + 25,000 – 15,000		₹ 75,000	
+ 3,75,000 – 25,000 + 15,000		Less Dep.) for 2021 - 2022 (1/2)	
+ 10,000)	6,10,000	₹ 28,125	1,96,875
To Profit (Estimated)	10,21,125		
	52,48,750		52,48,750

Illustration 56:

AKP Builders Ltd. commenced a contract on April 1st , 2021. The total contract was for ₹ 5,00,000. Actual expenditure for the period April 1st 2021 to March 31st 2022 and estimated expenditure for April 1st , 2022 to December 31st, 2022 are given below:

	2021-22 (Actuals)	*2022-23 (9 months) (Estimated)*
	₹	₹
Material Issued	90,000	85,750
Labour : Paid	75,000	87,325
Outstanding at the end	6,250	8,300
Plant	25,000	–
Sundry Expenses : Paid	7,250	6,875
Prepaid at the end	625	–
Establishment Charges	14,625	–

A part of the material was unsuitable and was sold for ₹ 18,125 (Cost being ₹ 15,000) and a part of plant was scrapped and disposed of for ₹ 2,875. The value of plant at site on 31st March, 2022 was ₹ 7,750 and the value of material at site was ₹ 4,250. Cash received on account to date was ₹ 1,75,000, representing 80% of the work certified. The cost of work uncertified was valued at ₹ 27,375. The contractor estimated further expenditure that would be incurred in completion of the contract:

- The contract would be completed by 31st December, 2022.
- A further sum of ₹ 31,250 would have to be spent on the plant and the residual value of the plant on the completion of the contract would be ₹ 3,750.
- Establishment charges would cost the same amount per month as in the previous year.
- ₹ 10,800 would be sufficient to provide for contingencies.

Required:

Prepare Contract Account and calculate estimated total profit on this contract.

Solution:

AKP Builders Ltd.
Contract Account

Dr. **(For the period April 1st 2021 to March 31st 2022)** **Cr.**

Particulars		₹	*Particulars*	₹
To Material issued		90,000	By Material (sold)	18,125
To Labour	75,000		By Plant (sold)	2,875
Add: Outstanding	6,250	81,250	By Plant at site	7,750
To Plant		25,000	By Material at site	4,250
To Sundry expenditure	7,250		By Balance c/d	1,87,625
Less: Pre-paid	625	6,625		
To Establishment charges		14,625		
To Profit and Loss A/c (Profit on sale of material)		3,125		
		2,20,625		2,20,625
To Balance b/d		1,87,625	By Work-in-Progress	
To Notional profit		58,500	Certified	2,18,750
			Uncertified	27,375
		2,46,125		2,46,125

Working Note:

1. Memorandum Contract Account (9 Months)

Particulars		₹	*Particulars*	₹
To Material			By Contractee's	
(90,000 + 3,125 – 18,125)	75,000		A/c	5,00,000,00
Add: New Addition	85,750	1,60,750.00		
To Plant				
(25,000 – 2,875)	22,125			
Add: New	(+) 31,250			
Less: Closing	(–) 3,750	49,625.00		
To Establishment charges	14,625			
Add: For nine months				
$\frac{14,625}{12} \times 9$ =	10,968.75	25,593.75		

To Sundry expenditure	6,625			
Add: New	(+) 6,875			
Prepaid	(+) 625	14,125.00		
To Labour	31,250			
Add: (87,325 – 6,250)	(+) 81,075			
Outstanding	(+) 8,300	1,70,625.00		
To Reserve for contingencies		10,800.00		
To Estimated profit		68,481.25		
		5,00,000.00		5,00,000,00

Illustration 57:

Z Limited obtained a Contract No. 999 for ₹ 50 lacs. The following details are available in respect of this contract for the year ended March 31,2022:

	₹
Materials purchased	1,60,000
Materials issued from stores	5,00,000
Wages and salaries paid	7,00,000
Drawing and maps	60,000
Sundry expenses	15,000
Electricity charges	25,000
Plant hire expenses	60,000
Sub- contract cost	20,000
Materials returned to stores	30,000
Materials returned to suppliers	20,000

The following balances relating to the Contract No. 999 for the year ended on March 31,2021 and March 31,2022 are available:

	As on 31st March, 2021	*As on 31st March, 2022*
	₹	₹
Work certified	12,00,000	35,00,000
Work uncertified	20,000	40,000
Materials at site	15,000	30,000
Wages outstanding	10,000	20,000

The contractor receives 75% of work certified in cash

Prepare Contract Account and Contractee's Account.

[CA Inter]

Solution:

Contract No. 999 Account

Dr. **For the year ended 31st March, 2022** **Cr.**

Particulars	*Amount (₹)*	*Particulars*	*Amount (₹)*
To Work in progress b/d:		By Materials returned	
Work certified	12,00,000	to store	30,000
Work uncertified	20,000	By Materials returned	
To Stock (Materials) b/d	15,000	to suppliers	20,000
To Materials purchased	1,60,000	By Stock (Materials)	
To Materials issued	5,00,000	c/d	30,000

To Wages paid	7,00,000		By Work in progress	
Less: Opening O/s	(10,000)		c/d:	
Add: Closing O/s	20,000	7,10,000	Work certified	35,00,000
To Drawing and maps*		60,000	Work uncertified	40,000
To Sundry expenses		15,000		
To Electricity charges		25,000		
To Plant hire expenses		60,000		
To Sub-contract cost		20,000		
To Notional profit c/d (balancing figures)		8,35,000		
		36,20,000		36,20,000

*Assuming that expenses incurred for drawing and maps are used exclusively for this contract only.

Illustration 58:

PVK Constructions commenced a contract on 1st April, 2021. Total contract value was ₹ 100 lakhs. The contract is expected to be completed by 31st December, 2023. Actual expenditure during the period 1st April, 2021 to 31st March, 2022 and estimated expenditure for the period 1st April, 2022 to 31st December, 2023 are as follows:

Particulars	*Actual (₹)*	*Estimated (₹)*
	1st April, 2021 to 31st March, 2022	*1st April, 2022 to 31st Dec., 2023*
Material issued	15,30,000	21,00,000
Direct Wages paid	10,12,500	12,25,000
Direct Wages outstanding	80,000	1,15,000
Plant purchased	7,50,000	
Expenses paid	3,25,000	5,40,000
Prepaid Expenses	68,000	–
Site office expenses	3,00,000	–

Part of the material procured for the contract was unsuitable and was sold for ₹ 2,40,000 (cost being ₹ 2,55,000) and a part of plant was scrapped and disposed of for ₹ 80,000. The value of plant at site on 31st March, 2022 was ₹ 2,50,000 and the value of material at site was ₹ 73,000. Cash received on account to date was ₹ 36,00,000, representing 80% of the work certified. The cost of work uncertified was values at ₹ 5,40,000.

- An additional amount of ₹ 4,62,500 would have to be spent on the plant and the residual value of the plant on the completion of the contract would be ₹ 67,500.
- Site office expenses would be the same amount per month as charged in the previous year.
- An amount of ₹ 1,57,500 would have to be incurred towards consultancy charges.

Required:

Prepare Contract Account and calculate estimated total profit on this contract. *[CA Inter]*

Solution:

PVK Constructions

Dr. Contract Account for the year 2021-22 Cr.

Particulars		*(₹)*	*Particulars*	*(₹)*
To Materials issued		15,30,000	BY Material sold	2,40,000
To Direct wages	10,12,500		By Costing P&L Account	
Add: Outstanding	80,000	10,92,500	(loss on sale of materials)	15,000

To Plant purchased		7,50,000	By Plant Sold		80,000
To Expenses	3,25,000		By Plant at site		2,50,000
Less: Prepaid	(68,000)	2,57,000	By Materials at site		73,000
To Site office expenses		3,00,000	By Work-in-Progress:		
To Notional profit c/d		17,68,500	Work Certified	45,00,000	
			Work Uncertified	5,40,000	50,40,000
		56,98,000			56,98,000

Calculation of Estimated Profit (April, 2021 to December, 2022)

Particulars	*Amount* ₹	*Amount* ₹	*Amount* ₹
Total value of the contract (*A*)			1,00,00,000
(i) Materials Costs:			
Materials Consumed in 2021-2022:			
Materials issued in 2021-22	15,30,000		
Less: Closing Materials at site	(73,000)		
Less: Unsuitable Materials sold	(2,55,000)	12,02,000	
Add Materials to be Consumed			
Materials to be issued	21,00,000		
Add: Opening materials at site	73,000	21,73,000	33,75,000
(ii) **Direct Wages Cost:**			
Direct Wages for 2021-22:			
Wages paid	10,12,500		
Add: Outstanding at closing	80,000	10,92,500	
Direct wages to be incurred:			
Wages to be paid	12,25,000		
Less: Outstanding at opening	(80,000)		
Add: Outstanding at closing	1,15,000	12,60,000	23,52,500
(iii) **Plant Cost:**			
Plant used during 2021-22:			
Plant purchased	7,50,000		
Less: Plant disposed off	(80,000)		
Less: Closing plant at site	(2,50,000)	4,20,000	
Plant to be used:			
Additional amount to be spent	4,62,500		
Add: Opening plant at site	2,50,000		
Less: Residual value of plant	(67,500)	6,45,000	10,65,000
(iv) **Expenses:**			
Expenses incurred during 2021-22:			
Expenses paid	3,25,000		
Less: Prepaid at closing	(68,000)	2,57,000	
Expenses to be incurred			
Expenses to be paid	5,40,000		
Add: Prepaid at opening	68,000	6,08,000	8,65,000
(v) **Site office expenses paid in 2021-22:**		3,00,000	
Add: To be paid			
{(3,00,000 ÷ 12) × 21 months}		5,25,000	8,25,000
(vi) **Consultancy charges to be paid:**			1,57,500
Total Estimated Cost of the Contract (B)			86,40,000
Estimated Profit (A – B)			
(1,00,000,000 – 8,40,000			13,60,000

OBJECTIVE QUESTIONS

I. Examine the correctness of following statements

1. Contractor has more probability of going into loss in cost plus contract.
2. Under cost plus contract, it is certain that final contract price will be paid.
3. In case of incomplete contract under contract costing, only a part of profit is transferred to Profit & Loss Account.
4. Escalation clause in the contract provides that contract price is fixed.

Ans. True 3, Others are incorrect statement

II. Fill in blanks

1. In contract costing unit of cost is .....
2. ..... of the contract provides that under certain specific condition the cost price will be increased appropriately.
3. Loss of incomplete contract is transferred to .....
4. When contract is complete more than half, the formula of profit to be transferred to profit and loss account is .....

Ans. 1. Contract A/c 2. Escalation clause
3. Profit and Loss Account 4. Notional Profit × 2/3; Cash Received/Value of Work Certified.

III. State whether following statements are True or False.

1. In cost -plus contracts, contractor runs a true risk of incurring a loss.
2. Escalation clause in a contract provides that contract price is fixed.
3. In contract costing the contract which is complete one half of the total contract, one fourth of the profit should be transferred to Profit and Loss Account.
4. In contract costing, profit on each contract is computed when the contract is completed.
5. Cost of sub contract work is credited to contract account.
6. Work-in-Progress certified and uncertified in a contract is valued at cost.
7. When Work-in-Progress certified is less than 25% of the contract price it is a common practice to transfer 25% of the national profit to Profit and Loss Account.
8. The object of inserting escalation clause in contract is to safeguard the interest of contractor against unfavourable changes in cost over the period of the contract.
9. Cost plus contract projects the contractor from the risk of market fluctuation in the prices of material, labour and other.

Ans. 1. F, 2. F, 3. F, 4. F,
5. F, 6. F, 7. F 8. T, 9. T

IV. Fill in the blank spaces

1. In contract costing Work-in-Progress certified is valued on the basis of ..... and uncertified work is valued at .....
2. When cash ratio is 85% the retention money is .....
3. When 60% of the contract price is certified as Work-in-Progress, the profit to be credited to Profit and Loss account will be equal to .....
4. The estimated profit is ₹ 60,000 and the contract is almost two third completed. If the cash ratio is 90% the profit to be transferred to Profit and Loss Account is.....
5. Progress payments in contract is based as a percentage of .....
6. Work-in-Progress certified of a contract is 45% of contract price. Profit to be transferred to P & L A/c is ..... portion of the profit.

Ans. 1. Contract price, Cost 2. 15% 3. 2/3
4. ₹ 36,000 5. Value of work certified 6. 1/3

V. Multiple Choice Questions

Select the correct answer in each of the following:

1. When a contract is not completed at the end of the accounting year, profit on incomplete contract is
   (a) transferred to Profit and Loss A/c
   (b) transferred to reserve
   (c) transferred partly to Profit and Loss Account and partly to work-in-progress
2. For contracts which are very near to completion, amount of profit to be credited to Profit and Loss Account is ascertained by the following formula.
   (a) Estimated profit × work certified/contract price
   (b) Estimated profit × W.C. × Cash Received/contracts price
   (c) Estimated profit × W.C. × Cost of Work done/ Contract Price × Total Cost do date
3. When contract is 40% complete, amount of profit to be credited will be :
   (a) The amount of profit estimated
   (b) 40% of the estimated profit
   (c) 1/3 of the estimated profit multiplied by cash ratio
4. In contract accounts, the account of Work-in-Progress consists of:
   (a) Cost of work certified
   (b) Cost of work uncertified
   (c) The amount of profit transferred to Profit and Loss Account
   (d) (a) + (b) above
   (e) (a) + (b) and *(c)*
5. Cost-plus contract is usually entered into in those cases where:
   (a) Cost can be easily estimated
   (b) It is not possible to compute the cost in advance with a reasonable degree of accuracy
   (c) Contractor wants to earn a higher amount of profit
   (d) None of these
6. Contract price is not fixed in case of:
   (a) Cost-plus contracts
   (b) Escalation clause
   (c) De-escalation clause
   (d) All of the above
7. Cost-plus contract is useful from the point of view of
   (a) Contractor
   (b) Contractee
   (c) both contractor and contractee
   (d) None of these
8. In a building contract of ₹ 2,40,000, at the end of the year work certified is ₹ 1,60,000 and estimated profit is ₹ 15,000. What is the amount of profit to be credited to Profit and Loss Account assuming cash ratio is 80%.
   (a) ₹ 15,000
   (b) ₹ 12,000
   (c) ₹ 8,000
9. In contract costing, valuation of which of the following does not includes an element of profit:
   (a) Work-in-Progress certified
   *(b)*Work-in-Progress uncertified
   (c) Both *(a)* and *(b)*
   (d) Neither *(a)* nor *(b)*

10. A contract of ₹ 5,00,000 is 55% complete as certified. It shows a notional loss of ₹ 20,000. Accounting treatment of this loss is:
    (a) Transfer 2/3 of this loss to P&L A/c
    (b) Transfer 2/3 × cash ratio of this loss to P&L A/c
    (c) Transfer 55% of this loss to P&L A/c
    (d) Transfer entire amount of loss to P&L A/c
11. Which of the following items is not written in the credit side of the contract account:
    (a) Work-in-Progress certified and uncertified
    (b) Materials returned
    (c) Cash received from contractee
    (d) Plant at site

Ans. *1. (c), 2. (a) 3. (c) 4. (e) 5. (b) 6. (d) 7. (c) 8. (c), 9. (d) 10. (d) 11. (c)*

ASSIGNMENTS

Theoretical Questions

1. What do you understand by Job Costing and Batch Costing. Discuss difference between the two.
2. What is the Contract Account? What important points should be borne in mind in its preparation?
3. Explain the purposes which are served by Work-in-Progress Account. How will this account appear in the Balance Sheet?
4. Do you think it desirable to calculate profit on uncompleted contract? If so, to what extent and why? Explain the procedure to ascertain this profit.
5. What do you understand by cost-plus method of contracts? In what cases is this method usually employed?
6. Describe the methods used for treatment of plant used on contract or job in contract account.
7. What items are included in the valuation of Work-in-Progress? How it would appear in the Balance Sheet?
8. Write a short note on 'Escalation Clause'.
9. Distinguish between Job Costing and Batch Costing.
10. Discuss the concept of Economic Batch Quantity.
11. Explain following: *(i)* Notional Profit in Contract Costing, *(ii)* Retention Money *(iii)* Economic Batch Quantity

Numerical Questions

1. The following was the expenditure on a contract of ₹ 3,00,000 commenced in January, 2020.

	₹
Materials	60,000
Wages	82,000
Plant	10,000
General Expenses	4,300

Cash received on account to 31st December amounted to ₹ 1,20,000 being 80% of the works certified, the value of materials on hand on 31st December was ₹ 5,000.

Prepare an account, showing position at the end of the year and the position of the profit which might reasonably be taken to Profit and Loss Account after allowing 15% for depreciation on plant.

Ans. Total Profit ₹ 7,200; Profit to P&L A/c ₹ 3,840.

2. Building Contractors Ltd. undertake contracts. On 31st October, 2021, when the actual accounts were prepared, the position of Contract No. 101, which was commenced on 1st January, 2021 was as under:

	₹
Materials purchased	37,500
Materials in hand	1,500
Wages paid	43,750
Wages outstanding	625
Proportionate share of indirect expenses	1,875
Cost of Plant	6,250

The value of work certified was ₹ 90,000, of which ₹ 67,500 had been received, work completed but uncertified was valued at ₹ 2,500. The contract price was ₹ 1,50,000. The plant on the site was valued at ₹ 5,000 on 31st October, 2021. Prepare Contract Account No. 101, after taking credit for profit which you think reasonable.

Ans. Total Profit ₹ 9,000; Profit to P&L A/c ₹ 4,500.

3. A contractor undertook a contract for constructing a building. The contract price was ₹14,00,000 and the contract commenced on 1st January, 2020. During the year the following expenses were incurred over the contract:

	₹
Materials issued from stores	10,000
Materials purchased	3,00,000
Labour	2,50,000
Indirect expenses	90,000
Plant	3,50,000
Materials returned to stores	20,000
Materials lost by fire	5,000
Materials at site 31-12-2020	15,000
Plant at site 31-12-2020	3,00,000
Work certified	7,00,000
Cash received from the contractee (80% of the work certified)	5,60,000

Prepare the Contract Account and Work-in-Progress Account and show how will Work-in-Progress appear in the Balance Sheet on 31-12-2020.

Ans. Total Profit ₹ 40,000; Profit to P&L A/c. ₹ 21,333;
Work-in-Progress ₹ 9,96,333; B/S Work- in-Progress less Cash received ₹ 4,36,333.

4. Bharat Constructions Ltd. obtained a contract for the construction of arts faculty of a University at 10% less of the estimated cost amounting to ₹ 20,00,000. The work was taken up on 1st April, 2022. On 31st March, 2023, the expenses on the contract were as follows:

	₹
Materials issued to the contract	3,60,000
Material at site	15,000
Wages	4,93,200
Plant & machinery specially for contract (subject to depreciation at 10%)	60,000
Direct expenses incurred	25,800
General overheads (share of the contract)	15,200
Cost of uncertified work	30,000

Up to the close of the year, total sum of ₹ 7,20,000 was received by contractors, being 80% of the amount payable on Architect's certificate. Prepare the Contract Account showing the profit on the contract.

Ans. Total Profit ₹ 44,800; Profit to P&L A/c ₹ 11,947, being 1/3 of profit received.

5. The following information is available in respect of a contract undertaken by a building contractor in 2021; the contract was for ₹ 4,00,000.

	₹
Materials issued	75,000
Wages paid	1,10,000
General charges	4,000
Plant installed at site on 1st July, 2021	20,000
Materials at hand on close	4,000
Wages accrued and due	4,000
Work certified	2,00,000
Work completed but not certified	6,000
Cash received	1,50,000
Materials transferred to other contracts	4,000
Materials received from other contracts	1,000

Depreciation on plant is to be provided at 10% per annum. Prepare Contract Account and show what part of the profit on contract should be taken credit to P&L Account of 2021.

Ans. Total Profit ₹ 19,000; Profit to P&L A/c ₹ 9,500.

6. A Building Contractor took a contract for the construction of a certain building on 1st Oct, 2021. The contract price was agreed at ₹ 3,00,000. The contractor had made the following transactions during the year:

	₹
Direct Materials purchased	20,000
Materials issued from stores	30,000
Direct Labour	30,000
Plant	80,000
Direct Expenses	20,000
	1,80,000

From the following further information, prepare a Contract Account for the year ending on 30th November 2022. Also show the amount of Work-in-Progress which will be shown in the Balance Sheet of the Contractor.

	₹
Value of plant on 30-9-22	60,000
Stock of materials on site on 30-9-22	10,000
Materials returned to stores	2,000
Work certified by the architects	1,50,000
Cash received from the contractee	1,40,000
Cost of work not yet certified	8,000

Ans. Total Profit ₹ 50,000. Profit Transferred to P&L A/c ₹ 31,111. Work-in-Progress ₹ 1,39,111.

7. The following information relates to a contract work done by a firm of Engineers during the year ended 31st December, 2021.

	₹
Work certified by the Architects	1,10,000
Materials issued	55,000
Wages	51,400
Plant installed at site	9,500
Value of plant at 31st Dec., 2021	7,200
Cash received from the contractee	1,00,000
Establishment charges	2,900
Cost of work not certified	2,200
Direct expenditure	2,100
Wages accrued due at 31 st December, 2021	1,600
Materials in hand 31st December, 2021	1,300
Materials returned to store	500
Direct expenditure accrued due at 31st Dec., 2021	150
Contract Price	1,50,000

You are required to show the working of the Contract Account up to 31st December, 2021, in order to ascertain the profit or loss made thereon.

Ans. Loss transferred to P&L A/c ₹ 1,450

8. Write up a Contract Account from the following particulars:

	₹
Direct material	18,000
Wages	12,000
Special Plant	8,000
Stores issued	3,200
Loose Tools	1,500
Cost of Tractor:	
Running Material	1,000
Wages of Driver, *etc*.	1,600
Workmen's Welfare Expenses	1,200

The contract was completed in 20 weeks at the end of which period plant was returned subject to depreciation of 20% on the original cost. The values of loose tools and stores returned were ₹ 1,000 and ₹ 400 respectively. The value of the tractor was ₹ 19,500 and depreciation was to be charged to this contract at the rate of 20% per annum. You are required to provide Office on cost at the rate of 15% on Works Cost. The contract was executed at a profit of 20% on Total Cost.

Ans. Office on cost ₹ 6,030. Profit on Contract ₹ 9,246. Contract price ₹ 55,476

9. A firm of building contractors began to trade on 1st April, 2020. The following was the expenditure on a contract for ₹ 2,50,000:

	₹
Materials issued to contract	45,000
Plant used for contract	20,000
Wages incurred	81,000
Other expenses incurred	5,000

Cash received on account to 31st March, 2021, amounted to ₹ 1,28,000, being 80% of the work certified. Of the plant and materials charged to the contract, plant which cost ₹ 3,000 and materials which cost ₹ 2,500 were lost. On 31st March, 2021, plant which cost ₹ 2,000 was returned to stores, the cost of work done but uncertified was ₹ 1,000 and materials costing ₹2,300 were in hand on site.

Charge 15% depreciation on plant, reserve 1/3 of profit received as Reserve for Contingencies and prepare a Contract Account from the above particulars.

Ans. Total Profit ₹ 32,250, Profit transferred to P&L A/c ₹ 17,200, Reserve for Contingencies ₹ 8,600

10. The following figures relate to two jobs of a contractor. You are required to prepare Contract Accounts for both the contracts and state what profit or loss (if any) should be brought to the Profit & Loss Account for the year 2021.

	Contract A	*Contract B*
	₹	₹
Total Expenditure up to 31-12-2020	9,00,000	6,75,000
Wages (2021)	1,05,000	21,500
Materials and Haulage Hire 2021	1,57,500	7,500
Indirect Expenses	5,250	600

Plants which were originally charged at cost were valued at the close of the year at ₹ 2,50,000 and ₹ 3,75,000 respectively for Contracts *A* and *B*. The contract price for *A* was ₹ 12,00,000 and for *B* ₹ 3,00,000. The work in each case was actually finished on 30th November, 2021 but the contracts could not be considered as completed until the maintenance period of six months, as stipulated in the contract, has expired on 31st May, 2022. The cost of maintenance is estimated at ₹ 5,000 for Contract *A* and ₹ 3,500 for Contract *B*.

Ans. Contract A Profit ₹ 2,77,250. Contract B Loss ₹ 33,100 after debiting maintenance charges

11. The following particulars relate to two houses which a firm of builders had in course of construction under contract.

	House A	*House B*
Work-in-Progress on 1st Jan. (excluding ₹ 800 estimated profit which was taken to Profit and Loss Account of 2020)	14,000	—
Materials Purchased	23,000	16,600
Wages	20,000	14,000
Electrical Service and Fitting	1,400	300
Road Making Charges	8,000	—
Contract Price (including Road Making)	60,000	40,000
Cash Received to 31st Dec. 2021	60,000	24,000
Percentage of Cash Received to Work Certi.	100%	66 2/3%
Value of Materials on hand on 31st Dec., 2021	400	540
Completed work not certified	—	2,500
Value of Plant used on sites	12,000	6,000
Period of Plant remained on site during the year	10 months	8 months

The total establishment exp. incurred during the year 2021 amounted to ₹ 12,240. These are to be charged to the two Contracts in proportion to wages. Depreciation of plant is to be taken into account at the rate of 10% per annum. Prepare the two Contract Accounts (in columnar form) showing the profit or loss on each house for the year 2021.

Ans. House A Loss ₹ 15,000; House B total profit 2,700 and Profit to P&L A/c ₹ 1,200

12. Three contracts beginning on 1st February, 1st June and 1st September respectively were undertaken by the Engineers Ltd., in 2021. Their accounts on 31st December, 2021 showed the following position :

	Contract No. 1 ₹	*Contract No.2* ₹	*Contract No. 3* ₹
Contract price	1,60,000	1,08,000	1,20,000
Work Certified	80,000	64,000	14,400
Work Uncertified	2,400	3,200	800
Materials	28,800	23,200	8,000
Wages	44,000	45,000	5,600
General Expenses	1,600	1,100	400
Cash received in respect of Work Certified	60,000	48,000	10,000
Wages Accrued	1,400	1,500	700
General Expenses Accrued	300	200	100
Materials on hand	1,600	1,600	800
Plant	8,000	6,400	4,800

On the respective dates of the contracts, the plant was installed, depreciation thereon being taken at 15 per cent per annum. You are required to prepare *(a)* Accounts in the contract ledger, and *(b)* A statement showing the estimated profit on Contract Nos. 1, 2 and 3.

Ans. Total Profit: Contract No. 1 ₹ 6,800, and ₹ 3,400 of Profit of Contract No. 1 may be tfd. to P&L A/c; Contract No. 3 Profit ₹ 960; Loss in Contract No. 2. ₹ 2,760 Profit of Contract 3 need not be transferred to P&L A/c.

13. The following is a summary of the entries in the Contract Ledger as on 31st December, 2022 in respect of Contract No. 147 :

	₹
Materials (direct)	31,500
Materials (from stores)	6,825
Wages	18,250
Direct expenses	7,035
Establishment charges	8,400
Plant	35,800
Sale of scrap	1,975
Sub-contract costs	7,680

You obtain the following further information:

1. Expenses outstanding and not brought into account were : Wages ₹ 850; Direct expenses ₹ 1,175.
2. Depreciation of Plant up to 31st December 2022 is ₹ 8,980.
3. Included in the above summary of entries are : Wages ₹ 1,150; Other expenses ₹ 1,475 incurred since certification. The value of materials used since certification is ₹ 2,180.
4. Materials on site at 31st December are valued at ₹ 10,500.
5. ₹ 65,600 had been certified up to 20th December, when three-eighths of the contract remained incomplete.
6. The total contract price is ₹ 1,10,000.

You are required to show what profit or loss should be taken into accounts for the period ended 31st December in respect of Contract No. 147.

Ans. Loss on Contract No. 147 ₹ 7,815

14. The following is a summary of the expenditure on Job No. 31 up to 31st December, 2022:

	₹
Direct Wages	6,900
Direct Materials	34,000
Stores issued	3,800
Stores returned	550
Sub-contract cost	6,300
Plant	12,000

You obtain the following further information:

1. The job was begun during 2022 and the total contract price is ₹ 60,000.
2. The architects have certified that four-fifths of the contract had been completed on December 15.
3. Depreciation of plant up to December 15, is ₹ 4,800.
4. The summary set out above includes items relating to the period since December 15: Wages ₹ 700, Materials used ₹ 1,620.
5. Materials on site on December 31 had cost ₹ 5,000 and stores on site had cost ₹ 400.
6. Establishment charges are 40% on direct wages.
7. A fine of ₹ 1,000 is likely to be imposed for late completion.

You are required in respect of Job No. 31 : *(a)* to prepare a Job Cost Ledger Account : *(b)* to show what profit or loss has arisen on the work certified; and *(c)* to suggest what figures should be taken to the Profit and Loss Account for the year to December 31, 2022.

Ans. Loss tfd. to P&L A/c ₹ 2,010 without debiting probable fine ₹ 1,000

15. A contractor who prepares his accounts on 31st December each year, commenced a contract No. 51 on 1st April, 2021. The costing records concerning the said contract yield the following information at 31st December, 2021:

	₹
Materials charges out to site	25,100
Labour	56,560
Foremen	8,130

A machine costing ₹ 26,000 has been on the site for 146 days. Its working life is estimated at 7 years and its final scrap value at ₹ 1,500.

A supervisor, who is paid ₹ 800 per mensem, has devoted approximately one-half of his time to this contract. All other expenses and administration Exps. amount to ₹ 13,650. Materials in hand at site on 31st Dec., cost ₹ 3,540.

The contract price is ₹ 2,00,000. On 31st December, two-thirds of the contract was completed; architect's certificates had been issued covering 50% of the contract price; ₹ 75,000 has so far been paid on account.

Prepare the Contract Account and state how much profit or loss should be included in the financial account to 31st Dec., 2020.

Ans. Cost of work uncertified ₹ 26,225. Profit to Profit and Loss A/c ₹ 10,662.50.

16. The following figures are disclosed by the books of a contractor for the year ending 31st December, 2021:

	₹	₹
Work-in-Progress as on 31st Dec., 2020	1,70,000	
Less: Advances from contractees as on 31-12-2020	1,10,000	60,000
Transactions during the year were:		
Materials supplied to contract directly by merchants		12,000
Materials issued from stores		21,000

Wages	17,000
Working expenses	3,000
Administration expenses (of which ₹ 500 are chargeable to general Profit and Loss Account)	2,500
Plant issued	5,000
Materials returned from contracts directly to merchants	900
Materials returned to store	1,100
Contracts finished	45,000
Work certified	30,000
Profit taken upon contracts	23,000
Advances from contractees	80,000

Prepare the Contract Ledger Account and the Total Contractees' Account, and show how the Work- in-Progress would appear in the Balance Sheet as on 31st Dec., 2021.

Ans. Work uncertified ₹ *1,76,000; Work-in-Progress* ₹ *2,06,000, Balance of Contractee's A/c* ₹ *1,45,000.*

17. The following Trial Balance was extracted on 31st December, 2022, from the Books of Swastik Co. Ltd. the contractor:

		₹
Share Capital : Shares of ₹ 100 each		3,51,800
Profit and Loss A/c on 1 Jan .2022		25,000
Provision for Depreciation on Machinery		63,000
Cash received on account: Contract No. 7		12,80,000
Creditors		81,200
Land and Buildings (Cost)	74,000	
Machinery (Cost)	52,000	
Bank	45,000	
Contract No. 7		
Materials	6,00,000	
Direct Labour	8,30,000	
Expenses	40,000	
Machinery on site (Cost)	1,60,000	
	18,01,000	18,01,000

Contract No. 7 was begun on 1st Jan. 2022, the contract price is ₹ 24,00,000 and the customer has so far paid ₹ 12,80,000, being 80% of the work certified. The cost of work done since certification is estimated at ₹ 16,000.

On 31st Dec., 2022, after the above trial balance was extracted, machinery costing ₹ 32,000 was returned to stores, and materials then on site were valued at ₹ 27,000.

Provision is to be made for direct labour accrued and due ₹ 6,000 and for depreciation of all machinery at 12.5% on cost.

You are required to prepare *(a)* the Contract Account, *(b)* a Statement of profit, if any, to be properly credited to Profit and Loss A/c for and *(c)* the Balance Sheet of Swastik Co., Ltd., as at 31st December 2022.

Ans. Profit tfd. to P&L A/c ₹ *78,400. Total of Balance Sheet* ₹ *6,25,400*

18. The Contractors Ltd. undertook a contract for ₹ 4,00,000 on 1st July, 2020. The following expenses were incurred up to 31st Dec., 2020:

	₹
Materials issued from stores	35,000
Materials charged direct	5,000
Direct charges	2,000
Wages	20,000

The amount of work certified was ₹ 80,000 of which the contractors received 75 per cent in cash.

The transactions for the year 2021 were as under:

	₹
Materials issued from stores	90,000
Wages	40,000
Direct charges	4,000

The cost of special Plant and Machinery issued on 1st Jan., 2021 for the contract was ₹ 80,000. Further work certified during the year amounted to ₹ 2,20,000, 75 per cent of which was received. Work done and not certified as on 31st December, 2021, was valued at ₹ 15,000. Special Plant is to be depreciated at 25 per cent per annum on the original cost. Materials on site were valued at ₹ 10,000.

The contract was completed on 30th April, 2022, up to which date the following further expenses were incurred:

	₹
Materials issued from stores	40,000
Wages	15,000
Direct charges	1,350

General on cost each year is to be taken at 5 per cent of the amount of materials consumed and wages paid during the year. On 30th April, 2022, the plant was valued at ₹ 50,000; the materials at site were sold for ₹ 7,000 and those returned to stores amounted to ₹ 13,000.

Prepare Contract Account and Contractee's Account showing the results of the transactions, assuming that the balance due from the contractee was duly received.

Ans. 2020 Profit not taken; 2021 Profit transferred to P&L ₹ 50,000, 2023 Profit to P&L ₹ 76,400

19. Excellent Erections Ltd. took up a contract for the construction of a Building at a contract price of ₹ 15,00,000. During the first year, the following amounts spent as against which a sum of ₹ 5,62,500 which represented 90% of the work certified and received by the contractor.

	₹
Materials	2,62,500
Wages paid to worker	1,50,000
Overhead expenses	37,500
During the second year, the firm spent the following amounts:	
Materials	3,75,000
Labour Cost	3,00,000
Overhead Exps.	75,000

In the second year the contract was completed and a sum of ₹ 8,75,000 was received by the contractor. You are required to prepare the Contract Accounts and Contractees' Accounts for both the years and calculate profit.

Note: Consider only 2/5th or 40% of the notional profit to be taken to the credit of P&L Account in the first year as the work done is less than 50%. (*CMA*)

Ans. Profit 1st year Total ₹ 1,75,000 Tr. to P&L ₹ 63,000; II year total profit ₹ 2,37,000.

20. From the following particulars of a contract which has been completed 95% find profit and compare it with profit which might have been earned on the completion of the contract.

	₹
Total cost to date	1,90,000
Estimated additional cost	10,000
Contract Price	2,50,000
Value of work certified	2,30,000
Cost of uncertified work	5,000
Cash received	2,15,000

Ans. Total estimated profit on completion of the contract ₹ 50,000;
Profit to P&L A/c this year 43,000 i.e., Total Profit × WC/CP × CR/WC.

21. Standard Ltd., contractors, commenced work on 1st January, 2020, on a contract of which the agreed price was ₹ 5,00,000. The following expenditure was incurred during the year to 31st Dec., 2020; Wages ₹ 1,40,000; Plant ₹ 35,000; Materials ₹ 1,05,000; Sundry Expenses ₹ 6,500; Head Office charges ₹ 12,500.

Certain of the materials, costing ₹ 10,000, proved unsuitable and were sold for ₹ 11,500 and a part of the plant was scrapped and sold for ₹ 1,700.

Of the Contract Price ₹ 2,40,000 representing 80% of the work certified had been received by 31st December, 2020, and on that date the value of the plant on the job was ₹ 8,000 and the value of the materials ₹ 3,000. The cost of work done but not certified was ₹ 25,000.

It was decided to estimate what further expenditure would be incurred in completing the contract, to compute from this estimate and the expenditure already incurred the total profit that would be made on the contract and to take to the credit of the Profit and Loss Account for the year 2020 that proportion of the total profit which corresponded with the work certified. The estimates were as follows:

(i) That the contract would be finished by 30th June, 2021.
(ii) That wages to complete would amount to ₹ 84,950.
(iii) That materials in addition to those in stock on 31st December, 2020, would cost ₹ 50,000 and further Sundry Expenses on the contract ₹ 3,500.
(iv) That a further ₹ 15,000 would have to be spent on plant and that the residual value of the plant on 30th June, 2021, would be ₹ 6,000.
(v) That the head office charges to the contract would be at the same annual rate as in 2020.
(vi) That claims of temporary maintenance and contingencies would require ₹ 9,000.

Prepare Contract Account for the year ended 31st December, 2020, and show your calculation of the sum of credited to Profit and Loss Account for the year.

Ans. Total Profit ₹ 48,700 (up to 31st December, 20). Total estimated profit on completion of contract ₹ 50,000. Transfer to Profit and Loss A/c ₹ 30,000.

22. A construction company undertook a contract at an estimated price of ₹ 108 lakhs, which includes a budgeted profit of ₹ 18 lakhs. The relevant data for the year ended 31-3-2022 are as under:

	(₹000's)
Materials issued to site	5,000
Direct wages paid	3,800
Plant hired	700
Site office costs	270
Materials returned from site	100
Direct expenses	500
Work certified	10,000
Progress payments received	7,200

A special plant was purchased specifically for this contract at ₹ 8,00,000 and after use on this contract till the end of 31.2.2022, it was valued at ₹ 5,00,000. The cost of materials at site at the end of the year was estimated at ₹ 18,00,000. Direct wages accrued as on 31.3.2022 were ₹ 1,10,000.

Required:

Prepare the Contract Account for the year ended 31st March, 2022, and compute the profit to be taken to the Profit and Loss Account. *[CA]*

Ans. Percentage of contract completion is 92.53% profit to be taken to P&L A/c ₹ 12,00,000.

[**Hint.** Budgeted profit $\times \frac{\text{Cash paid}}{\text{Work certified}} \quad \frac{\text{Work certified}}{\text{Contract price}}$

$= 1,800 \times (7,200/10,000) \times (10,000/10,800) = 1,200$]

23. *PQR* Construction Ltd. commenced a contract on April 1, 2020. The total contract was for ₹ 27,12,500. It was decided to estimate the total profit and to take to the credit of P&L A/c the proportion of estimated profit on cash basis which work completed bear to the total contract. Actual expenditure in 2020-21 and estimated expenditure 2021-22 are given below:

	2020-21	2021-22
	Actuals (₹)	*Estimated (₹)*
Materials issued	4,56,000	8,14,000
Labour : Paid	3,05,000	3,80,000
: Outstanding at end	24,000	37,500
Plant purchased	2,25,000	—
Expenses : Paid	1,00,000	1,75,000
: Outstanding at the end	—	25,000
: Prepaid at the end	22,500	—
Plant returned to stores (at historical cost)	75,000	1,50,000
	(on Dec. 31, 2021)	
Material at site	30,000	75,000
Works-in-Progress certified	12,75,000	Full
Work-in-Progress uncertified	40,000	—
Cash received	10,00,000	Full

The plant is subject to annual depreciation @ 20% of WDV cost. The contract is likely to be completed on December 31, 2021.

Required : Prepare the Contract A/c for the year 2020-21. Estimate the profit on the contract for the year 2020-21 on prudent basis which has to be credited to P&L A.c. *[CA]*

Ans. Estimated profit ₹ 4,32,000 upto 2021-22. Profit upto 2020-21 ₹ 4,37,000. Profit Ltd. to P&L ₹ 1,59,263

III
UNIT

Process Costing

4

Process Costing

Chapter Outline

- Meaning of Process Costing
- Process Accounting
- Wastage and By-Products
- Normal and Abnormal Wastage
- Oil Refinery Processes
- Work-in-Progress and Equivalent Production
- Inter-Process Profit
- Operation Costing
- *Miscellaneous Illustrations*
- *Objective Questions*
- *Assignments*

MEANING OF PROCESS COSTING

Process costing is a method of costing used to ascertain the cost of production of each process, operation or stage of manufacture where processes are carried on having one or more of the following features: *(i)* where the product of one process becomes the material of another process or operation, *(ii)* where there is simultaneous production at one or more processes of different products, with or without by-product, *(iii)* where, during one or more processes or operations of a series, the products or materials are not distinguishable from one another, as for instance, when finished products differ finally only in shape or form.

There are a number of industries where:

(i) the final product emerges only after two or more processes such as paper—the raw material, bamboo or sabai grass or any other, is made into pulp; pulp is made into paper and then it is finished, glazed etc. for sale;

(ii) the product of one process becomes the 'raw material' of another process or operation (for example, refined groundnut oil is the material for making vegetable 'ghee'); and

(iii) different products may have a common prior process (for example, brass goods will require melting of brass commonly for all goods). Another example is petroleum products produced by the same refinery.

A common feature is that production goes on without interruption and, normally, special production is not arranged for meeting any particular order. In a steel mill, for example, when a customer orders a certain quantity, no special arrangements will be made for him—his order will be executed out of the quantity produced in general. Thus, 100 tonnes of steel sheets of a certain size cannot be distinguished from the remaining quantity of steel sheets of that size.

Further, often important by-products are produced automatically at the end of each process. These by-products may have an importance almost equal to that of the main product. Consider kerosene oil, diesel oil, naphtha and petrol all of which are produced from the same crude oil, in addition to a host of smaller products.

In such industries the method of cost accounting used is known as Process Accounts. It may be possible to find out the total cost without distinguishing the cost of each process but it is not desirable to do so. Wastage and by-products of different nature may arise out of each operation or process. Each process is likely to entail different types of expenses. It would thus be advisable to find out the cost of each process or operation separately. Sometimes, it is possible to either process the materials ourselves or buy them ready for use in the next process. For instance, if one wants to market perfumed castor oil, one can buy castor seed and carry out all the processes—crushing, refining and finishing—or one can buy refined castor oil and add the necessary perfume and colour and bottle it and market it. The decision will depend upon the cost and the price prevailing in the market. This is another reason why cost of each process should be ascertained.

Definitions

In his "A Dictionary for Accounts", *Eric L. Kohler* defines process as:

1. Any unbroken series of acts, steps, or events or any unchanging persisting condition.
2. Hence, the sequence of operations.
3. Making up a plan of production, as on an assembly line; and continuous system involving an unbroken chain of activities
4. And a more or less continuous operation on constant output, as distinguished from a job order system of production".

Process costing has been defined by *Kohler* as:

"A method of accounting whereby costs are charged to processes or operations and averaged over units produced; it is employed principally where a finished product is the result of a more or less continuous operation, as in paper mills, refineries, canneries and chemical plants; distinguished from job costing, where costs are assigned to specific orders, lots or units."

Accounts can be kept, if desired, to show the cost of each job or order. It is possible, if it is insisted upon, to find out the cost of producing, say, 100 tonnes of oil ordered by somebody, rather than the cost of the bulk of the oil produced in a period. This involves the issue of requisition slips when the materials for the particular order are drawn, allocating the time of the direct workers for the particular order and allocating a proper share of the indirect expenses. However, since the oil produced against one order is not likely to be different from the bulk, it is unnecessary to ascertain the cost of each order. Accounts are maintained only to show the cost of the output as a whole.

The method is useful in the case of *(i)* metallurgical industries (like steel and aluminium); *(ii)* chemical industries (like plastics and drugs); *(iii)* food processing industries (like cheese, chocolates, etc.) and *(iv)* any other industry where there is continuous output involving two or more processes (like oil refinery).

Difference between Process Costing and Job Costing

Job Costing	*Process Costing*
1. In job costing production is carried on by specific order	1. In process costing production is a continuous flow and the products are homogeneous
2. Costs are determined by jobs or batches of products	2. Costs are compiled on time basis *i. e.*, for production for a given accounting period for each process.
3. Various Jobs are separate and independent.	3. Processes are related to each other. Products also lose their individual entity.
4. In job costing unit cost of a job is calculated by dividing the total cost by units produced in the lot or batch.	4. The unit cost of a process, which is computed by dividing the total cost for the period into the output of the process during that period, is an average cost (after adjusting opening and closing W.I.P) for the period.
5. In job costing, costs are calculated when a job is completed.	5. In process costing, costs are calculated at the end of period under each process.
6. In job costing there may not be opening or closing W.I.P in an accounting period.	6. Production in process costing is continuous and therefore there is normally W.I.P at beginning and closing.

7. In job costing there is normally no transfer from one job to another. It will be only when there is surplus or excess production.	7. In process costing, transfer from one process to another is a usual feature.
8. In job costing each products unit is different and therefore more managerial attention is needed for proper control.	8. In process costing, production is standardised and stable; the control is, therefore, easier.

PROCESS ACCOUNTING

Direct and Indirect Expenses

There is no departure from the principles regarding direct and indirect expenditure. Materials issued for a particular process are debited direct to it and so also labour engaged only on that process. If two or more processes are carried on in the same department, the department expenses will be apportioned among the processes carried on there.

A part from direct expenses, some indirect expenses—common to all processes—are bound to be incurred. The salary of the works manager, for example, will have to be allocated to all the processes. The normal practice is to do that on the basis of direct wages but that naturally would depend on the circumstances of each case. It is quite possible that a complicated process should absorb more indirect expenses.

The total of each process account less any work in progress is transferred to the next Process Account. The balance in the final process is transferred to the Finished Stock Account.

Illustration 1:

Product *X* requires three distinct processes and after the third process, the product is transferred to Finished Stock. You are required to prepare various Process Accounts from the following information:

	Total	*Pl*	*P2*	*P3*
	₹	₹	₹	₹
Direct Materials	5,000	4,000	600	400
Direct Labour	4,000	1,500	1,600	900
Direct Expenses	800	500	300	–
Production Overhead	6,000	–	–	–

Production overhead is to be allocated to different processes on the basis of 150% of direct wages, Production during the period was 200 units. Assume there is no opening and closing stock.

Solution:

Process *I* Account

Dr. **[Production 200 units]** **Cr.**

Particulars	*Cost Per Unit*	*Total*	*Particulars*	*Cost Per Unit*	*Total*
	₹	₹		₹	₹
To Direct Materials	20.00	4,000.00	By Output Transferred		
To Direct Labour	7.50	1,500.00	to Process *II*	41.25	8,250.00
To Direct Expenses	2.50	500.00			
To Production Overheads	11.25	2,250.00			
	41.25	8,250.00		41.25	8,250.00

Dr. **Process *II* Account** **Cr.**

Particulars	*Cost Per Unit*	*Total*	*Particulars*	*Cost Per Unit*	*Total*
	₹	₹		₹	₹
To Output Transferred from *I*	41.25	8,250	By Output Transferred to Process *II*	65.75	13,150
To Direct Materials	3.00	600			
To Direct Labour	8.00	1,600			
To Direct Expenses	1.50	300			
To Production Overhead	12.00	2,400			
	65.75	13,150		65.75	13,150

Dr. **Process *III* Account** **Cr.**

Particulars	*Cost Per Unit*	*Total*	*Particulars*	*Cost Per Unit*	*Total*
	₹	₹		₹	₹
To Output Transferred from Process *II*	65.75	13,150	By Output Transferred to Finished Stock A/c	79.00	15,800
To Direct Materials	2.00	400			
To Direct Wages	4.50	900			
To Production Overhead	6.75	1,350			
	79.00	15,800		79.00	15,800

WASTAGE AND BY-PRODUCTS

Normally in each process there is a residue left after transfer of the partially completed product to the next process. For example, in case of crushing of oilseeds, oil produced will be passed on to the refining process and oil cakes will be left. This is, strictly speaking, not wastage as it can be sold in the market. It is useful as a manure or as cattle feed. But the quantity of oil produced plus the quantity of cake left will not equal the quantity of oilseeds. It will be slightly less. The quantity not accounted for is a loss and effort should be to keep it as low as possible. The residue, if it can be sold in the market and if it can be used as a raw material for another finished article, is known as a *by-product*. In the process of converting coal into coke, useful by products such as coal tar, sulphate of ammonia and benzol are obtained.

The treatment in accounts is as follows:

(a) If the wastage or by-products are sold in the market, the price realised should be credited to the process account in which the wastage or by-products arose. For instance, sale proceeds of oil cakes should be credited to the Crushing Process Account.

(b) If the wastage of each process is individually of insignificant value, wastage of all processes should be sold together and the sale proceeds credited to indirect expenses so that all processes reap the benefit.

(c) In some cases the residue or wastage is of such a nature that it can be reprocessed in the same process and then passed on to the next process. In that case the value of wastage should be the same as that of the materials introduced into the process. It will be shown as a balance to be carried forward in the same process.

(d) In some cases, the wastage is of such a nature that it has to be reprocessed in a previous process. In that case, the value to be put on the wastage will be that of the materials introduced in the previous process. Suppose, the 'wastage' to be credited to Process *B* has to be put through Process *A* instead of Process *B* and suppose the price of raw materials introduced into Process *A* was ₹ 2.00 per unit, the value of wastage to be credited to Process *B* would then be ₹ 2.00. This amount will have to be transferred to Process *A* Account for the next period or to Stores Account, if kept in stores.

Illustration 2:

A particular brand of phenyl passed through three important processes. During the week ended 15th January, 600 gross of bottles are produced. The cost books show the following information:

	Process 1	*Process 2*	*Process 3*
	₹	₹	₹
Materials	4,000	2,000	1,500
Labour	3,000	2,500	2,300
Direct Expenses	600	200	500
Cost of bottles	Nil	2,030	Nil
Cost of corks	Nil	Nil	325

The Indirect expenses for the period were ₹ 1,600.

The by-products were sold for ₹ 240 (Process 2).

The residue sold for ₹ 125.50 (Process 3).

Prepare the account in respect of each of the processes showing its cost and cost of production of the finished product per gross of bottles.

Solution:

Process *I* Account

Dr. **(Output 600 Gross Bottles)** **Cr.**

Particulars	*Cost Per Unit*	*Total Cost*	*Particulars*	*Cost Per Unit*	*Total Cost*
		₹			₹
To Materials	6.6667	4,000.00			
To Labour	5.0000	3,000.00	By Transfer to		
To Direct Expenses	1.0000	600.00	Process No. *II*	13.6923	8,215.38
To Indirect Expenses	1.0256	615.38			
	13.6923	8,215.38		13.6923	8,215.38

Process *II* Account

Dr. **(Output 600 Gross Bottles)** **Cr.**

Particulars	*Cost per Gross*	*Total Cost*	*Particulars*	*Cost per Gross*	*Total Cost*
		₹			₹
To Transfer from			By Sales of		
Process *I*	13.6923	8,215.38	By-Products	0.4000	240.00
To Materials	3.3333	2,000.00	By Transfer to		
To Labour	4.1667	2,500.00	Process No. *III*	25.3636	15,218.20

To Direct Expenses	0.3333	200.00			
To Indirect Expenses	0.8547	512.82			
To Cost of Bottles	3.3833	2,030.00			
	25.7636	15,458.20		25.7636	15,458.20

Process *III* Account

Dr. **(Output 600 Gross Bottles)** **Cr.**

Particulars	*Cost per Gross*	*Total Cost*	*Particulars*	*Cost per Gross*	*Total Cost*
		₹			₹
To Transfer from			By Sales of Residue	0.2092	125.50
Process *II*	25.3636	15,218.20	By Finished Stock A/c	33.6492	20,189.50
To Materials	2.5000	1,500.00			
To Labour	3.8334	2,300.00			
To Direct Expenses	0.8334	500.00			
To Indirect Expenses	0.7863	471.80			
To Cost of Corks	0.5417	325.00			
	33.8584	20,315.00		33.8584	20,315.00

Illustration 3:

The finished goods of a factory pass through three processes known as *A, B* and *C*. The production of each process is passed on the next process. From the following figures show the cost of each process.

	Process A	*Process B*	*Process C*
	₹	₹	₹
Materials	10,000	20,000	60,000
Wages	9,200	16,000	27,750
Works on cost	16,000	15,000	18,000
General on cost	9,800	10,750	12,000
	Units	*Units*	*Units*
Production for the month of July	36,000	37,500	48,000
Stock at beginning (1st July)	–	4,000	16,500
Stock at close (31 st July)	–	1,000	5,500

Solution:

Dr. **Process *A* Account** **Cr.**

Particulars	*Units*	₹	*Particulars*	*Units*	₹
To Materials	36,000	10,000	By Transfer to Process		
To Wages		9,200	*B* Account		
To Works on Cost		16,000	(per unit ₹ 1.25)	36,000	45,000
To General on Cost		9,800			
	36,000	45,000		36,000	45,000

Dr. **Process *B* Account** **Cr.**

Particulars	*Units*	₹	*Particulars*	*Units*	₹
To Stock (1st July			By Stock (31st July		
@ ₹ 1.25 per unit)	4,000	5,000	@ ₹ 1.25 per unit)	1,000	1,250

To Process *A* Account (Transfer)	36,000	45,000	By Wastage	1,500	–
To Materials		20,000	By Transfer to Process *C* Account (Cost per unit ₹ 2.9,467)	37,500	1,10,500
To Wages		16,000			
To Works on Cost		15,000			
To General on Cost		10,750			
	40,000	1,11,750		40,000	1,11,750

Dr. **Process *C* Account** **Cr.**

Particulars	*Units*	₹	*Particulars*	*Units*	₹
To Stock (1st July @ ₹ 2.9467 per unit)	16,500	48,621	By Stock (31st July @ ₹ 2.9467 per unit)	5,500	16,207
To Process *B* Account (Transfer)	37,500	1,10,500	By Wastage	500	
To Materials		60,000	By Finished Stock (Cost per unit ₹ 5.4305)	48,000	2,60,664
To Wages		27,750			
To Works on Cost		18,000			
To General on Cost		12,000			
	54,000	2,76,871		54,000	2,76,871

Note : Opening and closing units of Process *B* have been valued at cost per unit of output of Process *A*. Similarly opening and closing units of Process *C* have been valued at cost per unit of output of Process *B*.

Illustration 4:

Mody Ltd. produces a patent material used in building, in the manufacture of which three processes are involved. The material is produced in three consecutive grades, namely, soft, medium and hard. Figures relating to production for the first six months of 2021 are as follows :

	Process 1	*Process 2*	*Process 3*
Raw materials used (tons)	1,000	–	–
Cost of materials per ton (₹)	200	–	–
Manufacturing Wages & Exps. (₹)	72,500	40,800	10,710
Weight Lost	5%	10%	20%
Scrap (sold at ₹ 50 per ton)	50 tons	30 tons	51 tons
The product is dealt with as follows:			
Transferred to Next Process	66-2/3%	50%	–
Transferred to Warehouse for Sale	33-1/3%	50%	100%

You are required to prepare an account for each process, showing the cost per ton of each process.

Solution:

Dr. **Process *I* Account** **Cr.**

Particulars	*Tons*	₹	*Particulars*	*Tons*	₹
To Raw Materials	1,000	2,00,000	By Loss in weight (5% of 1,000 tons)	50	–
To Mfg. Wages and Expenses		72,500	By Sale of Scrap (50 tons @ ₹ 50 a ton)	50	2,500
			By Transfer to Process 2 (66-2/3% of 900 tons)	600	1,80,000

			By Transfer to Warehouse (cost per ton ₹ 300)	300	90,000
	1,000	2,72,500		1,000	2,72,500

Dr. **Process *II* Account** **Cr.**

Particulars	*Tons*	₹	*Particulars*	*Tons*	₹
To Transfer from Process *I*	600	1,80,000	By Loss in weight (10% of 600 tons)	60	
To Mfg. Wages and Expenses		40,800	By Sale of scrap (30 tons @ ₹ 50 per ton)	30	1,500
			By Transfer to Process *III* (50% of 510 tons)	255	1,09,650
			By Transfer to warehouse (50% of 510 tons) (cost per ton ₹ 430)	255	1,09,650
	600	2,20,800		600	2,20,800

Dr. **Process *III* Account** **Cr.**

Particulars	*Tons*	₹	*Particulars*	*Tons*	₹
To Transfer from Process 2	255	1,09,650	By Loss in weight (20% of 255 tons)	51	–
To Mfg. Wages and and Expenses		10,710	By Sale of Scrap (51 tons @ ₹ 50 per ton)	51	2,550
			By Cost of Production transferred to Warehouse (Cost per ton ₹ 770)	153	1,17,810
	255	1,20,360		255	1,20,360

Illustration 5:

From the following particulars, prepare a Statement of Cost per gross of "Black" and "Coloured" pencils:

Output during the year was "Black" 24,000 gross and "Coloured" 8,400 gross.

Particulars	₹	*Particulars*	₹
Raw Materials Factory:		Finishing Wages:	
Opening Stock	38,150	Black	20,000
Purchases during the year	1,07,100	Coloured	5,600
Closing Stock	49,400	Raw Materials Finishing:	
Factory Wages:		Opening Stock	7,200
Black	42,000	Purchases during the year	33,700
Coloured	13,650	Closing Stock	8,900
Factory Charges	37,100	Finishing Charges	19,200
		General Expenses	36,450

Raw materials in the factory and general expenses are to be apportioned in the ratio of output: Factory charges in the ratio of factory wages: Finishing raw materials and finishing charges in the ratio of finishing wages.

Also state what profit per gross is made if 'Black' is sold at ₹ 10 per gross and 'Coloured' at ₹ 9.50 per gross.

Solution:

Statement of Process Cost

Particulars	*Total*	*Black Pencils (Output—24,000 Gross)*			*Coloured Pencils (Output—8,400 Gross)*		
		Amt.	*Amt.*	*Per Gross*	*Amt.*	*Amt.*	*Per Gross*
	₹	₹	₹	₹	₹	₹	₹
Factory Process:							
Raw Materials Consumed (20 : 7)	95,850	71,000		2.958	24,850		2.958
Wages	55,650	42,000		1.750	13,650		1.625
Factory Charges (40 : 13)	37,100	28,000		1.167	9,100		1.084
	1,88,600		1,41,000	5.875		47,600	5.667
Finishing Process:							
Raw Materials consumed (25 : 7)	32,000	25,000			7,000		
Wages	25,600	20,000			5,600		
Finishing Charges (25 : 7)	19,200	15,000			4,200		
	76,800		60,000	2.500		16,800	2.000
General Expenses (20 : 7)	36,450		27,000	1.125		9,450	1.125
Total Cost			2,28,000	9.500		73,850	8.792
Profit				0.500			0.708
Selling Price				10.000			9.500

NORMAL AND ABNORMAL WASTAGE

Elimination of wastage is important anywhere. In industries which are particularly fit for process accounts, each process causes some wastage and in order to see that, as a whole, it is not excessive, wastage in each process will have to be controlled. The figure for reasonable wastage for each process will be determined on the basis of past experience and by experiments in the laboratory and in the factory. This will be treated as '*normal' wastage* and any wastage over this figure will be treated as '*abnormal' wastage*, anything below it will be treated as '*abnormal' effectiv*e or *abnormal gain*. As pointed out in case of labour and materials, normal wastage is a part of cost of production but the value of the abnormal wastage or effective does not affect cost of production but will be transferred to the Costing Profit and Loss Account.

Abnormal Wastage: Suppose 100 units of an article are introduced in Process No. 1 and the total costs incurred in that process amount to ₹ 4,500. If normal wastage is taken to be 10 per cent, then 90 units ought to have been produced and the cost per unit would have been ₹ 50 *i.e.*, (₹ 4,500/ 90). Now, if the output, actually, is only 85 units, we cannot take the cost per unit to be ₹ 4,500/ 85 or ₹ 53. We must calculate the value of 5 units wasted unnecessarily. That will be at the rate of ₹ 50 per unit. ₹ 250 will be debited to the "Abnormal Wastage" Account and credited to Process I Account and the amount to be transferred to the next Process Account will be only ₹ 4,500-250 or ₹ 4,250 and credited to Process *I* Account for 85 units. In this way, the effect of abnormality will be separated from the normal cost of production which alone can reflect the change in efficiency.

Abnormal Gain: Sometimes it may happen that the actual loss in a process is less than the estimated normal loss or output is more than expected normal output. The difference is regarded as abnormal gain. It is debited to Process Account and credited to Abnormal Gain Account.

If in the above example 93 units were produced, the value of 3 units produced by extra efficiency will be similarly calculated, *i.e.*, at the rate of ₹ 50. ₹ 150 will be put to the credit of the Abnormal Effective or Gain Account and debit of Process Account. To the next process 93 units will be transferred and the amount will be ₹ 4,500 + ₹ 150 or ₹ 4,650.

Illustration 6:

A product passes through two distinct processes *A* and *B* and thereafter it is transferred to finished stock. From the following information, you are required to prepare Process Accounts.

	Process A	*Process B*
	₹	₹
Materials consumed	12,000	6,000
Direct labour	14,000	8,000
Manufacturing Exps.	4,000	4,000
Input in Process *A* (units)	10,000	
Input in Process *A* (value)	10,000	
Output (units)	9,400	8,300
Normal wastage percentage of input	5%	10%
Value of normal wastage (per 100 units)	8	10

Solution:

Dr. **Process *A* Account** **Cr.**

Particulars	*Units*	*Amount* ₹	*Particulars*	*Units*	*Amount* ₹
To Input value	10,000	10,000	By Normal loss		
To Materials		12,000	(5% of 10,000		
To Wages		14,000	@ ₹ 8 per		
To Manufacturing Exps.		4,000	hundred units)	500	40
			By Abnormal loss	100	421
			By Transfer to Process *B*	9,400	39,539
	10,000	40,000		10,000	40,000

Dr. **Process *B* Account** **Cr.**

Particulars	*Units*	*Amount* ₹	*Particulars*	*Units*	*Amount*
To Transfer value			By Normal loss		
Process *A*	9,400	39,539	(10% of 9,400		
To Materials		6,000	@ 10 per		
To Wages		8,000	hundred units)	940	94
To Manufacturing Exps.		4,000	By Abnormal loss	160	1,086
			By Transfer to		
			Finished Stock	8,300	56,359
	9,400	57,539		9,400	57,539

Working Notes:

1. *Cost of Abnormal Loss of Process A*

$$= \frac{\text{Total Normal Cost}}{\text{Normal Output}} \times \text{AW units}$$

$$\frac{(40{,}000 - 40)}{(10{,}000 - 500)} \times 100 = ₹\ 421$$

2. *Cost of Abnormal Loss in Process B*

$$\frac{(57{,}539 - 94)}{(9{,}400 - 940)} \times 160 = \frac{57{,}445}{8{,}460} 160 = ₹\ 1{,}086$$

Illustration 7:

(Abnormal Gain)

The following particulars for Process *II* are given:

	Units	₹
Transfer to Process *II* and Cost	4,000	9,000
Direct Wages		2,000
Direct Materials		3,000
Factory Overheads		4,000
Transfer to Finished Stock	3,240	
Direct Wages		2,000
Direct Materials used		3,000

Factory Overhead in Process is absorbed at a rate of 400% of Direct Materials. Allowance for Normal Loss is 20% of units worked. Scrap value is ₹ 5 per unit. Evaluate the cost of transfer to Finished Stock. Using the information supplied above, show the amount of loss or gain in the Process to be taken to Costing and Loss Account.

Solution:

Dr. **Process *II* Account** **Cr.**

Particulars	*Units*	*Amount* ₹	*Particulars*	*Units*	*Amount* ₹
To Transfer from Process *I*	4,000	9,000	By Normal Loss	800	4,000
To Direct Materials		3,000	By Transfer to next Process		
To Direct Wages		2,000	(@ ₹ 6.88 per unit)	3,240	22,275
To Factory Overheads (400% of Direct Material)		12,000			
To Abnormal Gain A/c	40	275			
	4,040	26,275		4,040	26,275

Working Note: In the Process *II* 4,000 units have been introduced. The normal loss is 20% *i.e.* 800 units. The normal production should be 4,000 – 800 = 3,200 units. But actual production is 3240 units. Hence these 40 units abnormal gain will be valued at normal cost per unit and will be debited to Process II Account.

$$\text{Cost of Abnormal Gain} = \frac{26{,}000 - 4{,}000}{(4{,}000 - 800)} \times 40 = \frac{22{,}000}{3{,}200} \times 40 = 275$$

Dr. **Normal Wastage Account** **Cr.**

Particulars	*Units*	₹	*Particulars*	*Units*	₹
To Process *II* A/c	800	4,000	By Sales	760	3,800
			By Abnormal Gain A/c	40	200
	800	4,000		800	4,000

Dr. **Abnormal Gain Account** **Cr.**

Particulars	*Units*	₹	*Particulars*	*Units*	₹
To Normal Wastage A/c	40	200	By Process *II* A/c	40	275
To Costing Profit and Loss A/c	–	75		–	–
	40	275		40	275

Illustration 8:

A product passes from Process *I* and Process *II*. Materials issued to Process *I* amounted to ₹ 40,000, labour ₹ 30,000 and manufacturing overheads were ₹ 27,000. Normal loss was 3% of input as estimated. But 500 more units of output of Process *I* were lost due to the carelessness of workers. Only 4,350 units of output of Process *I* were lost due to the carelessness of workers. Only 4,350 units of output were transferred to Processes *II*. There were no opening stocks. Input raw material issued to Process *I* were 5,000 units You are required to show Process *I* account.

[CA]

Solution:

Particulars	*Units*	*Amount*	*Particulars*	*Units*	*Amount*
To Material	5,000	40,000	By Normal loss		
To Labour		30,000	(5,000 × 3%)	150	—
To Manufacturing Overheads		27,000	By Abnormal loss (@ ₹ 20 p.u.)	500	10,000
			By Transfer to Process - *II* A/c (@ ₹ 20 per units)	4,350	87,000
	5,000	97,000		5,000	97,000

Working Notes:

$$\text{Calculation of Rate : } = \frac{40,000 + 30,000 + 27,000}{5,000 - 150} = \frac{97,000}{4,850} = ₹\ 20 \text{ per unit}$$

Note: The absence of any information, it is assumed that normal loss is not sold as scrap.

Illustration 9:

A product is obtained after it passes through three distinct processes. The following information is obtained from the accounts for the month ending January, 2004:

	Process I	*Process II*	*Process III*
	₹	₹	₹
Direct Materials	2,600	1,980	2,962
Direct Wages	2,000	3,000	4,000
Production Overheads	2,000	3,000	4,000

1,000 units at ₹ 3 each were introduced to Process *I*. There was no stock of materials or work-in-progress at the beginning or end of the period. The following additional data are obtained:

	Output during the month (units)	*Percentage of normal wastage in input*	*Value of Scrap per unit*
	₹	₹	₹
Process *I*	950	5%	2
Process *II*	840	10%	4
Process *III*	750	15%	5

Prepare Process Cost Accounts and Abnormal Loss or Gain Accounts.

Solution:

Dr. **Process *I* Account** **Cr.**

Particulars	*Units*	₹	*Particulars*	*Units*	₹
To Units introduced @ 3 per unit.	1,000	3,000	By Normal Wastage (5% of 1,000 units: value ₹ 2 per unit)	50	100
To Direct Materials		2,600	By Transfer to Process *II* (Cost per unit ₹ 10)	950	9,500
To Direct Wages		2,000			
To Production Overheads		2,000			
	1,000	9,600		1,000	9,600

Dr. **Process *II* Account** **Cr.**

Particulars	*Units*	₹	*Particulars*	*Units*	₹
To Transfer from Process *I*	950	9,500	By Normal Wastage (10% of 950 units: Value: ₹ 4 per unit)	95	380
To Direct Materials		1,980	By Abnormal Wastage	15	300
To Direct Wages		3,000	By Transfer to Process *III* (Cost per unit ₹ 20)	840	16,800
To Production Overheads		3,000			
	950	17,480		950	17,480

Dr. **Process *III* Account** **Cr.**

Particulars	*Units*	₹	*Particulars*	*Units*	₹
To Transfer from Process *II*	840	16,800	By Normal Wastage (15% of 840 units: Value: ₹ 5 per unit)	126	630
To Direct Materials		2,962	By Transfer to Finished Stock (Cost per unit ₹ 38)	750	28,500
To Direct Wages		4,000			
To Production Overheads		4,000			
To Abnormal Gain or Effective	36	1,368			
	876	29,130		876	29,130

Dr. **Abnormal Wastage or Loss Account (Process *II*)** **Cr.**

Particulars	*Units*	₹	*Particulars*	*Units*	₹
To Process *II* Account	15	300	By Sale of Scrap @ 4	15	60
			By Costing Profit and Loss Account		240
	15	300		15	300

Dr. **Abnormal Gain Account (Process *III*)** **Cr.**

Particulars	*Units*	₹	*Particulars*	*Units*	₹
To Normal Wastage A/c @ ₹ 5	36	180	By Process *III* A/c	36	1,368
To Costing Profit and Loss Account		1,188			
	36	1,368		36	1,368

OIL REFINERY PROCESSES

Oil refineries have normally three processes: 1. Crushing Process, 2. Refining Process, and 3. Finishing Process.

Crushing Process

In this process raw material *i.e.* oilseeds or coconut or copra or kernels etc. are used. Other expenses of the process are debited. Sale of bags or sacks is credited. Oil cakes or oil residue are sold as a by-product. The output is crude oil transferred as input in the next process *i.e.*, Refining Process. There may be loss in weight in the process.

Refining Process

Crude oil from Crushing Process is debited. Other materials, wages and overheads of the process are debited. Loss-in-weight, if any, is credited. The output is refined oil. Fats and residual oil may be obtained as by-products which are credited. The output being refined oil is transferred to the next process *i.e.*, *Finishing Process*.

Finishing Process

Refined oil obtained from Refining Process is debited. Other materials, wages and overheads of the process are debited. Sale of by-product and loss-in-weight are credited. Sundry sales of finished process oil are also credited. The balance of this process is credited as cost of production of finishing process oil. Cost of drums or barrels or tins for storage of refined oil is also debited to find out cost of stored finished oil.

Illustration 10:

In a factory the output passes through three processes to completion *i.e.*, Crushing, Refining and Finishing. The details are given below for the month of May.

	Crushing	*Refining*	*Finishing*
	₹	₹	₹
Wages	15,000	12,000	10,000
Power	6,000	5,000	3,000
Steam	2,000	1,000	500
Other Expenses	3,000	2,000	500

Copra purchased 3,000 kgs costing ₹ 3,00,000, Crude oil produced 2,500 kg. Refined oil 1,800 kg and Finishing oil 1,760 kg.

500 kg crude oil was sold at cost plus 20% in Crushing Process. Copra residue 300 kg sold for ₹ 10,000 and sacks sold for ₹ 1,000. Wastage of 100 kg of Refining Process sold for ₹ 800. Casks cost ₹ 3,000. Oil stored in casks sold for ₹ 200 per kg. Prepare necessary accounts.

Solution:

Dr. Crushing Process Account Cr.

Particulars	*Kg*	₹	*Particulars*	*Kg*	₹
To Copra purchased	3,000	3,00,000	By Loss in Weight	200	-
To Wages		15,000	By Copra residue sold	300	10,000
To Power		6,000	By Sacks sold		1,000
To Steam		2,000	By Crude oil sold		
To Other Exps.		3,000	Cost ₹ 63,000		
To Profit and Loss A/c			Plus 20%		
(Profit on crude oil sold)		12,600	Profit ₹ 12,600	500	75,600
			By Refining Process A/c		
			(Cost per kg 126)	2,000	2,52,000
	3,000	3,38,600		3,000	3,38,600

Dr. Refining Process Account Cr.

Particulars	*Kg*	₹	*Particulars*	*Kg*	₹
To Crushing Process A/c			By Loss in Weight	100	-
(output recd.)			By Wastage sold	100	800
@ ₹ 126	2,000	2,52,000	By Finishing Process A/c		
To Wages		12,000	(output transferred)		
To Power		5,000	(Cost per kg		
To Steam		1,000	₹ 150.67)	1,800	2,71,200
To Other. Exps.		2,000			
	2,000	2,72,000		2,000	2,72,000

Dr. Finishing Process Account Cr.

Particulars	*Kg*	₹	*Particulars*	*Kg*	₹
To Refining Process			By Loss in Weight	40	
A/c (Refined oil)	1,800	2,71,200	By Finished Stock A/c		
To Wages		10,000	(cost per kg		
To Power		3,000	₹ 162.67)	1,760	2,85,200
To Stream		500			
To Other Exps.		500			
	1,800	2,85,200		1,800	2,85,200

Dr. Finished Stock Account Cr.

Particulars	*Kg*	₹	*Particulars*	*Kg*	₹
To Finishing Process	1,760	2,85,200	By Total Cost of casked		
(Refined oil)			finished oil c/d (cost		
To Cost of casks		3,000	per kg ₹ 163.75)	1,760	2,88,200
	1,760	2,88,200		1,760	2,88,200
To Cost of casked			By Sales @ ₹ 200		
finished oil (per			per kg	1,760	3,52,000
kg ₹ 163.75)	1,760	2,88,200			
To Profit and Loss A/c					
(Profit per kg					
₹ 36.25)		63,800			
	1,760	3,52,000		1,760	3,52,000

Note:

1. Loss in weight is balancing weight in each process.
2. Cost of Crushing Process (3,00,000 + 15,000 + 6,000 + 2,000 + 3,000) – (1,000 + 1,000) = ₹ 3,15,000 and units of normal production 2,500.
3. Sale of 500 kg crude oil will have cost = (3,15,000 ÷ 2,500) × 500 = ₹ 63,000. The profit will be added @ 20%. The profit is debited to the Crushing Process.

Illustration 11:

An oil company gives the following cost data. You are required to prepare various Process Accounts. Purchases: 1,000 quintals of copra @ ₹ 500 per quintal.

	Crushing (i)	*Refining (ii)*	*Finishing (iii)*
	₹	₹	₹
Cost of Labour	6,600	3,000	3,000
Electric Power	1,000	500	400
Sundry Materials	700	200	–
Repair to Machinery and Plant	500	400	400
Steam	250	150	100
Cost of casks			580

Other Factory Exp. ₹ 9,450 to be charged at 75% of wages. Normal loss in 1st Process was 30% of input, actual output 690 quintals.

Process *II*, By-Product 90 quintals value ₹ 6,200.

Process *III*, Normal loss 5% actual output 580 quintals.

Scrap of 1st Process realised ₹ 10 per quintal.

Solution:

Dr. **Crushing Process (*I*) Account** **Cr.**

Particulars	*Qntls.*	*Amount*	*Particulars*	*Qntls.*	*Amount*
To Copra Used	1,000	5,00,000	By Normal Loss		
To Cost of Labour		6,600	(30% of 1,000)	300	3,000
To Electric Power		1,000	By Abnormal Loss	10	7,300
To Sundry Material		700	By Crude oil transferred		
To Repairs to Mach.			to next process (@		
and Plant		500	₹ 730 per quint.)	690	5,03,700
To Steam		250			
To Other Factory Exps.					
(75% of wages)		4,950			
	1,000	5,14,000		1,000	5,14,000

Dr. **Refining Process (*II*) Account** **Cr.**

Particulars	*Qntls.*	*Amount*	*Particulars*	*Qntls.*	*Amount*
To Transfer from			By By-products	90	6,200
Crushing Process	690	5,03,700	By Refined oil transferred		
To Cost of Labour		3,000	to finishing		
To Electric Power		500	process (@ ₹ 840		
To Sundry Material		200	per quintal)	600	5,04,000
To Repair to Mach.					
and Plant		400			
To Steam		150			

To Other Factory Exps. (75% of wages)		2,250			
	690	5,10,200		690	5,10,200

Dr. **Finishing Process (*III*) Account** **Cr.**

Particulars	*Qntls.*	*Amount*	*Particulars*	*Qntls.*	*Amount*
To Transfer from Refining Process	600	5,04,000	By Normal Loss (5%)	30	-
To Labour		3,000	By Transfer to Finished Stock @ ₹ 895		
To Electric power		400	per quintal	580	5,19,100
To Repairs to Mach. and Plant		400			
To Steam		100			
To Factory Expenses (75% of wages)		2,250			
To Abnormal Gain	10	8,950			
	610	5,19,100		610	5,19,100

Dr. **Finished Stock Account** **Cr.**

Particulars	*Qntls.*	*Amount*	*Particulars*	*Qntls.*	*Amount*
To Finishing Process	580	5,19,100	By Balance		
To Cost of Casks		580	@ ₹ 896 per quintal	580	5,19,680
	580	5,19,680		580	5,19,680

Working Note:

1. Cost of abnormal loss in Crushing Process

$$= \frac{5,14,000 - 3,000}{(1,000 - 300)} \times 10 = 7,300$$

2. There is no wastage in the Refining Process.
3. In the Finishing Process, the input is 600 Qtls. and normal loss is 5% *i.e.* 30 Qtls, therefore normal production should be 570 Qtls. But actual production is 580 units. Hence there is abnormal gain of 10 units to be valued at normal cost per Qtl.

$$= \frac{5,10,150}{570} \times 10$$

= ₹ 8,950.

Sale of By-Product

Illustration 12:
(Sales of By-product).

In a Chemical Industry one product has to pass through two processes. The finished product of the first process becomes the raw material of the last process. Find out the unit cost of the finished product of the last process per kg on the basis of the following data :

	First Process	*Last Process*
Raw Material	1,000 kg @ ₹ 1.50 per kg	
Direct Labour	200 men @ ₹ 2.50 per man	300 men @ ₹ 1.50 per man
Works Overhead	50% of Direct Labour	50% of Direct Labour
Finished Product	600 kg	500 kg
Sales value of By-products	400 kg @ ₹ 1 per kg	100 kg @ 25 paise per kg

Solution:

Dr. **First Process Account** **Cr.**

Particulars	*Kg.*	₹	*Particulars*	*Kg.*	₹
To Raw Materials	1,000	1,500	By Sales of By-product	400	400
To Direct Labour		500	By Transfer to Last		
To Works Overhead		250	Process (@ ₹ 3.083		
			per kg)	600	1,850
	1,000	2,250		1,000	2,250

Dr. **Last Process Account** **Cr.**

Particulars	*kg.*	₹	*Particulars*	*kg.*	₹
To Transfer from			By Sales of By-products	100	25
First Process	600	1,850	By Cost of Finished		
To Direct Labour		450	Product @ ₹ 5		
To Works Overhead		225	per kg	500	2,500
	600	2,525		600	2,525

Illustration 13:

(*Sales of By-product at profit*).

The following details are available from the books of a factory in which two processes are employed:

	Process A	*Process B*
Materials	2,000 tons at ₹ 50 per ton	—
Wages	₹ 60,000	₹ 40,000
Factory Overhead	50% of wages	30% of wages
Wastages	100 tons	200 tons
By-product	200 tons sold at cost plus 20%	200 tons sold at cost plus 25%

Solution :

Dr. **Process *A* Account** **Cr.**

Particulars	*Tons*	₹	*Particulars*	*Tons*	₹
To Materials	2,000	1,00,000	By Wastage	100	–
To Wages		60,000	By Sale of By-product		
To Factory Overhead		30,000	Cost 20,000		
To Profit on Sale			*Add*: 20% 4,000	200	24,000
of By-product		4,000	By Transfer to Process		
			B A/c (@ ₹ 100		
			per ton)	1,700	1,70,000
	2,000	1,94,000		2,000	1,94,000

Calculations

1. Cost per ton = [1,00,000 + 60,000 + 30,000] / [2,000 – 100]
   = ₹ 100 (*i.e.* Total Cost/Total tons produced)
2. Cost of By-product [200 tons] = 200 × 100 = ₹ 20,000
3. Profit on By-product 20% on ₹ 20,000 = ₹ 4,000.

Dr. **Process B Account** **Cr.**

Particulars	*Tons*	₹	*Particulars*	*Tons*	₹
To Process *A* A/c	1,700	1,70,000	By Wastage	200	—
To Wages		40,000	By Sale of By-product		
To Factory Overhead		12,000	Cost 29,600		
To Profit on Sale			*Add*: 25% 7,400	200	37,000
of By-product		7,400	By Transfer to		
			Finished Stock A/c		
			(@ ₹ 148 per ton)	1,300	1,92,400
	1,700	2,29,400		1,700	2,29,400

Calculations

1. Cost per ton = (1,70,000 + 40,000 + 12,000)/(1,700 – 200) = ₹ 148
2. Cost of By-product 200 tons = 200 × 148 = ₹ 29,600
3. Profit on By-product 25% on ₹ 29,600 = ₹ 7,400.

Illustration 14:

A certain chemical process yields 75% of the materials introduced as main product, 20% as a by-product, 5% being lost. The percentage of materials consumed by main product and by-product is 80 : 20. Time taken to produce one unit of by-product is half the time taken by main product. Overheads have been allocated at 200% of wages of each product.

During the period, 2,000 units of raw materials at a cost of ₹ 10,000 were introduced, labour totalled ₹ 8,500, overheads came to ₹ 17,000. Ascertain the cost of two products.

Solution :

Total number of units produced:

2,000 × 75% = 1,500 units of Main Product

2,000 × 20% = 400 units of By-product

2,000 × 5% = 100 units Wastage

Statement of Apportionment of Cost

Particulars	*Ratio*	*Total Cost* ₹	*Main Product (1,500)*		*By-product (400)*	
			Amount ₹	*Cost per* ₹	*Amount* ₹	*Per unit* ₹
Material	80 : 20	10,000	8,000	5.33	2,000	5.00
Labour	15 : 2	8,500	7,500	5.00	1,000	2.50
Overheads	200% of wages	17,000	15,000	10.00	2,000	5.00
		35,500	30,500	20.33	5,000	12.50

Working Notes:

1. Materials should be divided as to 20% to By-product and rest to the Main Product *i.e.* 80%. But production units will be Main Product 75% of 2,000 *i.e.* 1,500 and By-product 20% of 2,000 *i.e.*, 400 units.
2. Labour will be allocated in the ratio 1,500 × 1 : 400 × 1/2 *i.e.*, 1,500 : 200 or 15 : 2.

WORK-IN-PROGRESS AND EQUIVALENT PRODUCTION

It would be rare to find that there are no partly finished units in a process of manufacture. There is always some quantity of partly finished units or work-in-process or work-in-progress. The valuation of work-in-progress presents a good deal of difficulty because there are units in various stages of completion—from those on which work has just

begun to those which are only a step short of completion. Work-in-process can be valued on actual basis, *i.e.*, an attempt may be made to find out how much materials have been used on the unfinished units and how much actual amount of labour and expenses has been spent on them. But the degree of accuracy cannot be always satisfactorily ascertained. An alternative method is to *convert partly finished units into equivalent finished units*. For instance, if 25% work has been done on the average on units still in process, then 120 such units will be equal to 30 completed units. The cost of the work-in-progress will be equal to the cost of 30 finished units. This is known as the concept of equivalent production or equivalent units.

The technique of calculating *equivalent production* is below:

1. Firstly, the opening incomplete or work-in-progress units should be converted into equivalent units as complete. For example, opening, W.I.P are 600 units which are 60% complete, therefore only 40% work is to be done on these units in the process. Thus, on these units a cost of 600 × 40% = 240 units will be incurred in the process to complete these.
2. To above units, add units started and finished during the period or units completed in the process. These will be new units introduced less closing units and units scrapped.
3. Thereafter, add equivalent units of closing units.
4. The total of all these will be equivalent production. Following illustrations explain this technique.

Valuation of Work-in-Progress under FIFO Method

Under this method it is assumed that new units issued to the work-in-progress pass through the finished goods on the *FIFO* basis which means that unfinished work in the opening stock is completed first and thereafter new units introduced in the process are taken up. This method is suitable when prices of raw materials and rates of direct labour and overheads are relatively stated. The cost-added in each process during the period is pro-rated to the production necessary to complete the opening work-in-process, to complete the units introduced and completed during the period and to partially completed units in the closing work-in-progress. Thus, closing stock is valued at current cost.

Illustration 15:

(*Valuation of Equivalent Product*).

From the following find out *(a)* Equivalent Production, *(b)* Cost per unit of Equivalent Production and *(c)* Prepare Process *A* Account. Assume there is no opening work-in-progress and process loss.

Input	1,900 units
Output	1,500 units
Closing work-in-progress	400 units

Particulars	*Degree of Completion of Closing W.I.P*	*Process Costs of the Current Period*
		₹
Materials	80%	3,640
Labour	70%	5,340
Overheads	70%	3,560

Solution:

(a) **Statement of Equivalent Production**

Input		*Output*		*Equivalent Production*					
				Material		*Labour*		*Overhead*	
Items	*Units*	*Items*	*Units*	*%*	*Units*	*%*	*Units*	*%*	*Units*
Units Introduced	1,900	Units Completed	1,500	100	1,500	100	1,500	100	1,500
		Work-in-Progress	400	80	320	70	280	70	280
	1,900		1,900		1,820		1,780		1,780

(b) **Statement of Cost (Cost Per Unit)**

Element of Cost	*Cost*	*Equivalent Production Units*	*Cost Per Unit*
Materials	3,640	1,820	2.00
Labour	5,340	1,780	3.00
Overheads	3,560	1,780	2.00

(c) **Statement of Evaluation**

Production	*Element of Cost*	*Equivalent Production Units*	*Cost Per Unit*	*Cost*	*Total Cost*
Finished	Material	1,500	2	3,000	
	Labour	1,500	3	4,500	
	Overheads	1,500	2	3,000	10,500
Work-in-Progress	Material	320	2	640	
	Labour	280	3	840	
	Overheads	280	2	560	2,040

Dr. **Process Account** **Cr.**

Particulars	*Units*	*Amount*	*Particulars*	*Units*	*Amount*
To Materials	1,900	3,640	By Finished Stock A/c	1,500	10,500
To Labour		5,340	By Work-in-progress	400	2,040
To Overheads		3,560			
	1,900	12,540		1,900	12,540

Illustration 16:

[*Valuation of Equivalent Product*]

Compute the equivalent production for the month of May from the following data relating to the manufacture of a product.

Opening inventory of work-in-progress 300 units

Stage of Completion:	Materials	30%
	Labour	40%
	Overheads	50%
Number of units put into the process		10,000 units
Transferred to next process		9,600 units
Closing inventory of work-in-progress		700 units

Stage of Completion:	Materials	80%
	Labour	75%
	Overheads	60%

Solution:

Statement of Equivalent Production

Input		*Output*		*Equivalent Production*					
				Material		*Labour*		*Overhead*	
Items	*Units*	*Items*	*Units*	*%*	*Units*	*%*	*Units*	*%*	*Units*
Opening Stock	300	Opening stock (completed)	300	70	210	60	180	50	150
Units put into Process	10,000	Completely processed during the period	9,300	100	9,300	100	9,300	100	9,300
		Work-in-Progress at the end	700	80	560	75	525	60	420
	10,300		10,300		10,070		10,005		9,870

Working Note:

1. Opening stock 300 incomplete units are complete 30% as to material 40% as to labour and 60% as to overheads. These units are to be completed by incurring material equal to 300 ×70% *i.e*. 210 units, wages equal to 300 × 60% *i.e*. 180 units and overheads equal to 40% of 300 *i.e*. 120 units.
2. In case of closing incomplete units, these will be considered equal to work done *i.e*. Materials 700 × 80% = 560 units, wages 700 × 75% = 525 units and overheads 700 × 60% = 420 units.
3. Units transferred to next process are 9,600 units which include 300 opening incomplete units. It means 9,300 new units will be completed.

Normal Losses and Abnormal Losses in Equivalent Production

Normal losses are considered as a part of cost of good production, it is not charged to closing WIP. Only the scrap realised from such units will be deducted from the cost of Raw Material. Thus, while computing equivalent units, normal losses are ignored and the cost of the normal loss will be automatically apportioned to the units produced when it is deducted from cost of Raw Materials.

When there is abnormal loss, these units should be valued at their cost at stage of completion *i.e.*, at their equivalent units. The abnormal loss is charged to a separate account and written off as a period cost to the Costing Profit and Loss Account.

Illustration 17:

From the following data calculate: *(a)* Equivalent Production and *(b)* Cost per unit of finished production.

Units introduced in the process	4,000
Units completed and transferred to next process	3,000
Units in process at the end	800

(Stage of completion: Materials 80%; Labour and Overheads 70%)

Normal process loss (units)	200
Value of scrap per unit	₹ 10
Cost of Raw Materials	₹ 74,800
Wages	₹ 1,06,800
Overheads	₹ 71,200

Solution:

(a) **Statement of Equivalent Production**

Input		*Output*		*Equivalent Production*			
				As regards materials		*As regards labour and overheads*	
Particulars	*Units*	*Particulars*	*Total Units*	*Stage of completion*	*No. of units*	*Stage of completion*	*No. of Units*
Units Introduced in the process	4,000	Completed and transferred to next process	3,000	100%	3,000	100%	3,000
		Closing Stock	800	80%	640	70%	560
		Normal Loss	200	—	—	—	—
Total	4,000	Total	4,000				
		Total Equivalent completed units			3,640		3,560

(b) **Statement of Cost**

Elements of Cost	*Cost* ₹	*Equivalent Production Units*	*Cost per Unit* ₹
Materials	74,800		
Less: Value of scrap 200 units @ ₹ 10 (Normal Loss)	2,000	3,640	20
	72,800		
Wages	1,06,800	3,560	30
Overheads	71,200	3,560	20
Total	2,50,800	—	70

Illustration 18:

In a process costing system, the following details relate to the month of January, 2023:

Opening stock	1,500 units valued at ₹ 2,325
Degree of their completion:	
Materials	80%
Labour	60%
Overheads	60%
Transfer from pervious process	12,500 units:
Value ₹	₹ 12,080
Transfer to next process	12,000 units:
Materials added in process	Nil
Labour added in process	₹ 6,030
Overheads added in process	₹ 9,045

Units scrapped	800 units:
Value realised	₹ 200
Closing stock	1,200 units
Degree of their completion:	
Materials	90%
Labour	80%
Overhead	80%

You are required to work out: (1) Equivalent Production; (2) Cost Statement showing cost per unit; (3) Process Evaluation Statement showing the value of opening stock and closing stock; and (4) Process Cost Account.

Solution:

Dr. **Process Cost Account** **Cr.**

Particulars	*Units*	₹	*Particulars*	*Units*	₹
To Opening stock	1,500	2,325	By Units scrapped	800	200
To Transferred from earlier process	12,500	12,080	By Transferred to next process @ ₹ 2.25 per unit	12,000	27,000
To Labour		6,030			
To Overheads		9,045	By Closing stock	1,200	2,280
	14,000	29,480		14,000	29,480

Note: Various costs have been calculated as below:

1. Statement Showing Equivalent Production

Input		*Output*		*Material*		*Labour*		*Overheads*	
Items	*Units*	*Items*	*Units*	*%*	*Units*	*%*	*Units*	*%*	*Units*
Opening stock	1,500	Opening stock	1,500	20	300	40	600	40	600
From previous Process	12,500	Units Scrapped (Normal Loss)	800		–		–		–
		Units Completed (12,500 – 800 – 1,200)	10,500	100	10,500	100	10,500	100	10,500
		Closing Stock	1,200	90	1,080	80	960	80	960
	14,000	Equivalent Production	14,000		11,880		12,060		12,060

2. Cost Statement Showing Cost Per Unit

Cost	₹	₹	*Equivalent Production Units*	*Cost per Unit* ₹
Materials transferred from previous process	12,080			
Less: Value of scrap	200	11,880	11,880	1.00
Labour		6,030	12,060	0.50
Overheads		9,045	12,060	0.75
		26,955		2.25

3. Process Evaluation Statement

Cost	*Equivalent Production (Units)*	*Cost per Unit* ₹	*Cost* ₹	*Total Cost* ₹
Opening Stock:				
Materials	300	1.00	300	
Labour	600	0.50	300	
Overheads	600	0.75	450	1,050
Units completed during the month:				
Materials	10,500	1.00	10,500	
Labour	10,500	0.50	5,250	
Overheads	10,500	0.75	7,875	23,625
Closing Stock:				
Materials	1,080	1.00	1,080	
Labour	960	0.50	480	
Overheads	960	0.75	720	2,280
				26,955

Illustration 19:

During a particular month 2,000 units at a cost of ₹ 60,000 were introduced into Process 1. The normal loss was estimated at 5% of input. At the end of the month, 1,400 units had been produced and transferred to the next process, 460 units were partially completed and 140 units had been scrapped.

It was estimated that in respect of various factors of production, the partially complete units had reached the following stage of production.

Materials	100% Complete
Labour	50% Complete
Overheads	50% Complete
Additional costs incurred during the month were:	₹
Materials	17,000
Direct Wages	33,400
Production Overheads	16,700

The units scrapped realised ₹ 10 each. You are required to prepare Process Accounts and the statements which you consider necessary for the preparation of the Process Account.

Solution:

Statement of Equivalent Production

Input units	*Particulars*	*Output units*	*Equivalent Production*					
			Materials		*Labour*		*Overheads*	
			Units	*%*	*Units*	*%*	*Units*	*%*
2,000	Normal Loss	100	—	—	—	—	—	—-
	Abnormal Loss	40	40	100	40	100	40	100
	Finished Units	1,400	1,400	100	1,400	100	1,400	100
	Work-in-Progress	460	460	100	230	50	230	50
2,000	Equivalent Production		1,900		1,670		1,670	

Statement of Cost

Elements of Cost	*Cost (₹)*	*Equivalent Production Units*	*Cost Per Unit (₹)*
1. Direct Materials	60,000		
Add: Additional Materials	17,000		
	77,000		
Less: Scrap value realised from normal loss (₹10 × 100 Units)	1,000		
	76,000	1,900	40.00
2. Labour	33,400	1,670	20.00
3. Overheads	16,700	1,670	10.00
	1,26,100		70.00

Statement of Equivalent Cost

Production	*Element of Cost*	*Equivalent Production Units*	*Cost Per Unit (₹)*	*Cost (₹)*	*Total (₹)*
Abnormal Loss	Materials	40	40	1600	
	Labour	40	20	800	
	Overheads	40	10	400	2,800
Finished Production	Materials	1,400	40	56,000	
	Labour	1,400	20	28,000	
	Overheads	1,400	10	14,000	98,000
Work-in-Progress	Materials	460	40	18,400	
	Labour	230	20	4,600	
	Overheads	230	10	2,300	25,300

Dr. Process I Account Cr.

Production	*Units*	₹	*Production*	*Units*	₹
To Units Introduced	2,000	60,000	By Normal Loss (5%)	100	1,000
To Materials		17,000	By Abnormal Loss	40	2,800
To Labour		33,400	By Process 2 A/c	1,400	98,000
To Overheads		16,700	By Balance (W-in-P)	460	25,300
	2,000	1,27,100		2,000	1,27,100

Dr. Normal Loss Account Cr.

Production	*Units*	₹	*Production*	*Units*	₹
To Process *I* A/c	100	1,000	By Bank	100	1,000

Dr. Abnormal Loss Account Cr.

Production	*Units*	₹	*Production*	*Units*	₹
To Process 1 A/c	40	2,800	By Bank @ ₹ 10	40	400
			By Costing P&L A/c	—	2,400
	40	2,800		40	2,800

Illustration 20:

The following information is obtained in respect of Process *B* for the month of January.

Opening stock 1,200 units ₹ 2,100.

Degree of completion : Materials 80%; Labour 60% and Overheads 60%

Transfer from Process *A* 22,000 units ₹ 11,000

Transfer to Process *C* 17,600 units.
Direct Materials added in process ₹ 4,820.
Direct Labour ₹ 14,310.
Production overheads ₹ 19,080.
Units scrapped : 2,400 units.
Degree of completion; Materials 100%; Labour 70%, Overheads 70%
Closing Stock 3,200 units.
Degree of completion; Materials 70%; Labour 60%; Overheads 60%.
Normal Loss – 10% of production.
Units scrapped realised 50 paise per unit.

Solution:

(a) **Process *B* Statement of Equivalent Production**

Input		*Output*		*Equivalent Production Units*							
Particulars	*Units*	*Particulars*	*Units*	*Materials I*		*Materials II*		*Labour*		*Overheads*	
				%	*Units*	%	*Units*	%	*Units*	%	*Units*
Opening stock	1,200	Opening stock (now completed)	1,200	—	—	20	240	40	480	40	480
Process *A*	22,000	Units processed Completely during the period	16,400	100	16,400	100	16,400	100	16,400	100	16,400
		Normal Loss	2,000	—	—	—	—	—	—	—	—
		Abnormal Loss	400	100	400	100	400	70	280	70	280
		Closing stock	3,200	100	3,200	70	2,240	60	1,920	60	1,920
	23,200		23,200								
		Equivalent Production			20,000		19,280		19,080		19,080

Note : Opening W.I.P will not require Material *I*. But closing W.I.P, abnormal loss and units transferred will require 100% Material *I*. Scrap value of normal loss will reduce cost of Material *I*.

(b) **Statement of Cost Per Unit**

Elements of Cost	*Cost* ₹	*Equivalent Production Units*	*Cost Per Unit* ₹
***I* Materials:**			
Transferred from previous Process	11,000		
Less: Scrap value of normal loss 2,000 units @ 50 paise per unit	1,000		
	10,000	20,000	0.50
II Materials added in Process	4,820	19,280	0.25
Labour	14,310	19,080	0.75
Overheads	19,080	19,080	1.00

(c) **Statement of Cost Evaluation**

Stock	*Elements of Cost*	*Equivalent Production (Units)*	*Cost Per Unit* ₹	*Cost* ₹	*Total Cost* ₹
Opening Stock	Material *I*	—	0.50	—	
	Material *II*	240	0.25	60	
	Labour	480	0.75	360	
	Overheads	480	1.00	480	900
Abnormal Loss	Material *I*	400	0.50	200	
	Material *II*	400	0.25	100	
	Labour	280	0.75	210	
	Overheads	280	1.00	280	790
Completely processed during the period	Material *I*	16,400	0.50	8,200	
	Material *II*	16,400	0.25	4,100	
	Labour	16,400	0.75	12,300	
	Overheads	16,400	1.00	16,400	41,000
Closing Stock	Material *I*	3,200	0.50	1,600	
	Material *II*	2,240	0.25	560	
	Labour	1,920	0.75	1,440	
	Overheads	1,920	1.00	1,920	5,520

Dr. **Process *B* Account** **Cr.**

Particulars	*Units*	₹	*Particulars*	*Units*	₹
To Balance b/d	1,200	2,100	By Normal Loss		
To Process *A*	22,000	11,000	@ ₹ 0.50 per Unit	2,000	1,000
To Materials		4,820	By Abnormal Loss	400	790
To Labour		14,310	By Process *C* (Transfer)	17,600	44,000
To Overheads		19,080	By Balance c/d (W.I.P)	3,200	5,520
	23,200	51,310		23,200	51,310

Dr. **Process *C* Account** **Cr.**

Particulars	*Units*	*Amount* ₹	*Particulars*	*Units*	*Amount* ₹
To Process *B* A/c	17,600	44,000			

Dr. **Abnormal Loss Account** **Cr.**

Particulars	*Units*	*Amount* ₹	*Particulars*	*Units*	*Amount* ₹
To Process *B* A/c	400	790	By Cash A/c	400	200
			By Costing Profit Loss A/c		590
	400	790		400	790

Values of Unit Transferred to Process *C*

Particulars	*Units*	*Amount* ₹
Opening Work-in-Progress (old cost)	1,200	2,100
Opening Work-in-Progress (new cost)		900
Units introduced and competed	16,400	41,000
	17,600	44,000

Illustration 21:

From the following details prepare Process *B* Account for the month of March, ...

Opening stock	400	units at ₹ 5,150
Transfer from Process *A*	10,600	units at ₹ 82,300
Transfer to Process *C*	9,600	units
Closing Stock	1,000	units
Units Scrapped	400	units
Normal loss in process	5% of production	
Sale of scrap	₹ 3 per unit	
Degree of completion as regards :	Materials %	Labour and Overheads %
Opening stock	80	60
Closing	70	50
Scrap	100	70
Direct Materials added in Process *B*	₹ 39,520	
Direct Wages	₹ 19,520	
Production Overhead	₹ 9,760	

Solution:

(a) **Statement of Equivalent Production**

Input		*Output*		*Materials (1)*		*Materials (2)*		*Labour & Overheads*	
Particulars	*Units*	*Items*	*Units*	*%*	*Units*	*%*	*Units*	*%*	*Units*
Opening stock	400	Transfer to Process *C* :							
Transfer from Process *A*	10,600	Fully Processed	9,200	100	9,200	100	9,200	100	9,200
		Opening Stock	400	—	—	20	80	40	160
			9,600	—	9,200	—	9,280	—	9,360
		Normal Loss	500	—	—	—	—	—	—
		Closing Stock	1,000	100	1,000	70	700	50	500
			11,100	—	10,200	—	9,980	—	9,860
		Less: Abnormal gain	100	100	100	100	100	100	100
Total	11,000	Total equivalent Production	11,000	—	10,100	—	9,880	—	9,760

(b) **Statement of Cost**

Elements of Cost	₹	*Total Cost* ₹	*Equivalent Production Units*	*Cost Per Unit* ₹
Materials: (1)				
Form Process *A*	82,300			
Less : Sales of Scrap (Normal) Loss	1,500	80,800	10,100	8
Material: (2)				
(added in Process *B*)		39,520	9,880	4
Direct Wages		19,520	9,760	2
Production Overheads		9,760	9,760	1
	80,800	1,49,600	—	15

(c) **Statement of Apportionment of Cost**

Particulars	*Elements of Cost*	*Equivalent Units*	*Cost Per Unit* ₹	*Cost* ₹	*Total Cost* ₹
Opening W.I.P.	Material *I*	—	8	—	
(now completed)	Material *II*	80	4	320	
	Labour	160	2	320	
	Overheads	160	1	160	800
Introduced & completed	Material *I*	9,200	8	73,600	
during the period	Material *II*	9,200	4	36,800	
	Labour	9,200	2	18,400	
	Overheads	9,200	1	9,200	1,38,000
Closing Work-in-Progress	Material *I*	1,000	8	8,000	
	Material *II*	700	4	2,800	
	Labour	500	2	1,000	
	Overheads	500	1	500	12,300
Abnormal gain	Material *I*	100	8	800	
	Material *II*	100	4	400	
	Labour	100	2	200	
	Overheads	100	1	100	1,500

Dr. **Process B Account** **Cr.**

Particular	*Units*	₹	*Particular*	*Units*	₹
To Balance b/d	400	5,150	By Normal Loss	500	1,500
To Process *A*	10,600	82,300	By Process *C*	9,600	1,43,950
To Materials	—	39,520	By Balance c/d	1,000	12,300
To Wages	—	19,520			
To Overheads	—	9,760			
To Abnormal gain	100	1,500			
	11,100	1,57,750		11,100	1,57,750

Notes :

(i) Work-in-Progress at the end of March has been valued as under :

Materials 1.	1,000 × 8.00 = 8,000
Materials 2.	700 × 4.00 = 2,800
Wages	500 × 2.00 = 1,000
Overhead	500 × 1.00 = 500
	₹ 12,300

(ii) Abnormal gain has been valued @ ₹ 15 per unit *i.e.* (100 × 15) ₹ 1,500.

(iii) Normal Loss is 5% of production *i.e.* (opening stock + units introduced – closing stock *i.e.* (400 + 10,600 – 1,000) = 10,000 units and 5 per cent thereon is 500 units. Actual units lost is 400. Hence there is an extra production of 100 units.

(iv) Cost of units transferred to next process:

	₹
Opening Work-in-Progress (old cost)	5,150
Work on Work-in-Progress (new cost)	800
Units completed (cost)	1,38,000
	1,43,950

Illustration 22:

From the following information for the month of October 2022, prepare Process *III* Account.

Opening W.I.P in Process *III*	1,800 units at ₹ 27,000
Transfer from Process *II*	47,700 units at ₹ 5,36,625
Transferred to Warehouse	43,200 units
Closing W.I.P of Process *III*	4,500 units
Units scrapped	1,800 units
Direct Material added in Process *III*	₹ 1,77,840
Direct Wages	₹ 87,840
Production Overheads	₹ 43,920

Degree of Completion:

Particulars	*Opening Stock*	*Closing Stock*	*Scrap*
Materials	80%	70%	100%
Labour	60%	50%	70%
Overheads	60%	50%	70%

The normal loss in the process was 5% of the production and scrap was sold @ ₹ 6.75 per unit. *[CA]*

Solution:

Statement of Equivalent Production
Process *III* (FIFO Method)

Input		*Output*		*Equivalent Production*					
				Material A		*Material B*		*Labour & Overheads*	
Details	*Qty (Units)*	*Details*	*Qty (Units)*	*Qty (Units)*	*%*	*Qty (Units)*	*%*	*Qty (Units)*	*%*
Op. W.I.P	1,800	Scrap	2,250	—	—	—	—	—	—
Process *II*	47,700	Units **Completed:**							
		Op. Stock	1,800			360	20%	720	40%
		New	41,400	41,400	100%	41,400	100%	41,400	100%
		Cl. Stock	4,500	4,500	100%	3,150	70%	2,250	50%
			49,950	45,900		44,910		44,370	
		Abn. gain	450	450	100%	450	100%	450	100%
	49,500		49,500	45,450		44,460		43,920	

Statement of Cost for Each Element

Element of Cost		*Cost (₹)*	*Equivalent Production*	*Cost per unit (₹)*
Material *A*:				
Transfer from previous process	₹ 5,36,625			
Less: Scrap value of normal loss 2,250 units × ₹ 6.75	15,187	5,21,438	45,450	11.4728
Material *B*:		1,77,840	44,460	4.0000
Labour		87,840	43,920	2.0000
Overheads		43,920	43,920	1.0000
Total		8,31,038		18.4728

Statement of Apportionment of Cost

Items	*Elements*	*Equivalent Production (Units)*	*Cost Per Unit (₹)*	*Cost (₹)*	*Total (₹)*
Opening W.I.P. for completion	Material *A*	—	—	—	—
	Material *B*	360	4	1,440	
	Labour	720	2	1,440	
	Overheads	720	1	720	3,600
Units Introduced and completed during the period	Material *A*	41,400	11.4728	4,74,973	
	Material *B*	41,400	4.0000	1,65,600	
	Labour	41,400	2.0000	82,800	
	Overheads	41,400	1.0000	41,400	7,64,773
Closing W.I.P.	Material *A*	4,500	11.4728	51,628	
	Material *B*	3,150	4.0000	12,600	
	Labour	2,250	2.0000	4,500	
	Overheads	2,250	1.0000	2,250	70,978
Abnormal Gain	Material *A*	450	11.4728	5,163	
	Material *B*	450	4.0000	1,800	
	Labour	450	2.0000	900	
	Overheads	450	1.0000	450	(8,313)*
					8,31,038

Dr. **Process *III* A/c** **Cr.**

Particulars	*Units*	₹	*Particulars*	*Units*	₹
To Balance b/d	1,800	27,000	By Normal Loss (@ ₹ 6.75)	2,250	15,187
To Process *II* A//c	47,700	5,36,625	By Finished Goods (Note 1)	43,200	7,95,373
To Direct Materials		1,77,840	By Closing W.I.P.	4,500	70,978
To Wages		87,840			
To Production Overheads		43,920			
To Abnormal Gain A/c	450	8,313			
	49,950	8,81,538		49,950	8,81,538

Working Notes:

1. *Finished Goods*

Cost already incurred on opening stock	₹ 27,000
Cost incurred to complete opening stock	3,600
Units introduced and completed	7,64,773
Total	7,95,373

Illustration 23:

From the following information for the month ending October, 2022, prepare Process Cost Accounts for Process *III*. Use First-in-fist-out (*FIFO*) method to value equivalent production.

Direct materials added in Process *III* (Opening W.I.P.)	2,000 units at ₹ 25,750
Transfer from Process *II*	53,000 units at ₹ 4,11,500
Transferred to Process *IV*	48,000 units
Closing stock of Process *III*	5,000 units
Units scrapped	2,000 units
Direct material added in Process *III*	₹ 1,97,600
Direct wages	₹ 97,600
Production Overheads	₹ 48,800

Degree of completion

	Opening Stock	*Closing Stock*	*Scrap*
Materials	80%	70%	100%
Labour	60%	50%	70%
Overheads	60%	50%	70%

The normal loss in the process was 5% of production and scrap was sold at ₹ 3 per unit.

[CA PE II]

Solution:

Statement of Equivalent Production

Input Item	*Units*	*Output*		*Equivalent Production*					
		Item	*Units*	*Material A*		*Material B*		*Labour & Overheads*	
Op. Stock W.I.P.	2,000	Opening W.I.P.	2,000	—	—	400	20	800	40
Process *II* Transfer	53,000	Produced & Completed during the period (48,000 – 2,000)	46,000	46,000	100	46,000	100	46,000	100
			48,000						
		Normal Loss (2,000 + 53,000 – 5,000) × 5 %	2,500						
	55,000	Opening W.I.P.	5,000	5,000	100	3,500	70	2,500	50
			55,500	51,000		49,900		49,300	
		Abnormal Gain	(500)	(500)	100	(500)	100	(500)	100
			55,000	50,500		49,400		48,800	

Statement of Cost for Each Element

Elements of cost	*Cost* ₹	*Equivalent Production*	*Cost Per Unit* ₹
Material *A*			
Transfer form previous Process	4,11,500		
Less : Scrap value of Normal *Loss*: 2,500 × ₹ 3	7,500		
	4,04,000	50,500	8
Material *B*	1,97,600	49,400	4
Wages	97,600	48,800	2
Overheads	48,800	48,800	1
	7,48,000		15

Process Cost Sheet (In ₹)

			₹
Op. W.I.P. (for completion)	Mat. *B*	400 × ₹ 4 =	1,600
	Wages	800 × ₹ 2 =	1,600
	OHs.	800 × ₹ 1 =	800
			4,000
Introduced and completely processed during the period		46,000 × ₹ 15 =	₹ 6,90,000

Closing W.I.P.	Mat *A*	5,000 × 8 =	40,000
	Mat *B*	3,500 × 4 =	14,000
	Wages	2,500 × 2 =	5,000
	OHs	2,500 × 1 =	2,500
			61,500
Abnormal Gain		500 × ₹ 15 =	7,500

Dr. **Process *III* Account** **Cr.**

Particulars	*Units*	*Amount* ₹	*Particulars*	*Units*	*Amount* ₹
To Balance b/d	2,000	25,750	By Normal Loss	2,500	7,500
To Process *II* A/c	53,000	4,11,500	By Process *IV* A/c		
To Direct Materials		1,97,600	(6,90,000 + 4,000		
To Direct Wages		97,600	+ 25, 750)	48,000	7,19,750
To Prodn. Overheads		48,800	By Bal c/d	5,000	61,500
To Abnormal Gain	500	7,500			
	55,500	7,88,750		55,500	7,88,750

Valuation of Work-in-Progress under Average Method

Under FIFO Method opening W.I.P. are completed by adding cost of completing incomplete units and thereafter newly introduced units are completed. When average method of valuation of W.I.P. is followed, no distinction is made between partly completed units of preceding period (opening W.I.P.) and those units which we introduced and completed during the period. Cost of opening inventory is added to cost incurred during current period element-wise.

Thus, under average method the average process cost is obtained by adding the cost of opening W.I.P. and current cost and dividing the total by total equivalent units. It is not presumed that opening units will be completed first.

$$\text{Unit cost} = \frac{\text{Cost brought forward from previous period + Cost of current period}}{\text{Total equivalent units}}$$

Illustration 24:

(*Average Cost Method*).

The following information is available in respect of Process *II* for the month of March:

Opening Stock 1,000 units

Value : Direct Materials (1) ₹ 4,000; Direct Material (2) ₹ 2,000.
Direct Labour ₹ 350, Production Overhead ₹ 800

Transfer from Process 1: 16,000 units of ₹ 81,000

Transfer to Process 3 : 14,500 units	₹
Direct Material added to Process 2	43,750
Direct Labour amounted to	14,300
Production Overhead absorbed	28,500

Units Scrapped : 500

Degree of Completion : Direct Materials 100%
Direct Labour 60%
Production Overhead 20%

Normal Loss was estimated at 5% of production units, realised ₹ 5 per unit
Closing Stock : 2,000 units
Degree of Completion : Direct Materials 50%
Direct Labour 20%
Production Overhead 20%

Prepare the process and other accounts using *weighted average cost method.*

Solution:

Statement of Equivalent Units

Particulars	*Units*	*Materials 1*		*Materials 2*		*Materials 3*		*Materials 4*	
		Units	*%*	*Units*	*%*	*Units*	*%*	*Units*	*%*
Normal Loss	750	—	—	—	—	—	—	—	—
Completed Units	14,500	14,500	100	14,500	100	14,500	100	14,500	100
Costing Stock	2,000	2,000	100	1,000	50	400	20	400	20
	17,250	16,500		15,500		14,900		14,900	
Abnormal Gain	(250)	(250)	100	(250)	100	(250)	100	(250)	100
Total	17,000	16,250		15,250		14,650		14,650	

Statement of Equivalent Units Cost

Particulars	₹	*Cost (₹)*	*Equivalent Units*	*Cost Per Equivalent Unit (₹)*
Material (1)	4,000			
Opening W.I.P.	81,000			
Process 1	85,000			
Less : Scrap of Normal Loss				
@ ₹ 5 × 750 Units	3,750	81,250	16,250	5.00
Materials (2)				
Opening W.I.P.	2,000			
Add : Materials	43,750	45,750	15,250	3.00
Direct Labour				
Opening W.I.P.	350			
Add: Current Cost	14,300	14,650	14,650	1.00
Production Overheads				
Opening W.I.P.	800			
Add: Current Period	28,500	29,300	14,650	2.00
		1,70,950		

Statement of Cost

Particulars	*Elements of Cost*	*Equivalent Units*	*Cost Per Unit*	*Cost (₹)*	*Total Cost (₹)*
Completed Units	Material (1)	14,500	5	72,500	
	Material (2)	14,500	3	43,500	
	Direct Labour	14,500	1	14,500	
	Prod. Overheads	14,500	2	29,000	1,59,500

Closing Stock	Material (1)	2,000	5	10,000	
	Material (2)	1,000	3	3,000	
	Direct Labour	400	1	400	
	Prod. Overheads	400	2	800	14,200
Abnormal Gain	Material (1)	250	5	1,250	
	Material (2)	250	3	750	
	Direct Labor	250	1	250	
	Prod. Overheads	250	2	500	2,750

Dr. **Process 2 Account** **Cr.**

Particulars	*Units*	₹	*Particulars*	*Units*	₹
To Balance b/d	1,000	7,150	By Normal Loss A/c	750	3,750
To Process *I* A/c	16,000	81,000	By Process *III* A/c	14,500	1,59,500
To Direct Materials		43,750	By Balance c/d	2,000	14,200
To Direct Labour		14,300			
To Prod. Overheads		28,500			
Abnormal Gain	250	2,750			
	17,250	1,77,450		17,250	1,77,450

Dr. **Normal Loss Account** **Cr.**

Particulars	*Units*	₹	*Particulars*	*Units*	₹
To Process 2 A/c	750	3,750	By Bank	500	2,500
			By Abnormal Gain A/c	250	1,250
	750	3,750		750	3,750

Dr. **Abnormal Gain Account** **Cr.**

Particulars	*Units*	₹	*Particulars*	*Units*	₹
To Normal Loss A/c	250	1,250	By Bank	250	2,750
To Costing P&L A/c		1,500			
	250	2,750		250	2,750

Note :

1. Normal Loss 5% of units processed *i.e.* 5% of 15,000 = 750 units
2. Units processed = Opening stock + Transfer from Process I – Closing stock
   = 1,000 + 16,000 – 2,000 = 15,000 units
3. Normal output = Opening WIP + Transfer from Process I – Closing WIP – Normal Loss
   = 1,000 + 16,000 – 2,000 – 750 = 14,250 units
4. Abnormal gain = Completed units – Normal output
   = 14,500 – 14,250 = 250 units.

Illustration 25:

Opening work-in-progress, 1,000 units (60% complete); cost ₹ 1,100. Units introduced during the period 10,000 units; Cost ₹ 19,300. Transferred to next process - 9,000 units.

Closing work-in-progress - 800 units (75% complete). Normal loss is estimated at 10% of total input including units in process at the beginning. Scrap realised ₹ 1 per unit. Scrapped are 100% complete.

Compute equivalent production and cost per equivalent unit. Also evaluate the output, *(i)* Under FIFO Method *(ii)* Under Average Cost Method

Solution:

(*i*) FIFO Method

Statement of equivalent production and cost and cost per unit

Input		*Output*		*Equivalent*	*Production*
Particulars	*Units*	*Particulars*	*Units*	*% of Work done during current Period*	*Equivalent units*
Op. work-in-process	1,000	Op. W.I.P.			
Units introduced	10,000	Completed	1,000	40	400
		Completed units	8,000	100	8,000
		Normal loss	1,100		
		Closing Work in-process	800	75	600
		Abnormal loss	100	100	100
	11,000		11,000		9,100

Cost of the Process (for the period) ₹ 19,300

Less: Scrap value of normal loss ₹ 1,100

Cost per equivalent unit ₹ 18,200 ÷ 9,100 units = ₹ 2

Statement of Evaluation

Particulars	*Equivalent units* ₹	*Cost Per Equivalent unit* ₹	*Amount* ₹
1. Opening W.I.P. completed	400	2.00	800
Add: Cost of opening W.I.P.	–	–	1,100
Complete Cost of 1,000 units of Op. W.I.P.	1,000	1.90	1,900
2. Completely processed units	8,000	2.00	16,000
3. Abnormal Loss	100	2.00	200
4. Closing W.I.P.	600	2.00	1,200

(ii) **Average Cost Method**

Under this method, the cost of opening work-in-progress and cost of the current period are aggregated and the aggregate cost is divided by output in terms of completed units. The equivalent production in this case consists of workload already contained in opening work-in-process and workload of current period.

Under Average Cost Method, the solution will be as follows:

Statement of Equivalent Production and Cost per unit

Output	*Units*	*Equivalent Percentage*	*Production Units*
Transferred to Next Process	9,000	100	9,000
Normal Loss	1,100	–	–
Abnormal Loss	100	100	100
Closing work-in-process	800	75	600

Costs:	₹
Opening Work-in-Process	1,100
Cost of units introduced	19,300
	20,400
Less: Scrap value realised on normal loss	1,100
	19,300
Cost per equivalent unit ₹ 19,300 ÷ 9,700 units	= ₹ 1.99 (approx.)

Statement of Evaluation

Particulars	*Equivalent units*	*Cost Per Equivalent unit (₹)*	*Amount (₹)*
1. Transferred to next process	9,000	1.99	17,910
2. Abnormal loss	100	1.99	199
3. Closing Work-in-process	600	1.99	1,194
			19,303

Illustration 26:

Following information is available regarding process *A* for the month of February, 2022:

Production Record

Units in process as on 1.2.2022	4,000
(All materials used, 25% complete for labour and overhead)	
New units introduced	16,000
Units completed	14,000
Units in process as on 28.2.2022	6,000
(All materials used, 33-1/3% complete for labour and overhead)	

Cost Records

Work-in-process as on 1.2.2022	₹
Materials	6,000
Labour	1,000
Overhead	1,000
	8,000
Cost during the month	
Materials	25,600
Labour	15,000
Overhead	55,600

Presuming that average method of inventory is used, prepare:

(i) Statement of equivalent production.
(ii) Statement showing cost for each element.
(iii) Statement of apportionment of cost.
(iv) Process Cost Account for process *A*.

Solution:

(i) **Statement of Equivalent Production (Average cost method)**

Particulars			*Materials*		*Labour*		*Overheads*	
Input (Units)	*Output*	*Units*	*% Completed*	*Equivalent units*	*% Completed*	*Equivalent units*	*% Completed*	*Equivalent units*
20,000	Completed	14,000	100	14,000	100	14,000	100	14,000
	W.I.P.	6,000	100	6,000	33-1/3	2,000	33-1/3	2,000
20,000		20,000		20,000		16,000		16,000

(ii) **Statement Showing Cost for each Element**

Particulars	*Materials*	*Labour*	*Overheads*	*Total*
Cost of opening work-in-progress(₹)	6,000	1,000	1,000	8,000
Cost incurred during the month (₹)	25,600	15,000	15,000	55,600
Total cost (₹) : *(A)*	31,600	16,000	16,000	63,600
Equivalent units : *(B)*	20,000	16,000	16,000	
Cost per equivalent (₹) : *(C) = (A/B)*	1.58	1	1	3.58

(iii) **Statement of Apportionment of Cost**

		₹	₹
Value of output transferred : *(a)*	14,000 units @ ₹ 3.58		50,120
Value of closing work-in-progress : *(b)*			
Materials	6,000 units @ ₹ 1.58	9,480	
Labour	2,000 units @ ₹ 1	2,000	
Overhead	2,000 units @ ₹ 1	2,000	13,480
Total cost : (a + b)			63,600

Dr. **Process *A* Account** **Cr.**

Particulars	*Units*	₹	*Particulars*	*Units*	₹
To Opening W.I.P.	4,000	8,000	By Completed units	14,000	50,120
To Materials	16,000	25,600	By Closing W.I.P.	6,000	13,480
To Labour		15,000			
To Overhead		15,000			
	20,000	63,600		20,000	63,600

Valuation of Work-in-Progress under Last-in-First-Out (*LIFO*) Method

According to this method, units entering in the process at last are first to be completed. The completed units will be shown at the current cost and closing inventory of work-in-progress will be valued at the cost of opening inventory of work in progress because units representing opening inventory are to be completed at last. The closing inventory will be, thus, divided into two categories when number of units of closing inventory are more than opening inventory *(i)* units of opening W.I.P. lying as closing W.I.P., *(ii)* Newly introduced units lying in closing W.I.P.

Illustration 27:

From the following information relating to the month of April 06, 2022, calculate the equivalent production units and the value of finished production and work-in-progress, using the *LIFO* method.

Opening work-in-progress on 1st April: 5,000 units; 50% complete.

Cost	₹
	6,000
Materials	8,000
Labour	8,000
Overheads	22,000

Units introduced into the process : 10,000

Cost	₹
Materials	30,000
Labour	52,500
Overheads	70,000
	1,52,500

During the period 7,500 units were completed and transferred to the next process. Closing work-in- progress on 30th April: 7,500 units, 50% complete.

Solution:

Computation of Equivalent Production Units
(*LIFO* method)

Units	*Particulars*	*Equivalent Production*		
		Units out	*% of completion*	*Equivalent Units*
5,000	Opening Work-in-Process			
10,000	Units introduced into the Process			
	units completed and transferred			
	of the units introduced during the period	7,500	100	7,500
	of the units introduced during the period	2,500	50	1,250
	of the opening work-in-process	5,000	–	–
15,000		15,000		8,750

Note :

(i) Since the units in the opening work-in-process were already 50% complete, no work has been done on these units during the period.

(ii) Cost per unit of equivalent production = $\frac{₹1,52,000}{8,750}$ = ₹ 17.43

(iii) Valuation of finished production and W.I.P

1. Finished production : 7,500 × ₹ 17.43 = ₹ 1,30,725
2. Closing W.I.P : 22,000 + (1,250 × ₹ 17.43) = ₹ 43,787.50

INTER-PROCESS PROFIT

The usual practice is to transfer the materials to the next process at cost and from the last process to the finished stock account also at cost. But sometimes the transfer is made at market price. The main advantage of such a method is that each process will then reveal profit or loss and hence the efficiency or inefficiency at each stage will be immediately known and underlined. It will also be demonstrated whether it is advantageous to process the materials within the factory or to get them from the market already processed.

It should be noted that merely to add a margin of profit to the cost while transferring the materials to the next process cannot serve any useful purpose. The transfer should be made at the current market price.

Should the market price be higher than cost, a process account will reveal profit. Then the stock in the next process will not be valued at cost. The value of stock will

include a margin of profit which is not proper for balance sheet purposes. Therefore, it is necessary to find out how much profit is included in the stock of each process and then to create a proper reserve for it by debiting the Profit and Loss Account. The calculation is rather involved. The following is a very simple example.

Illustration 28:

A product passes through two processes-No. *I* and No. *II*. Output of Process No. *I* is passed to Process No. *II* at cost plus 25 per cent profit and finished output is similarly transferred to Finished Stock Account at cost plus 25 per cent profit. There was no partly finished work in either process on 31st December, on which date the following further information was available:

	Process No. 1	*Process No. 2*
	₹	₹
Materials consumed	4,000	12,000
Labour	6,000	8,000
Closing Stock (31st Dec.)	2,000	6,000

Out of the finished stocks, a portion remained at hand valued at ₹ 9,000 and the balance was sold for ₹ 29,000. Ignoring the question of overheads and assuming there were no opening stocks, prepare the Process and Finished Stock Accounts.

Solution:

Dr. **Process No. 1 Account** **Cr.**

Particulars	₹	*Particulars*	₹
To Materials	4,000	By Transfer to Process	
To Labour	6,000	No. 2 A/c	10,000
To Profit & Loss Account		By Stock at Hand	2,000
(25 % on ₹ 8,000)	2,000		
	12,000		12,000

Dr. **Process No. 2 Account** **Cr.**

Particulars	₹	*Particulars*	₹
To Transfer from Process		By Transfer to Finished	
No. 1 A/c	10,000	Stock Account	30,000
To Materials	12,000	By Stock at Hand	6,000
To Labour	8,000		
To Profit (25% on ₹ 24,000)	6,000		
	36,000		36,000

Dr. **Finished Stock Account** **Cr.**

Particulars	₹	*Particulars*	₹
To Transfer from Process		By Sales	29,000
No. 2 A/c	30,000	By Closing Stock	9,000
To Profit & Loss Account	8,000		
	38,000		38,000

The total profit shown is ₹ 16,000, but a reserve is required for the profit included in the closing stocks of Process No. 2 and in the Finished Stock Account. There is no profit included in the closing stock in Process No. 1 A/c. Taking the closing stock of Process No. 2 first, we

consider that there are two elements in it which make up its value, viz., *(a)* transferred amount from Process No. 1 and (*b*) costs incurred in Process No. 2 itself. Looking at the debit side we find that *(a)* is ₹ 10,000 and (*b*) is ₹ 20,000. The closing stock of ₹ 6,000 maybe considered as made up in the ratio of *(a)* : (*b*) or 1 : 2, *i.e.*, we may consider that out of ₹ 6,000, ₹ 2,000 is for the transferred amount (in which there has been included 25 per cent profit on cost) and ₹ 4,000 for costs incurred in Process No. 2 itself (in which there is nothing by way of profit). On ₹ 2,000, profit is ₹ 400 (20 per cent on transfer price which is the same as 25 per cent on cost). Therefore, for the stock of Process No. 2, a reserve of ₹ 400 is required.

Now taking the stock of finished goods, the stock represents entirely transfer from Process No. 2; 20 per cent profit was included in the transfer price and, therefore, ₹ 1,800 is required as reserve for this stock. The cost, as far as Process No. 2 is concerned, of the stock comes to ₹ 7,200, *i.e.*, 9,000 – 1,800. But this includes something by way of transfer from Process No. 1 also. The ratio of transfer from Process No. 1 and cost incurred in Process No. 2 is 1 : 2 as discussed in the above paragraph. Therefore, out of ₹ 7,200, ₹ 2,400 is for transfer from Process No. 1 A/c. A reserve of 20 per cent is required on this sum. This would be ₹ 480. Total reserve required on finished goods stock is ₹ 2,280 and total reserve required on all stocks is ₹ 2,680.

In the Balance Sheet, stocks will be valued as follows:

	₹
Process No. 1	2,000
Process No. 2 (6,000 – 400)	5,600
Finished Stock (9,000 – 2,280)	6,720
	14,320

Alternative Method of Solution: In each Process Account three columns will be drawn on both sides — Total, Cost and Profit. Only profit included is shown in the profit column.

Illustration 29:

From the following information given by a manufacturing company which manufactures a product, you are required to prepare Process Accounts.

	Process I	*Process II*	*Process III*
	₹	₹	₹
Direct Materials	30,000	7,500	7,500
Direct Wages	22,500	15,000	15,000
Closing Stock	7,500	8,750	21,300

Finished goods is sold for ₹ 1,30,000, value of closing finished stock is ₹ 5,112. It is the policy of the company to charge 20% on transfer price or 25% on cost price while transferring the goods from Process *I* to *II* and 20% on cost price from *II* to *III* and from *III* to the Finished Stock.

Solution:

Dr. **Process *I* Account** **Cr.**

Particulars	*Total* ₹	*Cost* ₹	*Profit* ₹	*Particulars*	*Total* ₹	*Cost* ₹	*Profit* ₹
To Direct Materials	30,000	30,000	—	By Closing Stock	7,500	7,500	—
To Direct Wags	22,500	22,500		By Transfer			
To Profit 25 % on	52,500	52,500	—	to Process *II*	56,250	45,000	11,250
cost price	11,250	—	11,250				
	63,750	52,500	11,250		63,750	52,500	11,250

Dr. **Process *II* Account** **Cr.**

Particulars	*Total* ₹	*Cost* ₹	*Profit* ₹	*Particulars*	*Total* ₹	*Cost* ₹	*Profit* ₹
To Transferred from Process *I*	56,250	45,000	11,250	By Closing Stock	8,750	7,500	1,250
To Materials	7,500	7,500		By Transfer to			
To Wages	15,000	15,000		to Process *III*	84,000	60,000	24,000
	78,750	67,500	11,250				
To Profit 20% on cost price	14,000		14,000				
	92,750	67,500	25,250		92,750	67,500	25,250

Dr. **Process *III* Account** **Cr.**

Particulars	*Total* ₹	*Cost* ₹	*Profit* ₹	*Particulars*	*Total* ₹	*Cost* ₹	*Profit* ₹
To Transferred from Process *II*	84,000	60,000	24,000	By Closing Stock	21,300	16,500	4,800
To Materials	7,500	7,500		By Transfer to			
To Wages	15,000	15,000		finished stock	1,02,240	66,000	36,240
To Profit 20% on	1,06,500	82,500	24,000				
cost price	17,040		17,040				
	1,23,540	82,500	41,040		1,23,540	82,500	41,040

Dr. **Finished Stock Account** **Cr.**

Particulars	*Total* ₹	*Cost* ₹	*Profit* ₹	*Particulars*	*Total* ₹	*Cost* ₹	*Profit* ₹
To Transferred from Process *III*	1,02,240	66,000	36,240	By Closing Stock	5,112	3,300	1,812
To Profit	32,872		32,872	By Sales	1,30,000	62,700	67,300
	1,35,112	66,000	69,112		1,35,112	66,000	69,112

Working Notes:

1. In Second and Third Processes and in Finished Stock A/c closing stocks include some unrealised profit because outputs transferred from previous processes have been at cost plus profit.
2. The unrealised profit in the closing stock of the Second Process has been calculated as below:

$$\text{Cost of closing stock} = \frac{\text{Cost}}{\text{Total}} \times \text{Closing stock} = \frac{67,500}{78,750} \times 8750 = 7,500$$

Unrealised Profit = 8,750 – 7,500 = 1,250

3. Similarly in the Third Process,

$$\text{Cost of closing stock} = \frac{\text{Cost}}{\text{Total}} \times \text{Closing stock} = \frac{82,500}{1,06,500} \times 21,300 = 16,500$$

Unrealised Profit = 21,300 – 16,500 = ₹ 4,800

4. In the Finished Stock Account,

$$\text{Cost of Closing Stock} = \frac{\text{Cost}}{\text{Total}} \times \text{Closing stock} = \frac{66,000}{1,02,240} \times 5,112 = 3,300$$

Unrealised Profit = 5,112 – 3,300 = 1,812

5. Total unrealised profit will be:
   Process *II* ₹ 1,250 + Process *III* ₹ 4,800 + Finished Stock ₹ 1,812 = 7,862

Illustration 30:

A certain product passes through three processes before it is transferred to finished stock. The following information is obtained for the month of January:

Particulars	*I* ₹	*II* ₹	*III* ₹	*Finished stock* ₹
Opening Stock	20,000	24,000	16,000	60,000
Direct Materials	40,000	42,000	60,000	—
Direct Wages	30,000	30,000	32,000	—
Production overheads	28,000	12,000	80,000	—
Closing Stock	10,000	12,000	8,000	30,000
Profit on cost of each process	33-1/3%	25%	25%	—
Inter-process profit for opening stock		4,000	4,000	22,000

Stock in processes are valued at prime cost and finished stock has been valued at price at which it is received from Process *III*. Sales during the period were ₹ 7,00,000.

Solution:

Notes :

Calculation of Unrealised Profit on Stock

Process *II* : $\frac{\text{Cost}}{\text{Total}} \times \text{Closing Stock or } \frac{20,000}{24,000} \times 12,000 = ₹\ 10,000$

$\therefore$ Unrealised Profit = 12,000 – 10,000 = ₹ 2,000

Process *III* :

$$\frac{3,06,000}{4,08,000} \times 8,000 = ₹6,000$$

Unrealised Profit 8,000 – 6,000 = ₹ 2,000

Finished Stock $\frac{3,80,000}{6,00,000} \times 30,000 = ₹19,000$

$\therefore$ Unrealised Profit 30,000 – 19,000 = ₹ 11,000

Dr. **Process *I* Account** **Cr.**

Particulars	*Total* ₹	*Cost* ₹	*Profit* ₹	*Particulars*	*Total* ₹	*Cost* ₹	*Profit* ₹
To Opening Stock	20,000	20,000	—	By Transfer			
To Materials	40,000	40,000		to Process *II*	1,44,000	1,08,000	36,000
To Direct Wages	30,000	30,000					
	90,000	90,000	—				
Less: Closing Stock	10,000	10,000					
Prime Cost	80,000	80,000	—				
To Overheads	28,000	28,000	—				
	1,08,000	1,08,000					
To Profit							
$(33\frac{1}{3}$ on cost)	36,000		36,000				
	1,44,000	1,08,000	36,000		1,44,000	1,08,000	36,000

Dr. **Process *II* Account** **Cr.**

Particulars	*Total* ₹	*Cost* ₹	*Profit* ₹	*Particulars*	*Total* ₹	*Cost* ₹	*Profit* ₹
To Opening Stock	24,000	20,000	4,000	By Transfer			
To Transferred				to *III*	3,00,000	2,02,000	98,000
from Process *I*	1,44,000	1,08,000	36,000				
To Material	42,000	42,000	—				
To Wages	30,000	30,000	—				
	2,40,000	2,00,000	40,000				
Less: Closing Stock	12,000	10,000	2,000				
	2,28,000	1,90,000	38,000				
To Overheads	12,000	12,000	—				
	2,40,000	2,02,000	38,000				
To Profit 25%							
on cost	60,000		60,000				
	3,00,000	2,02,000	98,000		3,00,000	2,02,000	98,000

Dr. **Process *III* Account** **Cr.**

Particulars	*Total* ₹	*Cost* ₹	*Profit* ₹	*Particulars*	*Total* ₹	*Cost* ₹	*Profit* ₹
To Opening Stock	16,000	12,000	4,000	By Transfer			
To Transferred				to Finished	6,00,000	3,80,000	2,20,000
from Process *II*	3,00,000	2,02,000	98,000	Stock A/c			
To Raw Materials	60,000	60,000					
To Wages	32,000	32,000					
	4,08,000	3,06,000	1,02,000				
Less: Closing Stock	8,000	6,000	2,000				
	4,00,000	3,00,000	1,00,000				
To Production							
overheads	80,000	80,000					
	4,80,000	3,80,000	1,00,000				
To Profit 25%							
on Cost	1,20,000		1,20,000				
	6,00,000	3,80,000	2,20,000		6,00,000	3,80,000	2,20,000

Dr. **Finished Stock Account** **Cr.**

Particulars	*Total* ₹	*Cost* ₹	*Profit* ₹	*Particulars*	*Total* ₹	*Cost* ₹	*Profit* ₹
To Opening Stock	60,000	38,000	22,000	By Sale	7,00,000	3,99,000	3,01,000
To Process *III*	6,00,000	3,80,000	2,20,000				
	6,60,000	4,18,000	2,42,000				
Less: Closing Stock	30,000	19,000	11,000				
	6,30,000	3,99,000	2,31,000				
To Profit	70,000		70,000				
	7,00,000	3,99,000	3,01,000		7,00,000	3,99,000	3,01,000

Unrealised Profits

Particulars	*Profit* ₹	*Opening Reserve* ₹	*Closing Reserve* ₹	*Difference* ₹	*Actual Profits* ₹
Process *I*	36,000	—	—	—	36,000
Process *II*	60,000	4,000	2,000	2,000	62,000
Process *III*	1,20,000	4,000	2,000	2,000	1,22,000
Finished Stock	70,000	22,000	11,000	11,000	81,000
					3,01,000

OPERATION COSTING

It is a variation of Process Costing. A manufacturing process may sometimes be sub-divided into a number of parts, each of which is known as operation. Thus a process is a large sphere of activity which may consist of several operations, each showing all characteristics of a process. For a greater accuracy of product costs and more detailed control, costs may be determined by operations, the cost of the process being the total of the costs of the constituent operation.

The procedure for costing of operations is broadly the same as for process costing. Materials, labour and expenses are recorded against each operation and transfer of cost is made from one operation to another as in the case of process costing. When the number of operations is not large, there may be control account in the cost ledger for each operation and where their number is large, there may be control account for each large process.

Illustration 31:

An article undergoes three successive operations from raw materials to finished product stage. The following information is available from the production records of a month:

Operation No.	*No. of Pieces Input*	*No. of Pieces Rejected*	*No. of Pieces Output*
1	12,000	4,000	8,000
2	13,200	1,200	12,000
3	9,600	1,600	8,000

Find out what should be the input in the first operation in number of pieces to obtain a finished product of 100 pieces after last operation.

Calculate the cost of raw material required to produce one piece of finished product from following particulars:

Weight of Finished Piece	100 gm per piece
Price of Raw Material	₹ 10 per kg

[CMA Inter]

Solution:

Percentage of Rejection on output

Operation 1 (4,000/8,000) × 100 = 50%
2 (1,200/12,000) × 100 = 10%
3 (1,600/8,000) × 100 = 20%

On the basis of above, taking output of 100 pieces in the third operation, the input in the first process will be ascertained as shown in the following table.

Operation No.	*Input Pieces*	*Rejection %*	*Rejection Pieces*	*Output Pieces*
1	198	50%	66	132
2	132	10%	12	120
3	120	20%	10	100

Thus when 198 pieces are input of the first operation, 100 units will be the output of the third operation.

Quantity of Raw Materials for 100 units = 198 × 100 gm = 19,800 gm

Cost of Raw Material = $19{,}800 \times \frac{10}{1000}$ = ₹ 198

Cost of Raw Material per unit = 198/100 = ₹ 1.98

MISCELLANEOUS ILLUSTRATIONS

Illustration 32:

A product which uses 100 tons as input per month passes through two processes. The details of cost in Process 1 for the month of April are:

Process I	*Cost per ton* ₹
Direct Material Cost	26,100
Direct Labour Cost	7,800
Overhead	13,500

The total loss in Process *I* is 2% of input and the scrap is 8% of input with a value of ₹ 12,000 per ton.

The material to Process *II* is transferred at cost. The process direct labour cost at Process *II* is ₹ 9,000 per ton of input. The overhead is 60% of direct labour cost. The scrap at Process *II* is 20% of input with a value of ₹ 12,000 per ton. Draw up a Cost Sheet to present the manufacturing scrap and waste at each stage of manufacturing.

[CA Inter]

Solution:

Process Cost Sheet of Process *I*

Particulars	*Tons*	*Cost per ton* ₹	*Total* ₹
1. Input			
Direct Materials	100	26,100	26,10,000
Direct Labour		7,800	7,80,000
Overheads		13,500	13,50,000
Total	100	47,400	47,40,000
2. Wastages			
Loss	2	—	—
Scrap	8	12,000	96,000
3. Output (Input – Wastage)	90	51,600	46,44,000

Note: Cost per ton shown above ₹ 51,600) has been calculated on the basis of total *i.e.* ₹ 46,44,000/90 = ₹ 51,600.

Process Cost Sheet of Process *II*

Particulars	*Tons*	*Cost per ton* ₹	*Total* ₹
1. Input			
Transfer From Process *I*	90	51,600	46,44,000
Direct Labour	–	9,000	8,10,000
Overheads (60% of Direct Labour)	–	5,400	4,86,000
	90	66,000	59,40,000
2. Scrap (20% of inputs)	18	12,000	2,16,000
3. Output (Input – scrap)	72	79,500	57,24,000

Note : Cost per ton of output is ₹ 57,24,000/72 = ₹ 79,500.

Illustration 33:

A product passes through three processes : *A, B* and *C*. 10,000 units at a cost of ₹ 1.10 were issued to Process *A*. The other direct expenses were as follows:

	Process A ₹	*Process B* ₹	*Process C* ₹
Sundry Materials	1,500	1,500	1,500
Direct Labour	4,500	8,000	6,500
Direct Exps.	1,000	1,000	1,503

The wastage of Process *A* was 5% and in Process *B* 4%. The wastage of Process *A* was sold at ₹ 0.25 per unit and that of *B* at ₹ 0.50 per unit and that at *C* of ₹ 1.00 per unit. The overhead charges were 160% of direct labour. The final product was sold at 10 per unit fetching a profit of 20% on sales. Prepare Process Accounts and also find out percentage of wastage in Process *C*.

[CS Inter]

Solution:

Dr. **Process *A* Account** **Cr.**

Particulars	*Units*	*Amount* ₹	*Particulars*	*Units*	*Amount* ₹
To Units Introduced @ ₹ 1.10	10,000	11,000	By Wastage (5% of input @ ₹ 0.25)	500	125
To Sundry Materials		1,500			
To Direct Labour		4,500	By Process *B* A/c		
To Direct Exps.		1,000	(Transfer @ 25,075/9,500 = 2.639)	9,500	25,075
To Overheads (160% of Direct labour)		7,200			
	10,000	25,200		10,000	25,200

Dr. **Process *B* Account** **Cr.**

Particulars	*Units*	*Amount* ₹	*Particulars*	*Units*	*Amount* ₹
To Process A Account (Transfer)	9,500	25,075	By Wastage (4 % of 9,500 @ ₹ 0.50)	380	190
To Sundry Materials		1,500			
To Direct Labour		8,000	By Process *C* A/c		
To Direct Exps.		1,000	(Transfer @		

To Overheads(160% of Direct Labour)		12,800	48,185/9,120= ₹ 5.238)	9,120	48,185
	9,500	48,375		9,500	48,375

Dr. **Process *C* Account** **Cr.**

Particulars	*Units*	*Amount* ₹	*Particulars*	*Units*	*Amount* ₹
To Process *B* A/c (Transfer)	9,120	48,185	By Wastage (see note below) @ ₹ 1	696	696
To Sundry Materials		1,500	By Finished Stock A/c @ ₹ 8	8,424	67,392
To Direct Labour		6,500			
To Direct Expenses		1,503			
To Overheads (160% of Direct Labour)		10,400			
	9,120	68,088		9,120	68,088

Calculation of Wastage in Process

1. Normal Cost per unit in *C* ₹ 10 – 20% profit ₹ 2 = ₹ 8
2. Assume wastage in *C* = x units
   Gross Output of *C* = 9,120 – x units
   Normal Cost (Total) = 68,088 – x @ ₹ 1 = ₹ (68,088 – x)
   Normal Cost per unit = Total Normal Cost/Output unit
   Hence $\frac{68088 - x}{9120 - x} = 8$
   or $68{,}088 - x = 72{,}960 - 8x$
   or $7x = 72{,}960 - 68{,}088 = 4{,}872$
   or $7x = 4{,}872$
   or $x = 696$
3. Output of Process C 9,120 – 696 = 4,824 units

Illustration 34:

In a manufacturing unit, raw material passes through four Processes *I, II, III* and *IV* and the output of each process is the input of the subsequent processes. The loss in the four processes *I, II, III* and *IV* are respectively 25%, 20%, 20% and 16-2/3% of the input. If the end product at the end of Process *IV* is 40,000 kg, what is the quantity of raw material required to be fed at the beginning of Process I and the cost of same at ₹ 5 per kg. Also find out the effect of increase or decrease in the material cost of the end product for variation of every ₹ 1 in the cost of raw material.

[CA Inter]

Solution:

Suppose the quantity of raw material put in Process *I* is 100 kg, The output and input in the four processes will be the following:

	Process I	*Process II*	*Process III*	*Process IV*
Input (kg)	100	75	60	48
Less (kg)	25	15	12	8
Output	75	60	48	40

Thus, end output is 40% of the input in Process *I*. If output of Process *IV* is 40,000 kg, the input in Process *I* will be 40,000 × 100/40 = 1,00,000 kg or for 1 kg of output 2.5 kg of materials is required. If cost of material increases or decreases by ₹ 1, the effect on output would decrease or increase by ₹ 2.50 per kg.

Illustration 35:

An article passes through three successive operations from the raw material to the finished product stage. The following data are available from the production records of a particular month:

Operation No.	*No. of pieces input*	*No. of Pieces rejected*	*No. of pieces output*
1	60,000	20,000	40,000
2	66,000	6,000	60,000
3	48,000	8,000	40,000

(i) Calculate the input required to be introduced in the first operation in number of pieces in order to obtain finished output of 100 pieces after last operations.

(ii) Calculate the cost of raw material required to produce one piece of finished product, given the following:

Weight of the finished piece is 0.10 kg and the price of raw material is ₹ 20 per kg.

[CA Inter]

Solution:

(a) Input Rejections and Output:

	Operation I (Pieces)	*Operation II (Pieces)*	*Operation III (Pieces)*
1. Input	60,000	66,000	48,000
2. Rejections	20,000	6,000	8,000
3. Output	40,000	60,000	40,000
4. Rejection as a percentage of output	50%	10%	20%

(b) Input required in Process *I* to obtain Output of 1000 Pieces:

	Pieces
Finished output after Operation *III*	100
Rejection in Operation *III* 20%	20
Input in Operation *III*	120
Rejection in Operation *II* 10%	12
Input in Operation *II*	132
Rejection in Operation *I* 50%	66
Input in Operation *I*	198

(c) Cost of Raw Materials:

Weight of 198 pieces of raw material required for an output of 100 pieces

198 × 0.10 kg = 19.80 kg

Cost of Raw Material 19.8 kg × ₹ 20 = ₹ 396

Cost of Raw Material for one piece of finished produce = ₹ 396/100 = ₹ 3.96.

Illustration 36:

A certain chemical process yields 75% of material introduced as main product, 20% as by-product and 5% being lost. In the process one unit of main product requires double the material

required for a unit of by-product. Further one unit of main product needs 1.5 times the time needed for one unit of by-product. Overheads are absorbed in the ratio of 3 : 1.

During a week 1,000 units of Raw Material at a cost of ₹ 17,000 were introduced. Labour totalled ₹ 5,300. Overheads came to ₹ 2,700. Wastage realised ₹ 300. Ascertain the cost of two products.

Solution:

Break-up of the total units in respect of Main Product, By-product and Loss is as below:

Main Product	75% of 1,000 = 750
By-product	20% of 1,000 = 200
Loss	5% of 1,000 = 50

Statement of Cost

Particulars	*Total*	*Ratio*	*Main Product (750 units)*		*By -Product (200 units)*	
			Total Cost ₹	*Cost per unit (₹)*	*Total Cost (₹)*	*Cost per unit (₹)*
Materials	17,000	15 : 2	15,000	20.00	2,000	10.00
Labour	5,300	45 : 8	4,500	6.00	800	4.00
Overheads (₹ 2,700 – 300)	2,400	3 : 1	1,800	2.40	600	3.00
	24,700	—	21,300	28.40	3,400	17.00

Note :

1. ₹ 300 realised from scrap has been deducted from overheads.
2. Material ratio is calculated as (750 × 2) : (200 × 1) = 15 : 2
3. Labour ratio is calculated as (750 × 3) : (200 × 2) = 45 : 8

Illustration 37:

A product is finished in three stages *I, II, III.* At the first stage a quantity of 72,000 kg was delivered at a cost of ₹ 2.50 per kg. The entire material was consumed.

The production particulars along with the allocated expenses were as indicated in the table below:

Stage	*Input*	*Output*	*Direct Wages*	*Fixed Overheads*	*Varying Overheads*
	Kg	*Kg*	₹	%	%
I	72,000	67,680	7,500	150	200
II	65,000	60,125	12,000	125	150
III	55,600	50,000	14,500	200	150
				(On Direct Wages)	

The producer, as was his practice, assessed his cost at ₹ 6.77 per kg based on his input expenditure and the finished output. With a selling price of ₹ 7.50 per kg he estimated his profit at ₹ 36,500. If you do not approve of his assessment of the end results of the operation, convince him of the real end results in a tabular form. You should assume the normal wastages as only 5% on input at each stage and any excess wastages should not be allowed to inflate the cost of the end product. *[CMA]*

Solution:

The producer's assessment :	₹
Material (72,000 kg. at ₹ 2.50)	1,80,000

Stage *I* :	Direct wages	7,500	
	Fixed overhead	11,250	
	Varying overhead	15,000	33,750
Stage *II*:	Direct wages	12,000	
	Fixed overhead	15,000	
	Varying overhead	18,000	45,000
Stage *III* :	Direct wages	14,500	
	Fixed overhead	29,000	
	Varying overhead	36,250	79,750
Total Expenditure			3,38,500
Cost per kg $\frac{3,38,500}{50,000}$ =			6.77
Selling price per kg			7.50
Profit per kg			0.73
Total Profit (50,000 × 0.73)			36,500

But this assessment cannot be approved. Following may be the *proper calculation*. It should be worked out at follows:

Dr. **Stage *I* Account** **Cr.**

Particulars	*Kg*	*Rate* (₹)	*Amount* (₹)	*Particulars*	*Kg*	*Rate* (₹)	*Amount* (₹)
To Material	72,000	2.50	1,80,000	By Normal Wastage			
To Direct Wages			7,500	5% of 72,000	3,600	—	—
To Fixed Overheads				By Abnormal loss			
(150% of 7,500)			11,250	(72,000 – 3,600) =			
To Varying				(68,400 – 67,680)	720	3.125	2,250
Overheads			15,000	By Output			
(200% of 7,500)				Stage *II*	65,000	3.125	2,03,125
				By Closing stock			
				(67,680 – 65,000)	2,680	3.125	8,375
	72,000		2,13,750		72,000		2,13,750

$$\text{Cost per kg} = \frac{\text{Total Cost} - \text{Value of normal wastage/scrap}}{\text{Input Qnty.} - \text{Normal wastage Qnty.}}$$

$$= \frac{2,13,750 - \text{Nil}}{72,000 - 3,600} = \frac{2,13,750}{68,400} = ₹\ 3.125$$

By this rate Abnormal loss and Closing stock will be valued

Dr. **Stage *II* Account** **Cr.**

Particulars	*Kg*	*Rate* (₹)	*Amount* (₹)	*Particulars*	*Kg*	*Rate* (₹)	*Amount* (₹)
To Input from I	65,000	3.125	2,03,125	By Normal Wastage			
To Direct Wages			12,000	5% of 65,000	3,250	—	—
To Fixed Overheads				By Abnormal loss			
125% of 12,000			15,000	(65,000 – 3,250			
To Varying				= 61,750) – 60,125	1,625	4.0182	6,530

Overheads (150% of 12,000)			18,000	By Output tr. to Stage *III*	55,600	4.1082	2,23,413
				By Closing stock (60,125 – 55,600)	4,525	4.0182	18,182
	65,000		2,48,125		65,000		2,48,125

$$\text{Cost per kg} = \frac{2,48,125 - \text{Nil}}{65,000 - 3,250} = \frac{2,48,125}{61,750} = ₹\ 4.0182 \text{ per kg.}$$

Dr. **Stage *III* Account** **Cr.**

Particulars	*Kg*	*Rate* (₹)	*Amt.* (₹)	*Particulars*	*Kg*	*Rate* (₹)	*Amt.* (₹)
To Input from *II*	55,600	4.0182	2,23,413	By Normal Wastage (5% of 55,600)	2,780	—	—
To Direct Wages			14,500				
To Fixed Overheads 200% of 14,500			29,000	By Abnormal loss	2,820	5.7395	16,186
To Varying Overheads 250% of 14,500			36,250	By Output	50,000	5.7395	2,86,977
	55,600		3,03,163		55,600		3,03,163

$$\text{Cost per kg} = \frac{3,03,163 - \text{Nil}}{55,600 - 2,780} = \frac{3,03,163}{52,820} = ₹\ 5.7395 \text{ per kg.}$$

Reconciliation

			₹
Sales 50,000 × 760			3,75,000
Less: Cost of finished output *i.e.* cost of goods sold			2,86,977
Gross profit			88,023
Less: Abnormal loss:			
Stage *I*	2,250		
Stage *II*	6,530		
Stage *III*	16,186		24,966
Net profit			63,057
Reconciliation:			
Estimated profit as per producer		36,500	
Add: Cost of Closing stock:			
Stage *I*	8,375		
Stage *II*	18,182	26,557	
Net profit		63,057	

Illustration 38:

A company is manufacturing building bricks and firebricks. Two processes-brick forming and heat treating—are required for completion of both the products.

Time required (in hours)

	Building Bricks	*Firebricks*
Bricks forming per 100 bricks	3	2
Heat treating per 100 bricks	2	5

Total costs of the two process departments in a particular month were :

Bricks Forming	:	₹ 21,200
Heat Treating	:	₹ 48,800

Production during that month was :

Building Bricks	:	1,30,000 pieces
Firebricks	:	70,000 pieces

Prepare a statement of manufacturing costs for the two varieties of bricks.

Solution:

Working Notes:

Statement of Apportionment of Cost on the Basis of Hours

Time required for Brick Forming:	Hours
Building Bricks (1,30,000 × 3/100)	3,900
Firebricks (70,000 × 2/100)	1,400
Total time required	5,300
Cost per hour of brick forming = $\frac{21,200}{5,300}$ = ₹ 4.00 per hour	₹ 21,200
Time required for Heat Treating	Hours
Building Bricks (1,30,000 × 2/100)	2,600
Firebricks (70,000 × 5/100)	3,500
Total time required	6,100
Cost per hour of heat treating = $\frac{48,800}{6,100}$ = ₹ 8.00 per hour	₹ 48,800

Statement of Manufacturing Costs

Particulars	*Building Bricks*	*Firebricks*	*Total (₹)*
Bricks Forming	3,900 × 4 = 15,600	1,400 × 4 = 5,600	21,200
Heat Treating	2,600 × 8 = 20,800	3,500 × 8 = 28,000	48,800
Total Mfg. Cost	36,400	33,600	70,000
Mfg. Cost per brick	$\frac{36,400}{1,30,000}$ = 0.28	$\frac{33,600}{70,000}$ = 0.48	
Mfg. Cost per 100 bricks	₹ 28	₹ 48	

Illustration 39:

Product ZENU is made by three sequential Processes, *I, II* and *III*. In Process *III* a by-product arises and after further processing in Process *XY,* at a cost of 2 per unit, by-product '*XYZ*' is produced. Selling and distribution expenses at ₹ 1 per unit are incurred in marketing '*XYZ*' at a selling price of 9 per unit.

	Process I	*Process II*	*Process III*
Standards provided for :			
Normal loss in process of inputs,	10%	5%	10%
Loss in process, having a scrap value, per unit	₹ 1	₹ 3	₹ 5

For the month of April 2022 the following data are given:

Particulars	*Process I*	*Process II*	*Process III*	*Process XY*
Output, in units	8,800	8,400	7,000 of ZENU	420 of XYZ
Cost	₹	₹	₹	Total ₹
Direct Materials—introduced				(I+II+III)
(10,000 units)	20,000			20,000
Direct materials added	6,000	12,640	23,200	41,840
Direct wages	5,000	6,000	10,000	21,000
Direct Expenses	4,000	6,200	4,080	14,280

Budgeted production overhead for the month was ₹ 84,000.

Absorption is based on a percentage of direct wages.

There are no stocks at the beginning or end of the month.

You are required, using the information given, to prepare accounts for : *(a)* Each Process *I, II* and *III*; *(b)* Process *XY.*

Solution:

Working Note: Production overhead is ₹ 84,000, while wages are ₹ 21,000. Thus absorption rate is 400% of wages.

(a) **Process *I* Account**

Particulars	*Units*	*Rate* ₹	*Amt.* ₹	*Particulars*	*Units*	*Rate* ₹	*Amt.* ₹
To Direct Materials	10,000	2	20,000	By Normal loss			
To Add. Materials			6,000	(10%)	1,000	1	1,000
To Direct Wages			5,000	By Abnormal			
To Direct Exps.			4,000	loss	200	6	1,200
To Production over-				By Output tr.			
head (400% of wages)			20,000	to Process *II*	8,800	6	52,800
	10,000		55,000		10,000		55,000

$$\text{Cost per unit} = \frac{\text{Total Cost} - \text{Value of Normal Loss}}{\text{Input Qty.} - \text{Normal Loss Qty.}}$$

$$= \frac{55,000 - 1,000}{10,000 - 1,000} = \frac{54,000}{9,000} = ₹\ 6 \text{ per unit}$$

Dr. **Process *II* Account** **Cr.**

Particulars	*Units*	*Rate* ₹	*Amt.* ₹	*Particulars*	*Units*	*Rate* ₹	*Amt.* ₹
To Output from P. I	8,800	6	52,800	By Normal Loss			
To Direct Materials			12,640	5% of 8,800	440	3	1,320
To Direct Wages			6,000	By Output tr.			
To Direct Exps.			6,200	to Process *III*	8,400	12	1,00,800
To Production Overheads			24,000				
	8,800		1,01,640				
To Abnormal Gain	40	12	480				
	8,840		1,02,120		8,840		1,02,120

$$\text{Cost per unit} = \frac{1,01,640 - 1,320}{8,800 - 440} = \frac{1,00,320}{8,360} = ₹\ 12$$

Dr. **Process *III* Account** **Cr.**

Particulars	*Units*	*Rate* ₹	*Amt.* ₹	*Particulars*	*Unit*	*Rate* ₹	*Amt* ₹
To Output from P. *II*	8,400	12	1,00,800	By Normal Loss			
To Direct Materials			23,200	10% of 8,400	840	5	4,200
To Direct Wages			10,000	By Abnormal Loss	140	24	3,360
To Direct Exps.			4,080	By Product to *XY*			
To Production				(Note 1)	420	6	2,520
Overheads			40,000	By Finished Stock			
				of ZENU	7,000	24	1,68,000
	8,400		1,78,080		8,400		1,78,080

Note : 1. Process *III* will be credited for By-products as follows:

		₹
Sales 420 × 9		3,780
Less : Further processing (420 × 2)	840	
S&D Exps. (420 × 1)	420	1,260
Net amount		2,520

The rate will be 2,520/420 = ₹ 6

$$\text{Cost per unit} = \frac{1,78,080 - 4,200 - 2,520}{8,400 - 840 - 420} = \frac{1,71,360}{7,140} = ₹\ 24 \text{ per unit}$$

(b) **Process *XY* Account**

Particulars	*Units*	*Rate*	*Amt.*	*Particulars*	*Unit*	*Rate*	*Amt.*
To Output				By Output of			
from *III*	420	6	2,520	*XYZ*	420	8	3,360
To Further Processing							
(420 × 2)			840				
	420		3,360		420		3,360

Note: 2.

	₹
Cost of production of *XYZ* @ ₹ 8	3,360
S&D expenses 420 × 1	420
	3,780
Sales of 420 units of *XYZ* at ₹ 9 per unit	3,780

Illustration 40:

A product passes through three processes *A, B* and *C*. The details of expenses incurred on the three processes during the year 2022 were as under :

Process:	*A*	*B*	*C*
	₹	₹	₹
Unit issued/introduced (Cost per unit ₹ 100)	10,000		
Sundry Materials	10,000	15,000	5,000
Labour	30,000	80,000	65,000
Direct Expenses	6,000	18,150	27,200
Selling price per unit of output	120	165	250

Management expenses during the year were ₹ 80,000 and selling expenses were ₹ 50,000. These are not allocable to the processes.

Actual output of the three processes was:

A—9,300 units, *B*—5,400 units and *C*—2,100 units. Two-thirds of the output of Process *A* and one- half of the output of Process *B* was passed on to the next process and the balance was sold. The entire output of Process *C* was sold.

The normal loss of the three processes, calculated on the input of every process, was:

Process *A*—5%, *B*—15% and *C*—20%

The loss of Process *A* was sold at ₹ 2 per unit, that of *B* at ₹ 5 per unit and of Process *C* at ₹ 10 per unit.

Prepare the three Process Accounts and the Profit and Loss Account.

Solution:

Dr. **Process *A* Account** **Cr.**

Particulars	*Units*	*Rate*	*Amt.*	*Particulars*	*Units*	*Rate*	*Amt.*
To Units introduced	10,000	100	10,00,000	By Normal loss (5%			
To Sundry Materials			10,000	of 10,000 units)	500	2	1,000
To Labour			30,000	By Abnormal loss	200	110	22,000
To Direct Expenses			6,000	By Output transferred			
				to Process '*B*' A/c	6,200	110	6,82,000
				By P&L A/c (Sales)	3,100	110	3,41,000
	10,000		10,46,000		10,000		10,46,000

$$\text{Cost per unit} = \frac{\text{Total cost} - \text{Value of normal loss}}{\text{Input quantity} - \text{Normal loss quantity}}$$

$$= \frac{10,46,000 - 1000}{10,000 - 500} = ₹\ 110$$

Process *B* Account

Particulars	*Units*	*Rate* ₹	*Amount* ₹	*Particulars*	*Units*	*Rate* ₹	*Amount* ₹
To Output				By Normal Loss			
from *A*'s A/c	6,200	110	6,82,000	(15% of			
To Sundry Material			15,000	6,200 units)	930	5	4,650
To Labour			80,000	By Output			
To Direct Expenses			18,150	transferred to			
	6,200		7,95,150	Process "*C*" A/c	2,700	150	4,05,000
To Abnormal Gain	130	150	19,500	By P&L A/c (Sales)	2,700	150	4,05,000
	6,330		8,14,650		6,330		8,14,650

$$\text{Cost per unit} = \frac{7,95,150 - 4,650}{6,200 - 930} = ₹\ 150$$

Dr. **Process *C* Account** **Cr.**

Particulars	*Units*	*Rate*	*Amt.*	*Particulars*	*Units*	*Rate*	*Amt.*
To Output from *B*	2,700	150	4,05,000	By Normal Loss			
To Sundry Materials			5,000	(20% of 2,700)	540	10	5,400
To Labour			65,000	By Abnormal Loss	60	230	13,800
To Direct Expenses			27,200	By P&L Account	2,100	230	4,83,000
	2,700		5,02,200		2,700		5,02,200

$$\text{Cost per unit} = \frac{5,02,200 - 5,400}{2,700 - 540} = \frac{4,96,800}{2,160} = ₹\ 230$$

Dr. **Profit & Loss Account** **Cr.**

Particulars	*Units*	*Rate*	*Amt.*	*Particulars*	*Units*	*Rate*	*Amt.*
To Process *A*	3,100	110	3,41,000	*By Sales:*			
To Process *B*	2,700	150	4,05,000	Process *A*	3,100	120	3,72,000
To Process *C*	2,100	230	4,83,000	Process *B*	2,700	165	4,45,500
To Management				Process *C*	2,100	250	5,25,000
Expenses			80,000	By Abnormal Gain			18,850
To Selling Expenses			50,000	By Net Loss			32,450
To Abnormal Loss			34,800				
	7,900		13,93,800		7,900		13,93,800

Dr. **Abnormal Loss Account** **Cr.**

Particulars	*Units*	*Rate*	*Amt.*	*Particulars*	*Units*	*Rate*	*Amt.*
To Process *A*	200	110	22,000	By Sales *A*	200	2	400
To Process *C*	60	230	13,800	By Sales *C*	60	10	600
				By P&L A/c			34,800
	260		35,800		260		35,800

Dr. **Abnormal Gain Account** **Cr.**

Particulars	*Units*	*Rate*	*Amt.*	*Particulars*	*Units*	*Rate*	*Amt.*
To Normal Loss A/c	130	5	650	By Process *B*	130	150	19,500
To P&L A/c			18,850				
	130		19,500		130		19,500

Illustration 41:

The input to a purifying process was 16,000 kg of basic material purchased @ ₹ 1.20 per kg. Process wages amounted to ₹ 720 and overhead was applied @ 240% of the labour cost. Indirect materials of negligible weight were introduced into the process at a cost of ₹ 336. The actual output from the process weighted 15,000 kg. The normal yield of the process is 92%. Any difference in weight between the input of basic material and output of purified material (product) is sold @ ₹ 0.50 per kg.

The process is operated under a licence which provides for the payment of royalty @ ₹ 0.15 per kg. of the purified material produced.

Prepare : *(i)* Purifying Process Account, *(ii)* Normal Wastage Account, *(iii)* Abnormal Wastage/Yield Account and *(iv)* Royalty Payable Account. *[CA Inter]*

Solution:

Dr. **Purifying Process Account** **Cr.**

Particulars	*Kg*	*Rate (₹)*	*Amt. (₹)*	*Particular*	*Kg.*	*Rate (₹)*	*Amt. (₹)*
To Basic Material	16,000	1.20	19,200	By Normal Wastage			
To Process Wages			720	(8% of 16,000)	1,280	0.50	640
To Overheads (240%				By Output tr.			
of labour cost)			1,728	to Prodn. A/c	15,000	1.45	21,750
To Indirect Materials			336				
	16,000		21,984				
To Abnormal Yield	280	1.45	406				
	16,280		22,390		16,280		22,390

Working Note:

1. Cost per unit = $\frac{\text{Total cost} - \text{Value of normal wastage}}{\text{Input Quantity} - \text{Normal Loss Quantity}}$

$= \frac{21,984 - 640}{16,000 - 1,280}$ = ₹ 1.45 per kg.

2. Abnormal yield is calculated as below:

Input	16,000	kg
Normal loss 8%	1,280	
Normal output	14,720	
Actual output	15,000	
Abnormal yield	280	kg

Dr. **Normal Wastage Account** **Cr.**

Particulars	*Kg.*	*Rate* ₹	*Amt.* ₹	*Particulars*	*Kg.*	*Rate* ₹	*Amt.* ₹
To Purifying Process A/c	1,280	0.50	640	By Debtors/cash (Sales)	1,000	0.50	500
				By Abnormal Yield A/c	280	0.50	140
	1,280		640		1,280		640

Dr. **Abnormal Yield Account** **Cr.**

Particulars	*Kg.*	*Rate* ₹	*Amt.* ₹	*Particulars*	*Kg.*	*Rate* ₹	*Amt.* ₹
To Normal Wastage	280	0.50	140	By Purifying Process A/c	280	1.45	406
To Costing P&L A/c (Abnormal Profit)			266				
	280		406		280		406

Dr. **Royalty Payable Account** **Cr.**

Particulars	₹	*Particulars*	₹
To Cash	2,250	By Production A/c (15,000 × 0.15) (Note 4)	2,250

Dr. **Production Account** **Cr.**

Particulars	*Kg.*	*Rate* (₹)	*Amt.* (₹)	*Particulars*	*Kg.*	*Rate* (₹)	*Amt.* (₹)
To Purifying Process	15,000	1.45	21,750	By Finished Stock A/c			
To Royalty Payable A/c (15,000 × 0.15)			2,250	(1.45 + 0.15) = 1.60 per kg)	15,000	1.60	24,000
	15,000		24,000		15,000		24,000

Illustration 42:

The following data pertains to Process I for March of Beta Limited:

		₹
Opening Work-in-Progress	1.500 units valued at	15,000

Degree of completion: Materials 100%; Labour and Overheads 33 1/3 %

Input of Materials	18,500 units at	52,000
Direct Labour		14,000
Overheads		28,000
Closing Work-in-Progress	5,000 units	

Degree of completion : Materials 90% and Labour and Overheads 30%

Normal Process Loss is 10% of total input (opening work-in-progress units + units put in)

Scrap value ₹ 2.00 per unit

Units transferred to the next process 15,000 units

You are required to:

(a) Compute equivalent units of production.

(b) Compute cost per equivalent unit for each cost element *i.e.* material, labour and overheads.

(c) Compute the cost of finished output and closing work-in-progress.

(d) Prepare the Process and Other Accounts.

Assume: *(i)* FIFO Method is used by the Company, *(ii)* The cost of opening Work-in-progress is fully transferred to the next process. *[CA Inter]*

Solution:

(*a*) **Statement of Equivalent Units of Production**

Input Units	*Particulars*	*Output*	*Equivalent units*					
			Materials		*Labour*		*Overheads*	
			%	*Units*	%	*Units*	%	*Units*
1,500	Op. W.I.P.	1,500	—	—	$66\frac{2}{3}$	1,000	$66\frac{2}{3}$	1,000
18,500	Introduced units							
	Introduced & Completed in the period.	13,500	100	13,500	100	13,500	100	13,500
	Transferred to next Process.	15,000						
	Normal Loss 10% of (1,500 + 18,500)	2,000	—	—	—	—	—	—
	Closing W.I.P.	5,000	90	4,500	30	1,500	30	1,500
		22,000		18,000		16,000		16,000
	Abnormal Gain	(–) 2,000	100	2,000	100	2,000	100	2,000
20,000	Total	20,000		16,000		14,000		14,000

(b) **Statement of Cost Per Unit**

Particulars	*Material*	*Labour*	*Overhead*
Materials:	52,000		
Less: Scrap Value 2,000 × 2 =	4,000		
	48,000	14,000	28,000
Cost per unit	16,000	14,000	14,000
Total Cost per unit ₹ 6	= ₹ 3	= ₹ 1	= ₹ 2

(c) **Statement of Cost of Finished Output & Closing W.I.P.**

Particulars			*Cost per unit* ₹	*Cost* ₹	*Total* ₹
Op. W.I.P.		—	—	—	
(for completion)	Material	1,000	1	1,000	
	Labour	1,000	2	2,000	3,000
	Overheads				
Introduction & Completed					
during period	Total Cost	13,500	6		81,000
Closing W.I.P.	Material	4,500	3	13,500	
	Labour	1,500	1	1,500	
	Overheads	1,500	2	3,000	18,000
Abnormal gain	Total Cost	2,000	6		12,000

Cost of Finished Output	*Units*	*Cost* (₹)
Op. W.I.P.	1,500	15,000
Op. W.I.P. for Completion		3,000
	1,500	18,000
Introduced & Completed during period	13,500	81,000
Finished Output tr. to Next Process	15,000	99,000

(d) **Process *I* Account**

Particulars	*Units*	*Amount* ₹	*Particulars*	*Units*	*Amounts* ₹
To Opening W.I.P	1,500	15,000	By Normal Loss	2,000	4,000
To Materials	18,500	52,000	By Output tr. to		
To Direct Labour		14,000	Process *II*	15,000	99,000
To Overheads		28,000	By Closing		
	20,000	1,09,000	W.I.P.	5,000	18,000
To Abnormal Gain	2,000	12,000			
	22,000	1,21,000		22,000	1,21,000

Dr. **Abnormal Gain Account** **Cr.**

Particulars	*Units*	*Amount* ₹	*Particulars*	*Units*	*Amount* ₹
To Normal Loss A/c	2,000	4,000	By Process *I* A/c	2,000	12,000
To Costing P&L A/c		8,000			
	2,000	12,000		2,000	12,000

Dr. **Normal Loss Account** **Cr.**

Particulars	*Units*	*Amount* ₹	*Particulars*	*Units*	*Amount* ₹
To Process *I*	2,000	4,000	By Abnormal Gain A/c	2,000	4,000

	Units
Op. W.I.P	1,500
Introduced	18,500
	20,000
Transferred to Next Process	15,000
Closing W.I.P	5,000

Illustration 43:

XP Ltd. furnishes you the following information relating to Process. II.

(i) Opening work-in-process — Nil

(ii) Units introduced — 42,000 units @ ₹ 12

(iii) Expenses debited to the process :

	₹
Direct Materials	61,530
Labour	88,820
Overheads	1,76,400

(iv) Normal loss in the process – 2% of input.

(v) Closing work-in-progress – 1,200 units

Degree of completion –	Materials	100%
	Labour	50%
	Overhead	40%

(vi) Finished output – 39,500 units

(vii) Degree of completion of abnormal loss :

Material	100%
Labour	80%
Overhead	60%

(viii) Units scraped as normal loss were sold at 4.50 per unit.

(ix) All the units of abnormal loss were sold at 9 per unit.

Prepare :

(a) Statement of equivalent production.

(b) Statement showing the cost of finished goods, abnormal loss and closing work-in-progress.

(c) Process *II* Account and Abnormal Loss Account.

[CA IPCC]

Solution:

Statement of Equivalent Production

Particulars	*Output*	*Materials*		*Labour*		*Overheads*	
		Units	*%*	*Units*	*%*	*Units*	*%*
Finished output	39,500	39,500	100	39,500	100	39,500	100
Normal Loss 2% of 42,000 units	840	—	—	—	—	—	—
Abnormal Loss (42,000 – 39,500 – 840 – 1,200)	460	400	100	368	80	276	60
Closing W.I.P.	1,200	1,200	100	600	50	480	40
	42,000	41,100		40,468		40,256	

Statement of Cost

Particulars	₹
Units Introduced 42,000 @ 12	5,04,000
Add: Material	61,530
	5,65,530
Less: Scrap Value of Normal Loss	3,780
Total Cost	5,61,750

		₹
Cost per unit		
Cost per Unit of Material	$\frac{5,61,750}{41,160}$ =	13.648
Cost per Unit of Labour	$\frac{88,820}{40,468}$ =	2.195
Cost per Unit of Overhead	$\frac{1,76,400}{40,256}$ =	4.382
		20.225
Abnormal Loss:		
Material	460 × 13.648	6,278.08
Labour	368 × 2.195	807.76
Overheads	276 × 4.382	1,209.42
		8,295.26
Closing W.I.P.		
Material	1,200 × 13.648	16,377.60
Labour	600 × 2.195	1,317.00
Overheads	480 × 4.382	2,103.36
		19,797.96
Finished Goods	39,500 × 20.225	₹ 7,98,887.50

Dr. **Process *II* Account** **Cr.**

Particulars	*Units*	*Amount*	*Particulars*	*Units*	*Amounts*
To Opening W.I.P.	–	Nil	By Normal Loss	840	3,780
To Input	42,000	5,04,000	By Abnormal Loss	460	8,295
To Direct Material	–	61,530	By Finished Goods	39,500	7,98,877
To Labour	–	88,820	By Closing W.I.P.	1,200	19,798
To Overhead	–	1,76,400			
	42,000	8,30,750		42,000	8,30,750

Dr. **Abnormal Loss Account** **Cr.**

Particulars	*Units*	*Amount*	*Particulars*	*Units*	*Amounts*
To Process *II*	460	8,295	By Cash (Sold@ ₹ 9)	460	4,140
			By Costing P&L A/c		4,155
	460	8,295		460	8,295

Illustration 44:

M/s AB Co. Ltd. is engaged in process in Engineering Industry. During the month of April, 2,000 units were introduced in Process *X*. The normal loss was estimated at 5% of input. At the end of the month, 1,400 units have been produced and transferred to Process *Y*; 460 units were incomplete; and 140 units, after passing through the process fully, had to be scrapped in full. The incomplete units had reached the following stage of completion:

Material	75% complete
Labour and Overhead	50% complete

Following further information is available relating to the Process '*X*':

	₹
Cost of 2,000 units	58,000
Additional direct materials	14,400
Direct Labour	33,500
Production Overhead	16,700

Units scrapped realised ₹ 10 each. Prepare Statement of Equivalent Production, Statement of Cost, Statement of Evaluation and Process '*X*' Account.

Solution:

Statement of Equivalent Production

Input Units	*Output*	*Units*	*Equivalent Production (Units)*					
			Materials		*Labour*		*Overheads*	
			Qnty.	%	*Qnty.*	%	*Qnty.*	%
2,000	Opening Work-in-Progress	—	—	—	—	—	—	—
	Introduced during the month	—	—	—	—	—	—	—
	Completed Units	1,400	1,400	100	1,400	100	1,400	100
	Normal Loss (5% of 2,000)	100	—	—	—	—	—	—
	Abnormal Loss (Bal. figure)	40	40	100	40	100	40	100
	Closing Work-in-Progress	460	345	75	230	50	230	50
2,000	Total	2,000	1,785		1,670		1,670	

Statement of Cost Per Unit

Particulars	*Cost* ₹	*Equivalent Units*	*Cost per Equivalent Unit* ₹
Materials			
2,000 Units introduced	58,000		
Additional Direct Material	14,400		
	72,400		
Less: Scrap value of normal loss (100 × ₹ 10)	1,000		
	71,400	1,785	40.00
Direct Labour	33,500	1,670	20.06
Overhead	16,700	1,670	10.00
Total	1,21,600		70.06

Statement of Cost

Particulars		*Equivalent Units*	*Cost per Eq. Unit* ₹	*Cost*	*Total Cost* ₹
Units Completed	Total Cost	1,400	70.06		98,084
Abnormal Loss	Total Cost	40	70.06		2,802
Closing W.I.P.	Material	345	40.00	13,800	
	Labour	230	20.06	4,614	
	Overhead	230	10.00	2,300	20,714
					1,21,600

Dr. **Process 'X' Account** **Cr.**

Particulars	*Units*	*Amount* ₹	*Particulars*	*Units*	*Amount* ₹
To Units introduced	2,000	58,000	By Normal Loss (100 × 10)	100	1,000
To Materials		14,400	By Normal Loss Account	40	2,802
To Labour		33,500	By Units completed and transferred to Process 'Y'	1,400	98,084
To Overheads		16,700	By Closing Work-in-Progress c/d	460	20,714
	2,000	1,22,600		2,000	1,22,600

Illustration 45:

The following data are available in respect of Process *I* for the month of February:

1. Opening Stock of work-in-process: 800 units at a total cost of ₹ 4,000.
2. Degree of completion of opening work-in-process:
   - Materials 100%
   - Labour 60%
   - Overheads 60%
3. Input of materials at a total cost of ₹ 36,800 for 9,200 Units.
4. Direct wages ₹ 16,740.
5. Production overhead ₹ 8,370.
6. Units scrapped 1,200 units. The stage of completion of these units was:
   - Materials 100%
   - Labour 80%
   - Overheads 80%
7. Closing work-in-process: 900 units. The stage of completion of these units was:
   - Materials 100%
   - Labour 70%
   - Overheads 70%
8. 7,900 units were completed and transferred to the next process.
9. Normal loss is 8% of the total input (opening stock plus units put in)
10. Scrap value is ₹ 4 per unit.

You are required to :

(a) Compute equivalent production.

(b) Calculate the cost per equivalent unit for each element.

(c) Calculate the cost of abnormal loss (or gain), closing work-in-process and the units transferred to the next process using the FIFO Method.

(d) Show the Process Account for February. *[C.A. Inter]*

Solution:

(a) **Statement of Equivalent Production**

Particulars	*Output*	*Equivalent units*					
		Materials		*Labour*		*Overheads*	
		%	*Units*	%	*Units*	%	*Units*
Op. W.I.P. (for completion)	800	—	—	40	320	40	320
Introduced & completed	7,100	100	7,100	100	7,100	100	7,100
tfd. to next process	7,900						
Normal loss 8 % of (800 + 9,200)	800	—	—	—	—	—	—
Abnormal loss 1,200 – 800	400	100	400	80	320	80	320
Closing W.I.P.	900	100	900	70	630	70	630
Total	10,000		8,400		8,370		8,370

(b) **Statement of Cost Per Unit**

Particulars	*Materials*	*Labour*	*Overheads*
Current Cost :	36,800	16,740	8,370
Less: Scrap value 800 × 4	3,200	—	—
	33,600	16,740	8,370
Cot per unit	33,600/8,400 = 4.00	16,740/8,370 = 2.00	8,370/8,370 = 1.00
Total cost per unit ₹ 7.00			

(c) **Statement of Cost**

Particulars	*Elements*	*Units*	*Cost per unit*	*Cost*	*Total*
Op. W.I.P. (for completion)	Material	—	—	—	
	Labour	320	2	640	
	Overheads	320	1	320	960
Introduced & completion	Total Cost	7,100	7		49,700
Abnormal loss	Materials	400	4	1,600	
	Labour	320	2	640	
	Overheads	320	1	320	2,560
Closing W.I.P.	Materials	900	4	3,600	
	Labour	630	2	1,260	
	Overheads	630	1	630	5,490

Transferred to Next Process (FIFO Method)

Particulars	*Units*	*Cost (₹)*
Opening W.I.P.	800	4,000
" " (for completion)		960
Introduced & Completed	7,100	49,700
Transferred to next process	7,900	54,660

(d) **Process Account**

Particulars	*Units*	*Amount* ₹	*Particulars*	*Units*	*Amount* ₹
To Opening W.I.P	800	4,000	By Normal loss	800	3,200
To Materials	9,200	36,800	By Abnormal loss	400	2,560
To Direct Wages		16,740	By Completed & trans-		
To Prodn. Overheads		8,370	ferred to next process	7,900	54,660
			By Closing W.I.P	900	5,490
	10,000	65,910		10,000	65,910

Illustration 46:

The in-process inventory in Process No. 2 at the beginning of a period was valued at₹ 2,950 made up of ₹ 1,400 towards materials, ₹ 1,000 towards labour and ₹ 550 towards overheads for 100 units. The value added during the period was ₹ 53,600 towards an introduction of 4,100 units from the previous process besides ₹ 40,800 towards labour and ₹ 19,400 towards overheads. Out of 3,600 units completed, 3,300 units were transferred to the next process leaving the balance in stock. 400 units were held back in process with half completion towards labour and overheads while 200 units were lost in processing considered normal and hence should be borne by the entire inventory. Prepare a cost of production statement using *average cost basis*.

[CMA Inter]

Solution:

Statement of Equivalent Production and Cost Per Unit
(Op. WIP 100 + Introduced 4,100 = 4,200 units total)

Items	*Output Units*	*Equivalent units*					
		Materials		*Labour*		*Overheads*	
		%	*Units*	%	*Units*	%	*Units*
Completed & transferred to next process:	3,300	100	3,300	100	3,300	100	3,300
Balance in Stock	300	100	300	100	300	100	300
Completed	3,600						
Lost in process	200	—	—	—	—	—	—
Closing W.I.P.	400	100	400	50	200	50	200
Total	4,200		4,000		3,800		3,800
Cost incurred:	₹						
Opening	2,950		1,400		1,000		550
Added	1,13,800		53,600		40,800		19,400
Total	1,16,750		55,000		41,800		19,950
			55,000		41,800		19,950
Cots per unit			4,000		3,800		3,800
Total ₹ 30.00			= 13.75		= 11.00		= 5.25

Cost of Production Statement

			₹
1. Completed & Transferred to next process		3,300 units @ ₹ 30	99,000
2. Held in stock		300 units @ ₹ 30	9,000
Completed units		3,600 units × 30	1,08,000
3. Closing W.I.P.	Materials	400 × 13.75	5,500
	Labour	200 × 11.00	2,200
	Overheads	200 × 5.25	1,050
	Total		8,750
Total Expenses	1,08,000 + 8, 750		1,16,750

Dr. **Process No. 2 Account** **Cr.**

Particulars	*Units*	*Amount* ₹	*Particulars*	*Units*	*Amount* ₹
To Op. W.I.P.	100	2,950	By Output transferred		
To Units Introduced	4,100	53,600	to next process	3,300	99,000
To Labour		40,800	By Process No.2		
To Overheads		19,400	Stock A/c	300	9,000
			By Lost in process		
			(Normal)	200	—
			By Closing W.I.P.	400	8,750
Total	4,200	1,16,750		4,200	1,16,750

Illustration 47:

The product manufactured by a light engineering factory undergoes two operations, Machining and Finishing. The following data are available relating to expenses incurred on production during November, 2022:

Particulars	*Machining*	*Finishing*
Units as input	90,000	60,000
Expenses incurred in process:	₹	₹
Direct Material	2,70,000	Nil
Direct Labour	1,28,000	45,000
Overheads	64,000	1,35,000

At the end of the month, there were 30,000 units lying incomplete in machining operation. While the full quantity of materials had been consumed for the total production, the expenditure on labour and overheads was estimated to be 66-2/3% in respect of the incomplete products.

You are required to prepare a detailed cost statement showing the final cost per unit assuming:

(i) Completed units of Machining operations are transferred to the Finishing operations;

(ii) Finishing operation has completed all the units received from the earlier operation during November, 2022, leaving no work-in-process at the end of the month.

[CMA (Inter)]

Solution:

Statement of Equivalent Production and Cost Per Unit

Particulars	*Output*	*Equivalent Units*					
		Materials		*Labour*		*Overheads*	
		Units	%	*Units*	%	*Units*	%
Completed & transferred to finishing	60,000	60,000	100	60,000	100	60,000	100
Work-in-Progress	30,000	30,000	100	20,000	66-2/3	20,000	66-2/3
Total	90,000	90,000		80,000		80,000	
Cost incurred	4,62,000	2,70,00		1,28,000		64,000	
Cost per unit (₹)			2,70,000		1,28,000		64,000
			÷ 90,000		÷ 80,000		÷ 80,000
Total cost per unit ₹ 5.40			= ₹ 3.00		= ₹ 1.60		= ₹ 0.80

Statement of Cost

Particulars		₹
Completed & transferred to Finishing : 60,000 × 5.40		3,24,000
Value of work-in-process:		
Materials	30,000 × 3.00	90,000
Labour	20,000 × 1.60	32,000
Overheads	20,000 × 0.80	16,000
		1,38,000

Finishing Operation for 60,000 units	*Amount*	*Cost per unit*
Cost of units transferred from Machining :	₹	₹
60,000 × 5.40	3,24,000	5.40
Direct Labour	45,000	0.75
Overheads	1,35,000	2.25
Total	5,04,000	8.40
Final cost per units = ₹ 8.40		

Illustration 48:
A company manufactures a product which involves two consecutive processes, viz., Pressing and Polishing. For the month of October, 2022, the following information is available:

	Pressing	*Polishing*
Opening stock	—	—
Input of units in Process	1,200	1,000
Units completed	1,000	500
Units under Process	200	500
Materials Cost	₹ 96,000	₹ 8,000
Conversion Cost	₹ 3,36,000	₹ 54,000

For incomplete units in process, charge materials cost at 100 per cent and conversion cost at 60 per cent in the Pressing Process and 50 per cent in Polishing Process. Prepare a statement of cost and calculate the selling price per unit which will result in 25 per cent profit on sale price. *[CA (Inter)]*

Solution:

Statement of Equivalent Production of Pressing Process

Input Units	*Output*	*Units*	*Equivalent Production*			
			Materials		*Conversion cost*	
			(Units)	*%*	*(Units)*	*%*
1,200	Completed	1,000	1,000	100	1,000	100
	Work-in-process	200	200	100	120	60
1,200		1,200	1,200		1,120	

Statement of Equivalent Production of Polishing Process

Input Units	*Output*	*Units*	*Equivalent Production*			
			Materials		*Conversion cost*	
			(Units)	*%*	*(Units)*	*%*
1,000	Completed	500	500	100	500	100
	Work-in-process	500	500	100	250	50
1,000		1,000	1,000		750	

Statement of Cost

Pressing Process : Elements of Cost	*Cost* (₹)	*Equivalent unit*	*Cost per units* (₹)
Materials Cost	96,000	1,200	80
Conversion Cost	3,36,000	1,120	300
Total	4,32,000		380

Cost of units completed = 1,000 units at ₹ 380 = 3,80,000

Polishing Process : Elements of Cost	*Cost* (₹)	*Equivalent unit*	*Cost per units* (₹)
Input Cost	3,80,000	1,000	380
Materials Cost	8,000	1,000	8
Conversion Cost	54,000	750	72
Total	4,32,000		460

Cost of Units Completed = 500 units at ₹ 460 = ₹ 2,30,000

Selling price per unit:		₹
Cost per unit		460.00
Profit at 25% on Sale Price *i.e.,*	33-1/3% on Cost	153.33
Selling Price per unit		613.33
Total Cost of Process		
Pressing Process		₹
Materials	200 units at ₹ 80	16,000
Conversion Cost	120 units at ₹ 300	36,000
Cost of W.I.P.		52,000
Cost of completed units		3,80,000
Total Cost of Process		4,32,000
Polishing process		₹
Materials	500 units at ₹ 388 (380 + 8)	1,94,000
Conversion Cost	250 units at ₹ 72	18,000
Cost of W.I.P.		2,12,000
Cost of completed units		2,30,000
Total Cost of process		4,42,000

Illustration 49:

A manufacturing concern produces standardised electric meters in one of its departments. From the following particulars relating to a job of 50 meters, you are required to determine the values of the work-in-progress and the finished goods:

(a) Costs incurred as per job card:

Direct Materials	₹ 7,500
Direct Labour	₹ 2,000
Overheads	₹ 6,000

(b) Selling price per meter ₹ 450

(c) Selling and distribution expenses 30% of the sale value.

(d) 25 meters are completed and transferred to the stock of finished goods.

(e) Completion stage of work-in-progress:

Direct Materials	100%
Direct labour	60%
Overhead	60%

Solution:

Statement of Equivalent Production

Output	*Units*	*Equivalent Production*					
		Materials		*Labour*		*Overheads*	
		Units	*%*	*Units*	*%*	*Units*	*%*
Finished goods	25	25	100	25	100	25	100
W.I.P.	25	25	100	15	60	15	60
Total	50	50		40		40	
Cost (₹)	15,500	7,500		2,000		6,000	
Cost per Unit	₹ 350	$\frac{7,500}{50}$ = 150		$\frac{2,000}{40}$ = 50		$\frac{6,000}{40}$ = 150	

Value of W.I.P.		₹
Materials	25 × 150	3,750
Labour	15 × 50	750
Overheads	15 × 150	2,250
		6,750

Cost of Production per unit of finished goods = ₹ 350

Net Realisable Value of finished goods : ₹

Selling Price per unit	450
Less: S&D Exp. (30% of sales)	135
Net Realisable Value	315

Note : Finished goods are to be valued at cost or market value whichever is lower. In this case, net realisable value is lower and hence finished stock is valued at ₹ 315 per unit.

Illustration 50:

Attractive & Co. operates a department producing a component which passes through two processes. During November, 2022 materials for 40,000 components were put into process. There was no opening process stock. 30,000 were finished and passed to next process. Those not passed forward were calculated to be one-half finished as regards wages and overhead. The costs incurred were as follows:

	₹
Direct Material	10,000
Factory Overhead	12,000
Direct Wages	8,000

Of those passed to the second process, 28,000 were completed and passed to finished stores. 200 were scrapped, which was not abnormal. 1,800 remained unfinished in process, one quarter finished as regards wages and overhead. No further process materials costs occur after introduction at the first process unit the end of the second process, when protective packing is applied to the completed components. The process and packing costs incurred at the end of the second process were :

	₹
Direct Material (packing)	4,000
Factory Overhead	4,500
Direct Wages	3,500

Prepare a cost analysis statement for November, 2022 accounting for total costs incurred, analysed into elements of costs for process, covering finished and part-finished items and process accounts.

[CS Inter]

Solution:

Process *I*. Statement of Equivalent Production

Output	*Units*	*Equivalent Units*					
		Materials		*Labour*		*Overheads*	
		Units	*%*	*Units*	*%*	*Units*	*%*
Finished goods	30,000	30,000	100	30,000	100	30,000	100
W.I.P.	10,000	10,000	100	5,000	50	5,000	50
Total	40,000	40,000		35,000		35,000	
Current Cost (₹)	30,000	10,000		8,000		12,000	
Cost per Unit (₹)		$\frac{10,000}{40,000}$		$\frac{8,000}{35,000}$		$\frac{12,000}{35,000}$	
Total cost per units = ₹ 0.82145		= 0.25		= 0.2286		= 0.34285	

Statement of Cost

Particulars		₹
Finished & Passed to next Process	30,000 units at ₹ 0.82145	24,643
Work-in-Progress		
Materials	10,000 × 0.25	2,500
Wages	5,000 × 0.2286	1,143
Overheads	5,000 × 0.34285	1,714
		5,357

Process *II*. Statement of Equivalent Units

Output	*Units*	*Equivalent Units*					
		Materials		*Labour*		*Overheads*	
		Units	*%*	*Units*	*%*	*Units*	*%*
Completed	28,000	28,000	100	28,000	100	28,000	100
Normal loss	200	—	—	—	—	—	—
W.I.P.	1,800	1,800	100	450	25	450	25
Total	30,000	29,800		28,450		28,450	
Current Cost (₹)		24,643		3,500		4,500	
Cost per Unit (₹)		$\frac{24,463}{29,800}$		$\frac{3,500}{24,450}$		$\frac{4,500}{28,400}$	
Total cost per units = ₹ 1.10815		= 0.82695		= 0.123		= 0.1582	

Statement of Cost

		₹
Completed units	28,000 × 1.10815	31,028
Add: Packing Materials		4,000
		35,028
Work-in-Progress		
Materials	1,800 × 0.82,695	1,489
Wages	450 × 0.123	55
Overheads	450 × 0.1582	71
		1,615

Dr. **Process *I* Account** **Cr.**

Particulars	*Units*	₹	*Particulars*	*Units*	₹
To Direct Materials	40,000	10,000	By Transfer to		
To Direct Wages		8,000	Process *II*	30,000	24,643
To Factory Overheads		12,000	By Work-in-Process	10,000	5,357
	40,000	30,000		40,000	30,000

Dr. **Process *II* Account** **Cr.**

Particulars	*Units*	₹	*Particulars*	*Units*	₹
To Process I Materials	30,000	24,643	By Finished stock	28,000	35,028
To Direct Wages (Packing)		4,000	By Normal Loss	200	—
To Direct Wages		3,500	By Work-in-Process	1,800	1,615
To Factory Overhead		4,500			
	30,000	36,643		30,000	36,643

Illustration 51:

The following information is given in respect of Process No. 3 for the month of January, 2022:

Opening stock - 2000 units made up of:

Direct Materials - *I*	₹ 12,350
Direct Materials - *II*	13,200
Direct Labour	17,500
Overheads	11,000

Transferred from Process No. 2: 20,000 units @ ₹ 6.00 per unit.

Transferred to Process No. 4: 17,000 units

Expenditure incurred in Process No. 3:

Direct Materials	₹ 30,000
Direct Labour	60,000
Overheads	60,000

Scrap: 1,000 units - Direct materials 100%, Direct Labour 60%, Overheads, 40%.

Normal Loss 10% of production

Scrapped units realised ₹ 4 per unit

Closing Stock: 4,000 units - Degree of completion: Direct Materials 80%, Direct Labour 60% and Overheads 40%.

Prepare Process No. 3 Account using average price method, along with necessary supporting statements.

[CA Inter]

Solution:

Process 3
(Average Method)
Statement of Equivalent Production

Input		*Output*		*Equivalent Production*							
Particulars	*Units*	*Particulars*	*Units*	*Materials-I*		*Materials-II*		*Labour*		*Overheads*	
				Units	*%*	*Units*	*%*	*Units*	*%*	*Units*	*%*
Op. Stock	2,000	Normal Loss *	1,800	—		—		—		—	
New units Introduced	20,000	Units completed & transferred to Process 4	17,000	17,000	100	17,000	100	17,000	100	17,000	100
		Closing stock	4,000	4,000	100	3,200	80	2,400	60	1,600	40
			22,800	21,000		20,200		19,400		18,600	
		Abnormal gain	800	800	100	800	100	800	100	800	100
	22,000		22,000	20,200		19,400		18,600		17,800	

* 10% of production or 10% of {2,000 + 20,000 – 4,000} = 1,800 units.

Statement of Cost for Each Element

Elements of Cost	*Cost of opening W.I.P.* ₹	*Cost in Process* ₹	*Total Cost* ₹	*Equivalent production (Units)*	*Cost per unit* ₹
Materials- I	13,250				
Cost transferred from Process No. 2 20,000 × ₹ 6		1,20,000			
Less : Scrap realised 1,800 × ₹ 4		(7,200)			
	12,350	1,12,800	1,25,150	20,200	6.1955
Materials- II	13,200	30,000	43,200	19,400	2.2268
Direct Labour	17,500	60,000	77,500	18,600	4.1667
Overheads	11,000	60,000	71,000	17,800	3.9888
Total	54,050	2,62,800	3,16,850		16.5778

Statement of Apportionment of Cost

Items	*Elements*	*Equivalent Production (Units)*	*Cost per unit* ₹	*Cost* ₹	*Total cost* ₹
Units introduced and completed during the period	Materials-*I*	17,000	6.1955	1,05,324	
	Materials-*II*	17,000	2.2268	37,856	
	Labour	17,000	4.1667	70,833	
	Overhead	17,000	3.9888	67,809	2,81,822
Closing Stock	Materials-*I*	4,000	6.1955	24,782	
	Materials-*II*	3,200	2.2268	7,126	
	Labour	2,400	4.1667	10,000	
	Overhead	1,600	3.9888	6,382	48,290
Abnormal Gain	Materials-*I*	800	6.1955	4,956	
	Materials-*II*	800	2.2268	1,782	
	Labour	800	4.1667	3,333	
	Overhead	800	3,9888	3,191	– 13,262
Total cost (Total cost less cost of abnormal gain)					3,16,850

Dr. **Process No. 3 Account** **Cr.**

Particulars	*Units*	*Amount* ₹	*Particulars*	*Units*	*Amount* ₹
To Opening stock	2,000	54,050	By Normal loss	1,800	7,200
To Units introduced	20,000	1,20,000	By Process 4	17,000	2,81,822
To Materials - *II*		30,000	By Closing Stock	4,000	48,290
To Labour		60,000			
To Overheads		60,000			
To Abnormal Gain A/c	800	13,262			
	22,800	3,37,312		22,800	3,37,312

Working Note:

Normal loss is 10% of production *i.e.*, opening stock plus receipts minus closing stock

Production = 2,000 units + 20,000 units – 4,000 units = 18,000 units.

Normal Loss = 10 % of 18,000 = 1,800 units.

Illustration 52:

Following data are available for a product for the month of July:

	Process I	*Process II*
Opening Work-in-Progress	Nil	Nil
Costs incurred during the month		
Direct Materials	₹ 60,000	
Labour	₹ 12,000	₹ 16,000
Factory overheads	₹ 24,000	₹ 20,000
Units of Production		
Received in Process	40,000	36,000
Completed and Transferred	36,000	32,000
Closing Work-in-Progress	2,000	?
Normal Loss in Process	2,000	1,500
Production remaining in Process has to be valued as follows'.		
Materials	100%	
Labour	50%	
Overheads	50%	

There has been no abnormal loss in Process *II*.

Prepare Process Accounts after working out the missing figures and with detailed workings. *[CA Inter]*

Solution:

Process *I*
Statement of Equivalent Production

Particulars	*Units*	*Equivalent Production*					
		Materials		*Labour*		*Overheads*	
		%	*Units*	%	*Units*	%	*Units*
Completed & transferred	36,000	100	36,000	100	36,000	100	36,000
Normal loss in Process	2,000	—	—	—	—	—	—
Closing W.I.P.	2,000	100	2,000	50	1,000	50	1,000

Total	40,000	38,000	37,000	37,000
Costs incurred (₹)	96,000	60,000	12,000	24,000
Cost per unit		60,000	12,000	24,000
		÷ 38,000	÷ 37,000	÷ 37,000
	2.5519	=1.5789	=0.3243	=0.6487

Statement of Cost

			₹
Completed & transferred (36,000 × 2.5519)			91,869
Closing W.I.P.:			
Materials	(2,000 × 1.5789)	3,158	
Labour	(1,000 × 0.3243)	324	
Overheads	(1,000 × 0.6487)	649	4,131
			96,000

Dr. **Process *I* Account** **Cr.**

Particulars	*Units*	₹	*Particulars*	*Units*	₹
To Direct Materials	40,000	60,000	By Normal loss	2,000	—
To Labour		12,000	By Closing W.I.P.	2,000	4,131
To Factory Overheads		24,000	By Output tr. to Process *II*	36,000	91,869
	40,000	96,000		40,000	96,000

Process *II*
Statement of Equivalent Production

Particulars	*Units*	*Equivalent Units*					
		Materials		*Labour*		*Overheads*	
		%	*Units*	%	*Units*	%	*Units*
Completed & transferred	32,000	100	32,000	100	32,000	100	32,000
Normal loss in process	1,500	—	—	—	—	—	—
Closing W.I.P. (Balancing Figure)	2,500	100	2,500	50	1,250	50	1,250
	36,000		34,500		33,250		33,250
Costs incurred (₹)	1,27,869		91,869		16,000		20,000
Cost per unit			91,869		16,000		20,000
			34,500		32,250		33,200
Total Cost per unit ₹ 3.74557			= 2.66287		= 0.4812		= 0.6015

Statement of Cost

			₹
Completed & transferred (32,000 × 3.74557)			1,19,858
Closing W.I.P.:			
Materials	(2,500 × 2.66287)	6,657	
Labour	(1,250 × 0.4812)	602	
Overheads	(1,250 × 0.6015)	752	8,011
			1,27,869

Dr. **Process *II* Account** **Cr.**

Particulars	*Units*	₹	*Particulars*	*Units*	₹
To Output Process *I*	36,000	91,869	By Normal loss	1,500	—
			By Closing W.I.P	2,500	8,011
To Labour		16,000	By Output completed	32,000	1,19,858
To Factory Overheads		20,000			
Total	36,000	1,27,869		36,000	1,27,869

Illustration 53:

Prepare a Statement of Equivalent Production, Cost Statement, Statement of Valuation and Process Account from the following particulars using *FIFO* method :

(a) Opening Work-in-Progress – 900 units at ₹ 4,500
Degree of completion:
Material – 100 %
Labour and Overheads – 60%

(b) Input of materials – 9100 units at ₹ 27,300
Expenses :
Labour – ₹ 12,300
Overheads – ₹ 8,200.

(c) Units scrapped – 1,200 units
Degree of completion :
Material – 100%
Labour and Overheads – 70%

(d) Closing Work-in-Progress – 1000 units
Degree of Completion :
Material – 100%
Labour and Overheads – 80%

(e) Finished units transferred to next process – 7,800

(f) Normal Scrap – 10% of input; scrap realisation @ ₹ 3 per unit.

If the above statements are prepared under average cost method, do you need any more details? *[CMA (Inter)]*

Solution:

Statement of Equivalent Production (Under FIFO Method)

Input units	*Details*	*Output Units*	*Equivalent Units*			
			Materials		*Labour & Overheads*	
			%	*Units*	%	*Units*
900	Opening W.I.P.					
9,100	Units introduced					
	Worked on W.I.P. & Completed	900	—	—	40	360
	Units Worked & Completed	6,900	100	6,900	100	6,900
	Units completed & transferred to next process	7,800				
	Normal loss (10%)	1,000	—	—	—	—

	Abnormal loss	200	100	200	70	140
	Closing W.I.P.	1,000	100	1,000	80	800
1,000		10,000		8,100		8,200

Statement of Cost Per Units

Elements of Cost	*Amount* ₹	*Equivalent units*	*Cost per Equivalent unit* ₹
Materials:	27,300		
Less: Realisation			
from normal scrap 1000 × 3 =	3,000		
	24,300	8,100	3.00
Labour	12,300	8,200	1.50
Overheads	8,200	8,200	1.00
Total	44,800		5.50

Statement of Cost

Items	*Elements*	*Equivalent units*	*Cost per Eq. unit*		*Total Cost* ₹
(i) Opening W.I.P.	Labour	360	1.50	540	
completed	Overheads	360	1.00	360	900
(ii) Units introduced & completed	Total	6,900	5.50	—	37,950
(iii) Abnormal Loss	Material	200	3.00	600	
	Labour	140	1.50	210	
	Overhead	140	1.00	140	950
(iv) Closing W.I.P.	Material	1,000	3.00	3,000	
	Labour	800	1.50	1,200	
	Overhead	800	1.00	800	5,000
					44,800

Dr. **Process Account** **Cr.**

Particulars	*Units*	*Amount* ₹	*Particulars*	*Units*	*Amount* ₹
To Opening W.I.P.	900	4,500	By Transfer to		
To Materials	9,100	27,300	next process	7,800	43,350
To Labour		12,300	By Normal Loss		
To Overheads		8,200	– realisation	1,000	3,000
			By Abnormal loss	200	950
			By Closing W.I.P.	1,000	5,000
	10,000	52,300		10,000	52,300

Working Notes:

(i) Transfer to next process has been calculated as below	₹
Value of opening W.I.P. (900 units)	4,500
Cost incurred for completing opening work-in-progress	900
Units introduced & completed (6,900 units)	37,950
Cost of transfer to next process (7,800 units)	43,350

(ii) Average Cost Method - Under average cost method element-wise cost in respect of opening W.I.P. will be taken up. The average cost is past cost + current cost in respect of materials, labour and overheads separately.

For preparing the above statements under *average cost method*, we require the element-wise cost particulars in respect of opening W.I.P. In the question, the cost of opening W.I.P has been given as ₹ 4,500. Break-up of ₹ 4,500 is required *i.e.* how much material cost, labour cost and overheads separately required in order to work out the average cost (*i.e.* past cost + current cost) in respect of materials, labour and overheads separately.

Illustration 54:

A Chemical Company carries on production operation in two processes. The material first pass through Process *I*, where Product "*A*" is produced.

Following data are given for the month just ended:

Material input quantity	2,00,000 kgs.
Opening Work-in-Progress quantity	
(Material 100% and conversion cost 50% complete)	40,000 kgs.
Work completed quantity	1,60,000 kgs.
Closing Work-in-Progress quantity	
(Material 100% and conversion cost two-thirds complete)	30,000 kgs.
Material input cost	₹ 75,000
Processing cost	₹ 1,02,000
Opening Work-in-Progress cost:	
Material input cost	₹ 20,000
Processing cost	₹ 12,000

Normal process loss in quantity may be assumed to be 20% of material input. It has no realisable value.

Any quantity of Product '*A*' can be sold for ₹ 1.60 per kg.

Alternatively, it can be transferred to Process *II* for further processing and then sold as Product '*AX*' for ₹ 2 per kg. Further materials are added in Process *II*, which yield two kgs. of product '*AX*' for every kg. of Product '*A*' of Process *I*.

Of the 1,60,000 kgs. per month of work completed in Process *I*, 40,000 kgs are sold as Product '*A*' and 1,20,000 kgs. are passed through Process *II* for sale as Product '*AX*'. Process *II* has facilities to handle up to 1,60,000 kgs. of Product '*A*' per month, if required.

The monthly costs incurred in Process *II* (other than the cost of Product '*A*') are:

	1,20,000 kgs. of Product 'A' input	*1,60,000 kgs. of Product A' input*
Materials Cost	1,32,000	1,76,000
Processing Costs	1,20,000	1,40,000

Required:

(i) Determine, using the weighted average cost method, the cost per kg. of Product "A" in Process I and value of both works completed and closing work-in-process for the month just ended.

(ii) Is it worthwhile processing 1,20,000 kgs. of Product "*A*" further?

(iii) Calculate the minimum acceptable selling price per kg., if a potential buyer could be found for additional output of Product "*AX* that could be produced with the remaining Product "*A*' quantity. *[CA PE II}*

Solution:

(i)

Process *I*
Statement of Equivalent Production

Inputs		*Output*			*Equivalent output*			
Particulars	*Units*	*Particulars*	*Units*		*Material*		*Conversion*	
	Kg.		*Kg.*	%	*Units Kg.*	%	*Units Kg.*	
Opening W.I.P	40,000	Normal loss	40,000	-	-	-	-	
New material introduced	2,00,000	Units Introduced & completed	1,60,000	100%	1,60,000	100%	1,60,000	
		Abnormal loss	10,000	100%	10,000	100%	10,000	
		Closing W.I.P.	30,000	100%	30,000	2/3rd	20,000	
	2,40,000		2,40,000		2,00,000		1,90,000	

Process *I*
Statement of Cost for Each Element

Elements of cost	*Cost of opening W.I.P.* ₹	*Cost in Process* ₹	*Total cost* ₹	*Equivalent units Kg.*	*Cost/Unit (Kg.)* ₹
Material	20,000	75,000	95,000	2,00,000	0.475
Conversion cost	12,000	1,02,000	1,14,000	1,90,000	0.600
	32,000	1,77,000	2,09,000		1.075

Statement of Apportionment of Cost

Units completed	*Elements*	*Equivalent units*	*Cost/unit* ₹	*Cost* ₹	*Total cost* ₹
Work completed	Material	1,60,000	0.475	76,000	
	Conversion	1,60,000	0.600	96,000	1,72,000
Closing W.I.P	Material	30,000	0.475	14,250	
	Conversion	20,000	0.600	12,000	26,250

(ii) **Statement showing comparative data** *to decide whether 1,20,000 kg. of product 'A' should be Processed further into 'AX'.*

Alternative I - To sell product '*A*' after Process - *I*	₹	₹
Sales 1,20,000 × 1.60		1,92,000
Less: Cost from Process *I*: 1,20,000 × 1.075		1,29,000
Gain		63,000
Alternative II - Process further into '*AX*'		
Sales 2,40,000 × 2.00		4,80,000
Less: Cost from Process *I* 1,20,000 × 1.075	1,29,000	
Material in Process *II*	1,32,000	
Processing cost in Process *II*	1,20,000	3,81,000
Gain		99,000
Hence company should process further.		
It will increase profit by 99,000 – 63,000	36,000	

(*iii*) **Calculation of minimum selling price/kg:**

Cost of processing remaining 40,000 kg further	₹
Material 1,76,000 – 1,32,000	44,000
Processing cost 1,40,000 – 1,20,000	20,000
Cost from process 1 relating to 40,000 kg. '*A*' (40,000 × 1.075)	43,000
Benefit foregone if 40,000 kg '*A*' are further processed 40,000 (1.60 – 1.075)	21,000
Total cost	1,28,000
Additional quantity of product '*AX* (40,000 × 2)	80,000
∴ Minimum selling price $\left(\frac{1,28,000}{80,000}\right)$	₹ 1.60

Illustration 55:

A company produces a component, which passes through two processes. During the month of April, 2022, materials for 40,000 components were put into Process *I* of which 30,000 were completed and transferred to Process *II*. Those not transferred to Process *II* were 100% complete as to materials cost and 50% complete as to labour and overheads cost. The Process I costs incurred were as follows:

Direct Materials	₹ 15,000
Direct Wages	₹ 18,000
Factory Overheads	₹ 12,000

Of those transferred to Process *II*, 28,000 units were completed and transferred to finished goods stores. There was a normal loss with no salvage value of 200 units in Process *II*. There were 1,800 units, remained unfinished in the process with 100% complete as to materials and 25% complete as regard to wages and overheads.

No further process material costs occur after introduction at the first process until the end of the second process, when protective packing is applied to the completed components. The process and packing costs incurred at the end of the Process *II* were:

Packing Materials	₹ 4,000
Direct Wages	₹ 3,500
Factory Overheads	₹ 4,500

Required:

(i) Prepare Statement of Equivalent Production, Cost per unit and Process *I* A/c

(ii) Prepare Statement of Equivalent Production, Cost per unit and Process *II* A/c

[CA PE II]

Solution:

(i) **Process *I***

Statement of Equivalent Production and Cost

	Material	*Labour and Overheads*	*Total*
Units completed (Units)	30,000	30,000	
Closing Inventory (Units)	(100%) 10,000	(50%) 5,000	
Equivalent Production (Units)	40,000	35,000	
	₹	₹	₹
Current Process Cost	15,000	30,000	45,000

Cost/unit	0.375	0.8571	
Closing inventory cost	3,750	4,286	(8,036)
Material transferred to Process *II*			36,964

Dr. **Process *I* Account** **Cr.**

Particulars	*Units*	₹	*Particulars*	*Units*	₹
To Direct material	40,000	15,000	By Process *II* A/c	30,000	36,964
To Direct wages		18,000	By Work-in-progress		
To Factory overheads		12,000	inventory	10,000	8,036
	40,000	45,000		40,000	45,000

(*ii*) **Process *II***

Statement of Equivalent Production and Cost

		Material		*Labour and Overheads*	*Total*
Units completed		28,000		28,000	
Closing Inventory (unit)	(1,000 %)	1,800	(25%)	450	
Equivalent Production (units)		29,800		28,450	
Process cost (₹)		36,964		8,000	44,964
Cost/unit (₹)		1.24		0.2812	
Closing inventory (₹)		2,232		127	(2,359)
					42,605
Packing material cost					4,000
					₹ 46,605

Dr. **Process *II* Account** **Cr.**

Particulars	*Units*	₹	*Particulars*	*Units*	₹
To Material			By Finished Goods		
transferred from			Stores A/c	28,000	46,605
Process *I*	30,000	36,964	By W.I.P. stock	1,800	2,359
To Packing Material		4,000	By Normal loss	200	
To Direct Wages		3,500			
To Factory Overheads		4,500			
	30,000	48,964		30,000	48,964

Illustration 56:

Following details are related to the work done in Process '*A*' of *XYZ* Company during the month of March, 2022:

	₹
Opening work-in-progress (2,000 units)	
Materials	80,000
Labour	15,000
Overheads	45,000
Materials introduced in Process 'A' (38,000 units)	14,80,000
Direct labour	3,59,000
Overheads	10,77,000
Units scrapped: 3,000 units	
Degree of completion:	
Materials	100%
Labour and overheads	80%

Closing work-in-progress : 2,000 units
Degree of Completion:
Materials 100%
Labour and overheads 80%
Units finished and transferred to Process *'B'* : 35,000
Normal Loss:
5% of total input including opening work-in-progress
Scrapped units fetch ₹ 20 per piece.

You are required to prepare:

(i) Statement of Equivalent Production;
(ii) Statement of Cost;
(iii) Statement of Distribution Cost; and
(iv) Process *'A'* Account, Normal and Abnormal Loss Accounts.

[CA PE II]

Solution:

(i) **Statement of Equivalent Production**

Input	*Units*	*Output*	*Units*	*Equivalent production*			
				Material		*Labour & Overheads*	
	%	*Units*		*%*	*Unit*	*%*	*Unit*
Opening W.I.P.	2,000	Completed and transferred to Process *'B'*	35,000	100	35,000	100	35,000
Units introduced	38,000	Normal loss (5% of 40,000)	2,000	—	—	—	—
		Abnormal loss	1,000	100	1,000	80	800
		Closing W.I.P.	2,000	100	2,000	80	1,600
	40,000		40,000		38,000		37,400

(ii) **Statement of Cost**

Details	*Cost at the beginning of process* ₹	*Cost added* ₹	*Total cost* ₹	*Equivalent Units* ₹	*Cost per unit* ₹
Material	80,000	14,80,000	15,60,000		
Less: Value of normal loss (20 × 2,000)			40,000		
			15,20,000	38,000	40
Labour	15,000	3,59,000	3,74,000	37,400	10
Overheads	45,000	10,77,000	11,22,000	37,400	30
					80

(iii) **Statement of Distribution of Cost:**

(a) Completed and transferred to Process '*B*' = 35,000 units @ ₹ 80 = ₹ 28,00,000

(b) Abnormal loss: 1,000 units:

Materials 1,000 units @40	= ₹ 40,000
Labour and Overheads 800 units @40	= ₹ 32,000
	₹ 72,000

(c) Closing W.I.P. : 2,000 units

Materials 2,000 units @ 40	= ₹ 80,000
Labour and Overheads 1,6000 units @40	= ₹ 64,000
	₹ 1,44,000

Dr. *(iv)* **Process 'A' Account** **Cr.**

Particulars	*Units*	*Amount*	*Particulars*	*Units*	*Amount*
To Opening W.I.P	2,000	1,40,000*	By Normal Loss	2,000	40,000
To Material introduced	38,000	14,80,000	By Abnormal Loss	1,000	72,000
To Direct labour		3,59,000	By Process '*B*' A/c transfer to next Process	35,000	28,00,000
To Overheads		10,77,000	By Closing W.I.P	2,000	1,44,000
	40,000	30,56,000		40,000	30,56,000

* Materials + Labour + Overheads = (80,000 + 15,000 + 45,000) = ₹ 1,40,000.

Dr. **Normal Loss Account** **Cr.**

Particulars	*Units*	*Amount*	*Particulars*	*Units*	*Amount*
To Process '*A*' A/c	2,000	40,000	By Bank A/c	2,000	40,000
	2,000	40,000		2,000	40,000

Dr. **Abnormal Loss Account** **Cr**

Particulars	*Units*	*Amount*	*Particulars*	*Units*	*Amount*
To Process '*A*' A/c	1,000	72,000	By Bank A/c	1,000	20,000
			By Costing Profit and Loss A/c		52,000
	1,000	72,000		1,000	72,000

Illustration 57:

M J Pvt. Ltd. produced a product " *SKY*" which passes through two processes, viz. Process- *A* and Process- *B*. The details for the year ending 31st March, 2022 are as follows:

Particulars	*Process A*	*Process B*
40,000 Units introduced at a cost of	₹ 3,60,000	—
Materials Consumed	₹ 2,42,000	₹ 2,25,000
Direct Wages	₹ 2,58,000	₹ 1,90,000
Manufacturing Expenses	₹ 1,96,000	₹ 1,23,720
Output in Units	37,000	27,000
Normal Wastage of Input	5%	10%
Scrap Value (per unit)	₹ 15	₹ 20
Selling Price (per unit)	₹ 37	₹ 61

Additional Information:

(*a*) 80% of the output of Process- *A*,was passed on to the next process and the balance was sold.

The entire output of Process- *B* was sold.

(*b*) Indirect expenses for the year was ₹ 4,48,080.

(*c*) It is assumed that Process-*A* and Process- *B* are not responsibility center.

Required:

(*i*) Prepare Process- *A* and Process- *B* Account.

(*ii*) Prepare Profit & Loss Account showing the net profit/net loss for the year.

[CA Inter]

Solution

(*i*) Process *A* Account

Particulars	*Units*	*Amount (₹)*	*Particulars*	*Units*	*Amount (₹)*
To Input	40,000	3,60,000	By Normal wastage		
To Materials	—	2,42,000	(2,000 units × ₹ 15)	2,000	30,000
To Direct Wages	—	2,58,000	By Abnormal loss A/c		
To Manufacturing Exp.	—	1,96,000	(1,000 units × ₹ 27)	1,000	27,000
			By Process- *B* (29,600 units × ₹ 27)	29,600	7,99,200
			By Profit & Loss A/c (7,400 units × ₹ 27)	7,400	1,99,800
	40,000	10,56,000		40,000	10,56,000

$$\text{Cost per unit} = \frac{₹10,56,000 - ₹30,000}{₹40,000 \text{ unit} - 2,000 \text{ units}} = ₹ 27 \text{ per unit}$$

Normal wastage = 40,000 units × 5 % = 2,000 units

Abnormal loss = 40,000 units – (37,000 units + 2,000 units)
= 1,000 units

Transfer to Process -*B* = 37,000 units × 80% = 29,600 units

Sales = 37,000 units × 20% = 7,400 units

Dr. Process *B* Account Cr.

Particulars	*Units*	*Amount (₹)*	*Particulars*	*Units*	*Amount (₹)*
To Process- *A* A/c	29,600	7,99,200	By Normal wastage		
To Materials	—	2,25,000	(2,960 units × ₹ 20)	2,960	59,200
To Direct Wages	—	1,90,000	By Profit & Loss A/c		
To Manufacturing Exp.	—	1,23,720	(27,000 Units × 48)	27,000	12,96,000
To Abnormal Gain A/c (360 unit × ₹ 48)	360	17,280			
	29,960	13,55,200		29,960	13,55,200

$$\text{Cost per unit} = \frac{₹13,37,920 - ₹\ 59,200}{₹29,600\text{units} - 2,960\text{units}} = ₹48 \text{ per unit}$$

Normal wastage = 29,600 units × 10% = 2,960 units
Abnormal gain = (27,000 units + 2,960 units) – 29,600 units
= 360 units

(*ii*) **Profit & Loss Account**

Particulars	*Amount (₹)*	*Particulars*	*Amount (₹)*
To Process- *A* A/c	1,99,800	By Sales:	
To Process- *B* A/c	12,96,000	– Process- *A*	
To Abnormal loss A/c	12,000	(7,400 units × ₹ 37)	2,73,800
To Indirect Expenses	4,48,080	– Process- *B*	
		(27,000 units × ₹ 61)	16,47,000
		By Abnormal Gain A/c	10,080
		By Net loss	25,000
	19,55,880		19,55,880

Working Notes:

Dr. **Normal Wastage (Loss) Account** **Cr.**

Particulars	*Units*	*Amount (₹)*	*Particulars*	*Units*	*Amount (₹)*
To Process- *A* A/c	2,000	30,000	By Abnormal Gain A/c		
To Process- *B* A/c	2,960	59,200	(360 units × ₹ 20)	360	7,200
			By Bank (Sales)	4,600	82,000
	4,960	89,200		4,960	89,200

Dr. **Abnormal Loss Account** **Cr.**

Particulars	*Units*	*Amount (₹)*	*Particulars*	*Units*	*Amount (₹)*
To Process- *A* A/c	1,000	27,000	By Bank A/c (1,000		
			units × ₹ 15)	1,000	15,000
			By Profit & Loss A/c	—	12,000
	1,000	27,000		1,000	27,000

Dr. **Abnormal Gain Account** **Cr.**

Particulars	*Units*	*Amount (₹)*	*Particulars*	*Units*	*Amount (₹)*
To Normal loss A/c (360			By Process- *B* A/c	360	17,280
units × ₹ 20)	360	7,200			
To Profit & Loss A/c		10,080			
	360	17,280		360	17,280

Illustration 58:

Alpha Ltd. is engaged in the production of a product *A* which passes through 3 different process - Process *P*, Process *Q* and Process *R*. The following data relating to cost and output is obtained from the books of accounts for the month of April 2017:

Particulars	*Process P (₹)*	*Process Q (₹)*	*Process R (₹)*
Direct Materials	38,000	42,500	42,880
Direct Labour	30,000	40,000	50,000

Production overheads of ₹ 90,000 were recovered as percentage of direct labour.

10,000 kg. of raw materials @ ₹ 5 per Kg. was issued to Process *P*. There was no stock of materials or work in Process. The entire output of each process passes directly to the next process and finally to warehouse. There is normal wastage , in processing , of 10%. The scare value of wastage is ₹ 1 per kg. The output of each process transferred to next process and finally to warehouse are as under:

Process *P* = 9,000 kg
Process *Q* = 8,200 Kg
Process *R* = 7,300 Kg

The company fixes selling price of the end product in such a way so as to yield a profit of 25 % on selling price.

Prepare Process *P, Q* and *R* accounts. Also calculate selling price per unit of end product.

Solution:

Dr. **Process *P* Account** **Cr.**

Particulars	*Units (Kg)*	*Amount (₹)*	*Particulars*	*Units (Kg)*	*Amount (₹)*
To Raw Material (₹ 5 × 10,000 Kg)	10,000	50,000	By Normal loss (10% of 10,000) × ₹ 1	1,000	1,000
To Direct Material	—	38,000	By Process - *Q* A/c		
To Direct Labour	—	30,000	(₹ 15.50 × 9,000 Kgs)	9,000	1,39,500
To Production OH (90,000 × 3/12)		22,500			
	10,000	1,40,500		10,000	1,40,500

Cost Per unit of completed units

$$= \frac{\text{Total Cost} - \text{Realisation value from normal loss}}{\text{Input units} - \text{Normal loss units}}$$

$$= \frac{₹1,40,500 - ₹1,000}{10000 \text{ kgs} - 1000 \text{ kgs}}$$

$$= \frac{₹1,39,500}{9000 \text{ kg}}$$

= ₹ 15.50

Dr. **Process *Q* Account** **Cr.**

Particulars	*Units (Kg)*	*(₹)*	*Particulars*	*Units (Kg)*	*(₹)*
To Process- *Q* A/c	9,000	1,39,500	By Normal loss		
To Direct Material	—	42,500	(10% of 9,000 kg × ₹ 1)	900	900
To Direct Labour	—	40,000	By Process – *R* A/c		
To Production OH			(₹ 31 × 8,200 kg.)	8,200	2,54,200
(90,000 × 4/12)	—	30,000			
To Abnormal Gain					
(₹ 31 × 100 Kgs)	100	3,100			
	9,100	2,55,100		9,100	2,55,100

Cost Per unit of Completed units and abnormal Gain

$$= \frac{\text{Total cost} - \text{Realisation value from normal loss}}{\text{Input units} - \text{Normal loss units}}$$

$$= \frac{₹\ 2{,}52{,}000 - ₹\ 900}{9000\ \text{kgs} - 900\ \text{kgs}}$$

$$= \frac{₹ 2{,}51{,}100}{8100\ \text{kgs}}$$

= ₹ 31

Dr. **Process *R* Account** **Cr.**

Particulars	*Units (Kg)*	*(₹)*	*Particulars*	*Units (Kg)*	*(₹)*
To Process- *Q* A/c	8,200	2,54,200	By Normal loss		
To Direct Material	—	42,880	(10% of 8,200 kg × ₹ 1)	820	820
To Direct Labour	—	50,000	By Finished Goods		
To Production OH			(₹ 52 × 7,300 Kg)	7,300	3,79,600
(90,000 × 4/12)	—	37,500	By Abnormal loss		
			(₹ 52 × 80 Kg)	80	4,160
	8,200	3,84,580		8,200	3,84,580

Cost per unit of Completed unit and abnormal loss :

$$= \frac{\text{Total cost} - \text{Realisation Value from N.L}}{\text{Input units} - \text{Normal loss units}} = \frac{₹\ 3{,}84{,}580 - ₹\ 820}{8200\text{kgs} - 820\text{kgs}}$$

= ₹ 52

Calculation of Selling Price

	Cost of Product		
	(52 × 7,300 Kg)	=	₹ 3,79,600.00
+	Profit	=	₹ 1,26,533.33
	Sales	=	5,06,133.33
÷	No. of Kg	=	7,300 Kg
	Selling Price per kg.	=	₹ 69.33

Illustration 59:

A product passes through two distinct processes before completion.

Following information is available in this respect:

	Process - 1	*Process - 2*
Raw materials used	10,000 units	—
Raw materials cost (per unit)	₹ 75	—
Transfer to next Process/Finished Good	9,000 units	8,200 units
Normal loss (on input)	5%	10%
Direct Wages	₹ 3,00,000	₹ 5,60,000
Direct expenses	50 % of direct wages	65 % of direct wages
Manufacturing overheads	25 % of direct wages	15 % of direct wages
Realisable value of scrap (per unit)	₹ 13.50	₹ 145

8,000 units of finished goods were sold at a profit of 15 % on cost. There was no opening and closing stock of work-in-progress

Prepare:

(*i*) Process - 1 and Process - 2 Accounts
(*ii*) Finished Goods Account
(*iii*) Normal Loss Account
(*iv*) Abnormal Loss Account
(*v*) Abnormal Gain Account

Solution:

(*i*) Dr. **Process- 1 Account** **Cr.**

Particulars	*Units*	*(₹)*	*Particulars*	*Units*	*(₹)*
To Raw Material used (₹ 75 00 × 10,000)	10,000	7,50,000	By Normal Loss (5 % of 10,000) × 13.50	500	6,750
To Direct Wages	—	3,00,000	By Process - 2 A/c		
To Direct Exps.	—	1,50,000	(₹ 133.5 × 9,000 units)	9,000	12,01,500
To Manufacturing Overheads	—	75,000	By Abnormal loss (₹ 133.5 × 500 units)	500	66,750
	10,000	12,75,000		10,000	12,75,000

Cost per unit of completed units and abnormal loss:

$$= \frac{\text{Total Cost} - \text{Realisation Value from normal loss}}{\text{Input units} - \text{Normal loss units}}$$

$$= \frac{₹12,75,000 - ₹6,750}{10,000 \text{ units} - 500 \text{ units}} = \frac{₹12,68,250}{9,500 \text{ units}} = ₹ 133.50$$

Dr. **Process- 2 Account** **Cr.**

Particulars	*Units*	*(₹)*	*Particulars*	*Units*	*(₹)*
To Process - 1 A/c	9,000	12,01,500	By Normal loss (10% of 9,000 units) × 145	900	1,30,500
To Direct Wages	—	5,60,000	By Finished Stock A/c		
To Direct Exps.	—	3,64,000	(₹ 256.67 × 8,200 units)	8,200	21,04,667
To Manufacturing Overheads	—	84,000			
To Abnormal gain (₹ 256.67 × 100 units)	100	25,667			
	9,100	22,35,167		9,100	22,35,167

Cost per unit of completed units and abnormal gain

$$= \frac{\text{Total Cost} - \text{Realisation value from normal loss}}{\text{Inputunits} - \text{Normal loss units}}$$

$$= \frac{₹22,09,500 - ₹1,30,500}{9,000 \text{ units} - 900 \text{ units}} = \frac{₹20,79,000}{8,100 \text{ units}} = ₹ 256.67$$

(*ii*) Dr. **Finished Goods Account** **Cr.**

Particulars	*Units*	*(₹)*	*Particulars*	*Units*	*(₹)*
To Process - 2 A/c	8,200	21,04,667	By Cost of Sales (₹ 256.67 × 8,000 units)	8,000	20,53,333
			By Bal. c/d	200	51,334
	8,200	21,04,667		8,200	21,04,667

(*iii*) Normal Loss Account

Particulars	*Units*	*(₹)*	*Particulars*	*Units*	*(₹)*
To Process - 1 A/c	500	6,750	By Cost		
To Process - 2 A/c	900	1,30,500	Ledger Control A/c	1,400	1,37,250
	1,400	1,37,250		1,400	1,37,250

(*iv*) Abnormal loss Account

Particulars	*Units*	*(₹)*	*Particulars*	*Units*	*(₹)*
To Process - 1 A/c	500	66,750	By Cost Ledger		
			Control A/c	500	60,000
			By Costing P&L A/c	—	6,750
	500	66,750		500	66,750

(*v*) Abnormal Gain Account

Particulars	*Units*	*(₹)*	*Particulars*	*Units*	*(₹)*
To Cost Ledger Control			By Process -2 A/c	100	25,667
A/c	100	11,167			
To Costing P&L A/c	—	14,500			
	100	25,667		100	25,667

Illustration 60:

The following information relate to Process *A*:

(*i*) Opening Work-in-Progress — 8,000 units at ₹ 75,000
Degree of Completion :
Material — 100%
Labour and Overheads — 60%
(*ii*) Input 1,82,000 units at — ₹ 7,37,500
(*iii*) Wages paid — ₹ 3,40,600
(*iv*) Overheads paid — ₹ 1,70,300
(*v*) Units Scrapped — 14,000
Degree of completion :
Material — 100%
Wages and Overheads — 80%
(*vi*) Closing Work-in-Progress — 18,000 units
Degree of Completion:
Material — 100%
Wages and Overheads — 70%
(*vii*) Units completed and transferred 1,58,000 to next process
(*viii*) Normal loss 5% of total input including opening WIP
(*ix*) Scrap value is ₹ 5 per unit to be adjusted out of direct materials cost

You are required to compare on the basis of FIFO basis:

(*i*) Equivalent Production
(*ii*) Cost Per Unit
(*iii*) Value of Units transferred to next process.

[CA Inter]

Solution:

(*i*) Statement of Equivalent Production (Under FIFO Method)

Input		*Output*		*Equivalent Production*			
Particulars	*Units*	*Particulars*	*Units*	*Materials*		*Labour & Overheads*	
				(%)	*Units*	*(%)*	*Units*
Opening W.I.P.	8,000	Transfer to next Process:					
Introduced	1,82,000	Opening W.I.P completed	8,000	—	—	40	3,200
		Introduced & completed	1,50,000	100	1,50,000	100	1,50,000
		Normal loss 5 %					
		(8,000 + 1,82,000)	9,500	—	—	—	—
		Abnormal loss	4,500	100	4,500	80	3,600
		Closing W.I.P	18,000	100	18,000	70	12,600
	1,90,000		1,90,000		1,72,500		1,69,400

(*ii*) Computation of Cost per unit

Particulars	*Materials (₹)*	*Labour (₹)*	*Overheads (₹)*
Input of Materials	7,37,500	—	—
Expenses	—	3,40,600	1,70,300
Total	7,37,500	3,40,600	1,70,300
Less : Sale of Scrap (9,500 unit × ₹ 5)	(47,500)	—	—
Net cost	6,90,000	34,06,000	1,70,300
Equivalent Units	1,72,500	1,69,400	1,69,400
Cost Per Unit	4.0000	2.0106	1.0053

Total cots per unit = ₹ (4.0000 + 2.0106 + 1.0053) = ₹ 7.0159

(*iii*) Value of Units Transferred to Next Process

Particulars	*Amount (₹)*	*Amount (₹)*
Opening W.I.P.	75,000	
Add : Labour (3,200 units × ₹ 2.0106)	6,434	
Overheads (3,200 units × ₹ 1.0053)	3,217	84,651
New introduced (1,50,000 units × ₹ 7.0159)		10,52,385
		11,37,036

Illustration 61:

The following information is furnished by *ABC* Company for Process - *II* of its manufacturing activity for the month of April 2022:

(*i*)	Opening Work-in-Progress	Nil
(*ii*)	Units transferred from Process- *I*	55,000 units at ₹ 3,27,800
(*iii*)	Expenditure debited to Process - *II*	
	Consumables	₹ 1,57,200
	Labour	₹ 1,04,000
	Overheads	₹ 52,000

(*iv*) Units transferred to Process - *III* ₹ 51,000 units
(*v*) Closing W.I.P. - 2,000 units (Degree of completion):
Consumable - 80%
Labour - 60%
Overheads - 60%
(*vi*) Units scrapped - 2000 units, scrapped units were sold at ₹ 5 per unit.
(*vii*) Normal loss 4 % of units introduced

Your are required to :
(*i*) Prepare a Statement of Equivalent Production.
(*ii*) Determine the cost per unit.
(*iii*) Determine the value of Work-in-Process and units transferred to Process- *III*

[CA Inter]

Solution:

(*i*) Statement for Equivalent Production

Particulars	*Input*	*Particulars*	*Output*	*Material A*		*Consumable*		*Labour & Overheads*	
				(%)	*E.U.*	*(%)*	*E.U.*	*(%)*	*E.U.*
Opening W.I.P.	0	Opening W.I.P.	0	—	—	—	—	—	—
Fresh	55,000	Fresh units	51,000	100%	51,000	100%	51,000	100%	51,000
		Total transfer	51,000	—	51,000	—	51,000	—	51,000
		Normal loss	2,200	—	—	—	—	—	—
		Abnormal gain	(200)	100%	(200)	100%	(200)	100%	(200)
		Closing W.I.P.	2,000	100%	2,000	80%	1,600	60%	1,200
Total	55,000	Total	55,000		52,800		52,400		52,000

(*ii*) Determination of Cost per Unit

	Particulars	*Amount (₹)*	*Units*	*Per Unit (₹)*
(*i*)	**Direct Materials (Consumables):**			
	Value of units transferred from Process-*I*	3,27,800		
	Less: Value of Normal loss (2,200 units × ₹ 5)	(11,000)		
		3,16,800	52,800	6.00
(*ii*)	Consumables added in Process-*II*	1,57,200	52,400	3.00
(*iii*)	Labour	1,04,000	52,000	2.00
(*iv*)	Overheads	52,000	52,000	1.00
	Total Cost per equivalent unit			12.00

(*iii*) Determination of value of Work-in-Process and units Transferred to Process- *III*

Particulars	*Units*	*Rate (₹)*	*Amount (₹)*
Value of Closing W.I.P:			
Materials from Process- *I*	2,000	6.00	12,000
Consumables	1,600	3.00	4,800
Labour	1,200	2.00	2,400

Overheads	1,200	1.00	1,200
			20,400
Value of Units transferred to Process - *III*	51,000	12.00	6,12,000

Illustration 62:

Following details are related to the work done in Process-*I* by *ABC* Ltd. during the month of May 2022:

			₹
Opening work in process (3,000 units)			
Materials			1,80,500
Labour			32,400
Overheads			90,000
Materials introduced in Process-*I* (42,000 units)			36,04,000
Labour			4,50,000
Overheads			15,18,000
Units Scrapped	:	4,800 units	
Degree of completion			
Materials	:	100%	
Labour & overheads	:	70%	
Closing Work-in-process	:	4,200 units	
Degree of completion	:		
Materials	:	100%	
Labour & overheads	:	50%	

Units finished and transferred to Process-*II* : 36,000 units

Normal loss :

4 % of total input including opening work-in-process

Scrapped units fetch ₹ 62.50 per piece.

Prepare:

(*i*) Statement of Equivalent Production.
(*ii*) Statement of Cost per Equivalent unit.
(*iii*) Process- *I* A/c
(*iv*) Normal Loss Account and
(*v*) Abnormal Loss Account *[CA Inter]*

Solution:

(*i*) Statement of Equivalent Production (Weighted Average method)

Particulars	*Input Units*	*Particulars*	*Output Units*	*Equivalent Production*			
				Material A		*Labour & O.H.*	
				(%)	*Units*	*(%)*	*Units*
Opening W.I.P	3,000	Completed and transferred to Process- *II*	36,000	100	36,000	100	36,000
Units introduced	42,000	Normal Loss (4% of 45,000 units)	1,800	—	—	—	—

		Abnormal loss (Balancing figure)	3,000	100	3,000	70	2,100
		Closing W.I.P	4,200	100	4,200	50	2,100
	45,000		45,000		43,200		40,200

(*ii*) Statement Showing Cost for Each Element

Particulars	*Materials (₹)*	*Labour (₹)*	*Overhead (₹)*	*Total (₹)*
Cost of opening work-in-process	1,80,500	32,400	90,000	3,02,900
Cost incurred during the month	36,04,000	4,50,000	15,18,000	55,72,000
Less: Realisable Value of normal scrap (₹ 62.50 × 1,800 units)	(1,12,500)	—	—	(1,12,500)
Total cost : (*A*)	36,72,000	4,82,400	16,08,000	57,62,400
Equivalent units : (*B*)	43,200	40,200	40,200	
Cost per equivalent unit: (*C*) = (*A* ÷ *B*)	85.00	12.00	40.00	137.00

Statement of Distribution of cost

Particulars	*Amount (₹)*	*Amount (₹)*
1. Value of units completed and transferred:		
(36,000 units × ₹ 137)		49,32,000
2. Value of Abnormal Loss:		
– Materials (3,000 units × ₹ 85)	2,55,000	
– Labour (2, 100 units × ₹ 12)	25,200	
– Overheads (2,100 units × ₹ 40)	84,000	3,64,200
3. Value of Closing W.I.P.:		
– Materials (4,200 units × ₹ 85)	3,57,000	
– Labour (2,100 ×₹ 12)	25,200	
– Overheads (2,100 units × ₹ 40)	84,000	4,66,200

(*iii*) Dr. Process - *I* Account Cr.

Particulars	*Units*	*(₹)*	*Particulars*	*Units*	*(₹)*
To Opening W.I.P.					
Materials	3,000	1,80,500	By Normal Loss (₹ 62.5		
Labour	—	32,400	× 1,800 units)	1,800	1,12,500
Overheads	—	90,000	By Abnormal loss	3,000	3,64,200
To Materials introduced	42,000	36,04,000	By Process - *I* A/c	36,000	49,32,000
To Labour		4,50,000	By Closing W.I.P	4,200	4,66,200
To Overheads		15,18,000			
	45,000	58,/4,900		45,00	58,74,900

(*iv*) Dr. Normal Loss Account Cr.

Particulars	*Units*	*(₹)*	*Particulars*	*Units*	*(₹) 1*
To Process - 1 A/c	1,800	1,12,500	By Ledger Control A/c	1,800	1,12,500
	1,800	1,12,500		1,800	1,12,500

(*v*) **Dr.** **Abnormal Loss Account** **Cr.**

Particulars	*Units*	*(₹)*	*Particulars*	*Units*	*(₹) 1*
To Process - 1 A/c	3,000	3,64,200	By Cost Ledger Control A/c (₹ 62.5 × 3,000 units)	3,000	1,87,500
			By Costing Profit & Loss A/c (Bal. Figure)		1,76,700
	3,000	3,64,200		3,000	3,64,200

Illustration 63:

KMR Ltd. produces *AY*, which passes through three processes "*XM*" , "*YM*" and "*ZM*". The output of process "*XM*" and "*YM*" is transferred to next process at cost plus 20 per cent each on transfer prices and the output of Process "*ZM*" is transferred to finished a stock at a profit of 25 per cent on transfer price. The following information are available in respect of the year ending 31st March, 2022:

Particulars	*Process - XM (₹)*	*Process - YM (₹)*	*Process - ZM (₹)*	*Finished Stock (₹)*
Opening Stock	30,000	54,000	80,000	90,000
Material	1,60,000	1,30,000	1,00,000	—
Wages	2,50,000	2,16,000	1,84,000	—
Manufacturing Overheads	1,92,000	1,44,000	1,33,000	—
Closing Stock	40,000	64,000	78,000	1,00,000
Inter process profit included in Opening Stock	Nil	8,000	20,000	40,000

Stock in process is valued at prime cost. The finished stock is valued at the price at which received from process "*ZM*". Sales of the finished stock during the period was ₹ 28,00,000.

You are required to prepare:

(*i*) All process accounts and

(*ii*) Finished stock account showing profit element at each stage.

[CA Inter]

Solution:

Dr. **Process "*XM*" Account** **Cr.**

Particulars	*Cost*	*Profit*	*Total (₹)*	*Particulars*	*Cost*	*Profit*	*Total (₹)*
To Opening Stock	30,000	–	30,000	By Process			
To Material	1,60,000	–	1,60,000	*YM* A/c	5,92,000	1,48,000	7,40,000
To Wages	2,50,000	–	2,50,000				
Prime Cost	4,40,000	–	4,40,000				
(–) Closing Stock	(40,000)	–	(40,000)				
Net Balance	4,00,000	–	4,00,000				
To Manu. OH	1,92,000	–	1,92,000				
Total Cost	5,92,000	–	5,92,000				
To Costing P&L A/c (20% on Cost)	–	1,48,000	1,48,000				
	5,92,000	1,48,000	7,40,000		5,92,000	1,48,000	7,40,000

Dr. **Process "*YM*" Account** **Cr.**

Particulars	*Cost*	*Profit*	*Total* (₹)	*Particulars*	*Cost*	*Profit*	*Total* (₹)
To Opening Stock	46,000	8,000	54,000	By Process "*ZM*" A/c	10,72,758	4,52,242	15,25,000
To Process "*XM*" A/c	5,92,000	1,48,000	7,40,000				
To Materials	1,30,000	—	1,30,000				
To Wages	2,16,000	—	2,16,000				
Prime Cost	9,84,000	1,56,000	11,40,000				
(–) Closing Stock Cost = (64,000 × 9,84,000 ÷ 11,40,000)	(55,242)	(8,758)	(64,000)				
Net Balance	9,28,758	1,47,242	10,76,000				
To Manu. OH	1,44,000	—	1,44,000				
Total Cost	10,72,758	1,47,242	12,20,000				
To Costing P&L A/c (25% on Cost)		3,05,000	3,05,000				
	10,72,758	4,52,242	15,25,000		10,72,758	4,52,242	15,25,000

Dr. **Finished Stock Account** **Cr.**

Particulars	*Cost* (₹)	*Profit* (₹)	*Total* (₹)	*Particulars*	*Cost* (₹)	*Profit* (₹)	*Total* (₹)
To Opening Stock	50,000	40,000	90,000	By Costing P&L A/c (Transfer)	14,83,725	13,16,275	20,00,000
To Process "*ZM*" A/c	14,91,258	11,00,742	25,92,000				
Total	15,41,258	11,40,742	26,82,000				
Less: Closing Stock	57,533	42,407	1,00,000				
	14,83,725	10,98,000	25,82,000				
To Closing Profit and Loss A/c (Profit) (Balancing Figure)	—	2,18,000	2,18,000				
	14,83,725	13,16,275	28,00,000		14,83,725	13,16,275	28,00,000

Calculation of amount of unrealizes profit on closing stock:

"*XM*" = Nil

Process "*YM*" = $\frac{₹1,56,000}{₹11,40,000}$ × ₹ 64,000 = ₹ 8,758.

Process "*ZM*" = $\frac{₹4,72,242}{₹18,89,000}$ × ₹ 78,000 = ₹ 19,500.

Finished Stock = $\frac{₹11,00,742}{₹25,92,000}$ × ₹ 1,00,000 = ₹ 42,467.

Note : Unrealised profit on closing finished stock can also be calculated on the basis of Average cost.

Illustration 64:

K Ltd. Produces a product EMM which passes through two processes before it is completed and transferred to finished stock. The following data relate to May 2022:

Particulars	*Process*		*Finished stock*
	A (₹)	*B* (₹)	(₹)
Opening Stock	5,000	5,500	10,000
Direct Materials	9,000	9,500	
Direct Wages	5,000	6,000	
Factory Overheads	4,600	2,030	
Closing Stock	2,000	2,490	5,000
Inter-process profit included in opening stock		1,000	4,000

Output of Process *A* is transferred to Process *B* at 25% profit on the transfer price and output of Process *B* is transferred to finished stock at 20 % profit on the transfer price. Stock in process is valued at prime cost. Finished stock is valued at the price at which it is received from Process *B*. Sales during the period are ₹ 75,000.

Prepare the Process cost accounts and Finished stock account showing the profit element at each stage. *[CA Inter]*

Solution:

Dr. **Process Account** **Cr.**

Particulars	*Total* (₹)	*Cost* (₹)	*Profit* (₹)	*Particulars*	*Total* (₹)	*Cost* (₹)	*Profit* (₹)
To Opening Stock	5,000	5,000	–	By Process *B* A/c	28,800	21,600	7,200
To Direct Materials	9,000	9,000	–				
To Direct Wages	5,000	5,000	–				
	19,000	19,000	–				
Less: Closing Stock	(2,000)	(2,000)					
Prime Cost	17,000	17,000					
To Overheads	4,600	4,600					
Process Cost	21,600	21,600					
To Profit (1/3 of the total cost)	7,200	—	7,200				
	28,800	21,600	7,200		28,800	21,600	7,200

Dr. **Process *B* Account** **Cr.**

Particulars	*Total* (₹)	*Cost* (₹)	*Profit* (₹)	*Particulars*	*Total* (₹)	*Cost* (₹)	*Profit* (₹)
To Opening Stock	5,500	4,500	1,000	By Finished			
To Process *A*	28,800	21,600	7,200	Stock *A*/c	61,675	41,550	20,125
To Direct Materials	9,500	9,500	–				
To Direct Wages	6,000	6,000	–				
	49,800	41,600	8,200				
Less : Closing Stock*	(2,490)	(2,080)	(410)				

Prime Cost	47,310	39,520	7,790			
To Overheads	2,030	2,030	–			
Process Cost	49,340	41,550	7,790			
To Profit (25% on total cost)	12,335	–	12,335			
	61,675	41,550	20,125	61,675	41,550	20,125

* Cost of Closing Stock = $\frac{₹\ 41,600}{₹\ 49,800} \times 2,490 = ₹\ 2,080$

Dr. **Finished Stock Account** **Cr.**

Particulars	*Total (₹)*	*Cost (₹)*	*Profit (₹)*	*Particulars*	*Total (₹)*	*Cost (₹)*	*Profit (₹)*
To Opening Stock	10,000	6,000	4,000	By Costing P&L			
To Process *B* A/c	61,675	41,550	20,125	A/c	75,000	44,182	30,818
	71,675	47,550	24,125				
Less : Closing Stock*	(5,000)	(3,368)	(1,632)				
To Finished Stock	66,675	44,182	22,493				
To Profit	8,325	—	8,325				
	75,000	44,182	30,818		75,000	44,182	30,818

* Cost of Closing Stock = $\frac{₹\ 41,550}{₹\ 61,675} \times ₹\ 5,000 = ₹\ 3,368$

Working Notes:

Let the transfer price be 100 then profit is 25 : *i.e.* cost price is ₹ 75.

1. If cost is ₹ 75 then profit is ₹ 25
   If cost is ₹ 21, 600 then profit will be 25/75 × 21,600 = ₹ 7,200
2. If cost is ₹ 80 then profit will be ₹ 20
   If cost is ₹ 49,340 then profit will be 20/80 × 49,340 = ₹ 12,335

OBJECTIVE QUESTIONS

I. State whether the following statements are True or False

(i) Equivalent production means the production in terms of completed units.
(ii) Process costing is suitable for garment industry.
(iii) Direct and indirect materials are not ordinarily distinguished in process costing.
(iv) Process costing and Job costing cannot be applied in the same industry simultaneously.
(v) Abnormal process loss is absorbed in good units of production.
(vi) Output of one process may be transferred to the subsequent process at market process or at cost.
(vii) There is no difference between operation costing and operating costing.
(viii) The main product of one industry may be the by-product of another.
(ix) The management may treat a joint product as a by-product.
(x) Waste has no realisable market value.
(*xi*) Spoiled work can be rectified while a defective work cannot be rectified.
(*xii*) There is no difference between 'joint cost' and 'common cost'.

Ans. True (*i*), (*iii*), (*vi*), (*viii*), (*ix*), (*x*)
False (*ii*), (*iv*), (*v*), (*vii*), (*xi*), (*xii*)

II. Fill in the blanks

(i) The excess of anticipated loss over actual loss in a process is called .....

(ii) Two main methods for computing equivalent production are.....and .....methods.

(iii) ln inter-process profits, the output of one process is transferred to the subsequent process at..... but not at.....

(iv) The cost of ..... process is absorbed in the cost of production of good units produced.

(v) The stage of production where separate products are identified is called.....

(vi) The distinction between scrap, by-products is made from the .....of the product.

(vii) Costs incurred upto the point where individual products can be identified are called ..... costs.

Ans. *(i) Abnormal gain* *(ii) FIFO, Average Cost*
(iii) Market price, actual cost *(iv) Normal loss*
(v) Split off point *(vi) Relative sales value* *(vii) Joint.*

III. Tick the correct answer

(*i*) A process loss which does not affect the cost per unit is :
- (*a*) normal loss
- (*b*) abnormal loss
- (*c*) seasonal loss
- (*d*) standard loss.

(*ii*) In process costing, cost per unit increases due to :
- (*a*) abnormal loss
- (*b*) abnormal gain
- (*c*) normal loss
- (*d*) normal gain.

(*iii*) Which method of costing is suitable in chemical industries:
- (*a*) job costing
- (*b*) contract costing
- (*c*) batch costing
- (*d*) process costing.

(*iv*) Individual products, each of a significant sales value, produced simultaneously from the identical raw material, are called
- (*a*) joint products
- (*b*) common-products
- (*c*) by-products
- (*d*) main products.

(*v*) Trimmings in timber industry are treated as :
- (*a*) waste
- (*b*) by-product
- (*c*) joint products
- (*d*) scrap

Ans. *(i)* (*b*); *(ii)* (*c*); *(iii)* (*d*); *(iv)* (*a*); *(v)* (*a*);

IV. Examine correctness of following statements

1. Process costing is applied in textile industry.
2. Process costing is used in chemical industry.

3. Normal loss does not increase per unit cost of actual output.
4. Abnormal loss does not increase per unit cost of actual output.
5. Abnormal gain after deducting normal loss therefrom, balance is transferred to P/L. A/c
6. Equivalent product is represented by completed units of products.
7. There is clear difference between main product and by products.
8. By-products can be sold at their original form.

Ans. False 1., 3. and remaining are correct

V. Indicate whether the following statement is True or False

1. In industries using process costing, production is mostly on a continuous basis for stock, and not against customer orders.
2. In process costing cost per unit is calculated separately for each process.
3. Process costing procedure and Job costing procedure is quite similar.
4. Abnormal process loss does not affect cost per unit.
5. In process cost procedure, finished product of one process is treated as raw material for the next process.
6. A process cost system is applicable to paper mills, chemical works, textile, mills *etc*.
7. Process costing is ordinarily applied where all the operations are performed in one department.
8. In process industries, unlike job order industries, all units receive identical attention of each production department or operation.
9. In process costing ordinarily no distinction is made between direct and indirect materials.
10. The cost of abnormal loss is not included in the cost.
11. The output of one process may be transferred to the next process at cost or at market price.
12. Abnormal gain is credited in the process account.

Ans. False are 1. 3. 6. 7., 12. Remaining are true

VI. Fill in the blanks

1. When actual wastage is more than estimated wastage, the difference is known as.....
2. When in a process 1,000 units are 60% complete then these will be equivalent to..... completed units.
3. ..... process loss is transferred to Costing P/L Account.
4. Upto separation point all costs are known as ..... cost.
5. That point of production where different products are identified is called.....

Ans. 1. Abnormal loss 2. 600 3. Abnormal
4. Joint 5. Separation point

ASSIGNMENTS

Theoretical Questions

1. Define Process Costing and explain its working. For which kinds of business is process costing suitable?
2. What is by-product? How should it be treated in the ascertainment of the cost of main product?

3. How would you account for wastage in the cost of production? Define normal wastage and abnormal effective and distinguish between them.
4. Write short notes on :
   (i) Scrap and wastage, *(ii)* Inter-Process Profit, *(iii)* Joint Expenses and Separate Expenses and *(iv)* Equivalent Production.
5. Distinguish between Job Costing and Process Costing.
6. Write a short note on Abnormal Gain in Process Costing.
7. 'The value of scrap generated in a Process should be credited to the Process Account'. Do you agree with this statement? Give reasons.
8. Explain normal wastage, abnormal wastage and abnormal gain and state how they should be dealt with in Process Cost Accounting
9. Explain briefly the procedure for valuation of work-in-progress.

Numerical Questions

1. An article has to undergo three different processes before it becomes ready for sale. From the following information, find out the cost of production of that article, if 200 articles were manufactured up to 31 st December, 2022.

   Expenses of 200 articles :

	Mfg. Process	*Refining Process*	*Finishing Process*
	₹	₹	₹
Materials	2,000	1,000	750
Labour	1,500	2,500	1,000
Direct Expenses	400	200	300

   The indirect expenses for the period amount to ₹ 6,000 in the factory out of which ₹ 2,000 is attributable to this product. There was no stock at the end in any process. The indirect expenses should be allocated to each process on the basis of direct labour.

   Ans. Mfg. Process : Total Cost ₹ 4,500, Cost per unit ₹ 22.50;
   Ref. Process : Total Cost ₹ 9,200, Cost per unit ₹ 46.00;
   Fin. Process : Total Cost ₹ 11,650,Cost per unit ₹ 58.25

2. A particular brand phenyl passes through three consecutive processes, *viz. A, B* and *C*. During the week ended 15th March, 2022, 500 grosses of bottles were produced. The cost books reveal the following information:

	Process A	*Process B*	*Process C*
	₹	₹	₹
Materials	4,000	1,500	1,000
Labour	2,500	2,000	2,000
Direct Expenses	500	300	400
Cost of Bottles	—	3,000	—
Cost of Corks	—	—	300

   The indirect expenses for the period amounted to ₹ 1,300. The by-products were sold for ₹ 250 (Process *B*) and the residue sold for ₹ 150 (Process *A*).

   Prepare the accounts in respect of each of the processes showing its cost and cost of production of the finished product per gross of bottle.

   Ans. Process A Total Cost ₹ 7,350, Cost per gross ₹ 14.70.
   Process B Total Cost ₹ 14,300 Cost per gross ₹ 28.60.
   Process C Total cost ₹ 18,400, Cost per gross ₹ 36.80

3. In a factory the output passes through three processes to completion. The production of each process is passed on to the next process immediately on completion.

	Process		
	A	*B*	*C*
	₹	₹	₹
Materials and Wages	18,000	12,000	10,000
Manufacturing expenses	12,000	6,000	4,000
Output in units	10,000	12,000	15,000
Opening Stock in units	—	5,000	8,000
Closing Stock in units	—	1,000	3,000

Ans. A. Total Cost ₹ 30,000, per unit ₹ 3.00; B. Total Cost ₹ 60,000, per unit ₹ 5.00; C. Total Cost ₹ 99,000, per unit ₹ 6.60

4. In a factory the output passes through *A* and *B* processes. In both processes 5% of the total weight is lost and 10% scrap which realises from processes *A* and *B* ₹ 30 and ₹ 50 per ton respectively.

	A	*B*
Materials used (in tons)	10,000	1,200
Cost of materials per ton	₹ 25	₹ 50
Wages	₹ 35,000	₹ 10,000
Manufacturing Expenses	₹ 15,000	₹ 6,000

Ans. Process A Cost of output ₹ 2,70,000, Cost per ton ₹ 31.76. Process B Cost of output ₹ 2,97,500, Cost per ton ₹ 36.08

5. The Products Ltd. manufactures and sells their chemicals produced by consecutive processes. The products of these processes are dealt with as under :

	Process 1	*Process 2*	*Process 3*
Transferred to next process	66-2/3%	60%	—
Transferred to warehouse for sale	33-1/3%	40%	100%

In each process 4% of the weight put is lost and 6% is scrap, which from process (1) realises at ₹ 3 per ton; from processes (2) and (3) at ₹ 5 and ₹ 6 per ton respectively. The following particulars relate to October, 2022:

	Process 1	*Process 2*	*Process 3*
Raw Materials used	1,400 tons	160 tons	1,260 tons
Rate per ton	₹ 10	₹ 16	₹ 7
Wages and other Expenses	₹ 5,152	₹ 3,140	₹ 2,898

Prepare Process Accounts showing cost per ton of each product.

Ans. Cost per ton: Process I ₹ 15; Process II ₹ 20; Process III ₹ 13.50.

6. A firm has three workshops and a wholesale warehouse. The following details were extracted from its books for the year ended 31st December, 2022:

	Workshop A	*Workshop B*	*Workshop C*
Raw Materials used: Tonnes	250	152	145
Cost per tonne	₹ 120	₹ 80	₹ 50
Direct Wages	₹ 85,800	₹ 20,250	₹ 10,560
Direct Expenses	₹ 13,800	₹ 13,870	₹ 2,250
Loss of tonnage due to processing	4%	5%	$2\frac{1}{2}$ %

Proportion of production transferred :			
To Workshop *B* at cost	20%		
To Workshop *C* at cost		50%	
Proportion of production transferred to wholesale warehouse	80%	50%	100%
Wholesale Warehouse :			
Stock on 1-1-2022 at cost ex-workshop	₹ 2,500	₹ 2,000	₹ 4,000
Stock on 31-12-2022 ex-workshops in tonnes	10	20	40

Sales of Products ₹ 4,00,000

Salaries ₹ 40,000

Administrative Expenses ₹ 20,000

The closing stocks in the wholesale warehouse are to be valued at the prime cost per tonne during the year.

You are required *(a)* to prepare cost accounts for the year in respect of each workshop, *(b)* to calculate the prime cost per tonne of each process, and *(c)* to prepare an account showing the net profit of the business for the year 2022.

Ans. Prime cost per ton A ₹ 540; B ₹ 380; C ₹ 240. Net Profit ₹ 1,58,160

7. A product passes through two processes. The output of Process *I* becomes the input of Process *II* and the output of Process *II* is transferred to warehouse. The quantity of raw materials introduced into Process I is 20,000 kgs. at ₹ 10 per kg. The cost and output data for the month under review are as under:

	Process I	*Process II*
Direct Materials	₹ 60,000	₹ 40,000
Direct Labour	₹ 40,000	₹ 30,000
Production Overheads	₹ 39,000	₹ 40,250
Normal Loss	8%	5%
Output (Units)	18,000	17,400
Loss realisation ₹/Unit	2.00	3.00

The company's policy is to fix the selling price of the end product in such a way as to yield a profit of 20% on selling price.

Required:

(i) Prepare the Process Accounts.

(ii) Determine the selling price per unit of the end product. *[CA PE II]*

Ans. Process I Abnormal loss 400 kgs, ₹ 7,300, Transfer to Process II 18,000 kgs ₹ 3,28,500,
Process IIA/c Abnormal Gain 300 kgs ₹ 7,650,
Transfer to warehouse 17,400 kgs ₹ 4,43,700.

8. A product passes through two distinct processes A and B and to finished stock. From the following information prepare the Process Accounts:

	Process A	*Process B*
Materials consumed	₹ 12,000	₹ 6,000
Direct Labour	₹ 14,000	₹ 8,000
Manufacturing Exps.	₹ 4,000	₹ 4,000
Input in Process *A* (units)	10,000 units	

Input in Process *A* (value)	₹ 10,000	
Output (units)	9,400	8,300
Normal Wastage (% of input)	5%	10%
Value of Normal Wastage (per 100 units)	₹ 8	₹ 10

No opening or closing stock is held in process.

Ans. Process A—Abnormal wastage 100 units 421 ;Transfer to Process B—9,400 units ₹ 39,539
Process B—Abnormal wastage 160 units ₹ 1,086; Transferred to finished product 8,300 units ₹ 56,359

9. 600 kg. of a material was charged to Process *I* at the rate of ₹ 4 per kg. The direct labour accounted for 200 and other departmental expenses amounted to ₹ 760. The normal loss is 10% of input and the net production was 500 kg. Assuming that process scrap is saleable at ₹ 2 per kg, prepare a ledger account of Process *II* clearly showing the values of normal and abnormal wastage.

Ans. Abnormal wastage 40 kg, ₹ 240; Output 500 kg ₹ 3,000

10. Product *X* is obtained after it passes through three distinct processes. The following information is obtained through the accounts for the month ending 31st December, 2021:

		Processes		
Item	*Total*	*I*	*II*	*III*
	₹	₹	₹	₹
Direct Materials	7,542	2,600	1,980	2,962
Direct Wages	9,000	2,000	3,000	4,000
Production Overheads	9,000			

1,000 units at ₹ 3 each introduced to Process *I*. There was no stock of materials or work-in-progress at the beginning or end of the period. The output of each process passes direct to the next process and finally to finished stores. Production overhead is recovered on 100 per cent of direct wages. The following additional data are obtained:

Process	*Output during the month (units)*	*Percentage of normal loss to input*	*Value of scrap per unit* ₹
Process *I*	950	5%	2
Process *II*	840	10%	4
Process *III*	750	15%	5

Prepare Process Accounts and Abnormal Gain or Loss Accounts.

Ans. Process I Neither Abnormal Loss nor Abnormal gain.
Transferred to Process II 950 units ₹ 9,500; Process II Abnormal Loss 15 units ₹ 300;
Transferred to Process III 840 units ₹ 16,800; Process III Abnormal Gross 3 units ₹ 1,368;
Transferred to finished stock 750 units ₹ 28,500.

11. Product X in a manufacturing unit passes through three processes — *A, B* and *C*. The expenses incurred in the three processes during the year 2022 were as under:

	Process A	*Process B*	*Process C*
Unit of input issued	9,000		
Cost per unit	₹ 150		
Sundry Materials	₹ 23,500	₹ 25,000	₹ 15,000
Direct Labour	₹ 80,000	₹ 2,07,200	₹ 26,110
Direct Expenses	₹ 2,250	₹ 7,200	₹ 8,100
Selling price per unit of output	₹ 200	₹ 280	₹ 600

The actual outputs obtained *vis-a-vis* normal process losses from the processes were:

	Output (units)	*Process loss (%)*
Process *A*	8,400	5
B	5,700	10
C	3,660	3

During the year, three-fourths of the output of process *A* and two-thirds of the output of process *B* were transferred to the next process and the balances were sold outside. The entire output of process *C* was, however, sold outside. The losses of the three processes were sold at ₹ 5 per unit for process *A*, ₹ 10 per unit for process *B* and ₹ 15 per unit for process *C*.

Prepare the three process accounts and a statement of income considering a total selling and distribution expenses of ₹ 45,000 which is not allocated to processes.

[CMA Inter]

Ans. Process A: Abnormal Loss 150 units ₹ 25,500, Transfer to Process B 6,300 units ₹ 10,71,000.

Process B: Abnormal Gain 30 units ₹ 6,900, Transfer to Process C 3,800 units ₹ 8,74,000.

Process C: Abnormal Loss 26 units ₹ 6,500, Transfer for sale 3,660 units ₹ 9,15,000.

Net Profit on sale (after adjusting Abnormal Gain and Abnormal Loss ₹ 13,69,740.

12. Copra Product Ltd. is a manufacturing concern, the main product of which passes through three processes, namely. Crushing, Refining and Finishing. The following figures were extracted from the books for the four-week period ended 28th June, 2021:

	Crushing ₹	*Refining* ₹	*Finishing* ₹
Wages	10,000	4,000	6,000
Power	2,400	1,440	960
Steam	2,400	1,800	1,800
Other Material	400	8,000	—
Plant Repairs	1,120	1,320	560
Sundry Expenses	5,280	2,640	900

2,000 tons of copra were consumed at ₹ 400 a ton, the output being 1,200 tons of crude oil, 850 tons of oil (refined) and 840 tons oil (casked) ready for delivery.

The difference in tonnage in respect of crude oil (refined) is not all loss, 240 tons of crude oil being sold as crude oil at cost plus 20 per cent.

Copra is delivered to the factory baled in heavy sacks, and the sacks were sold for ₹ 1,500.

600 tons of copra residue were sold for ₹ 35,000. 80 tons of waste from the refining process were sold for ₹ 9,500. The cost of casks used in finishing process was ₹ 24,000. Casked oil was sold for ₹ 1,000 a ton.

You are required to prepare cost accounts showing *(a)* the cost per ton of output of each stage of manufacture and *(b)* the total profit for the period.

Ans. Crushing Process: Cost per ton ₹ 654.25; Profit on crude oil sold ₹ 31,404;

960 tons crude oil transferred at a cost of ₹ 6,28,080.

Refining Process: Cost per ton ₹ 750.33; 850 tons of Refined oil transferred at a cost of

₹ 6,37,780. Finishing Process: Cost per ton ₹ 771.42; 840 tons of finished oil total cost ₹ 6,48,000.

Cost of casked oil ₹ 800 per ton. Total cost ₹ 6,72,000

13. The following details are extracted from the costing records of an Oil Mill for the three months ended 31 st March, 2022:

Purchase of 500 tons of Copra 2,00,000

	Crushing ₹	*Refining* ₹	*Finishing* ₹
Cost of Labour	2,500	1,000	1,500
Electric Power	600	360	240
Sundry Materials	100	2,000	—
Repairs to Machinery	280	330	140
Steam	600	450	450
Factory Expenses	1,320	660	220
Cost of Casks	—	—	7,500

300 tons Crude Oil were produced.

250 tons of Oil were produced by the Refining Process.

248 tons of Refined Oil were finished for delivery.

Copra sacks sold for ₹ 400.

175 tons of copra residue sold for ₹ 11,000.

Loss in weight in Crushing 25 tons.

45 tons of by, products obtained from Refining Process valued at ₹ 6,750.

You are required to show the accounts in respect of each of the following stages of manufacture for the purpose of arriving at the cost per ton of each process and the total cost per ton of Finished Oil: *(a)* Copra Crushing Process, *(b)* Refining Process, *(c)* Finishing Process (including casking).

Ans. Cost of crude oil 300 tons ₹ 1,94,000 (per ton ₹ 646,67);

Refined oil 250 tons ₹ 1,92,050 (per ton ₹ 768.2);

Finished oil 248 tons ₹ 1,94,600.(per ton ₹ 784.68)

Cashed oil 248 tons ₹ 2,02,100 (per ton ₹ 814.92).

14. A work order passes through two distinct processes. The product of the first process, less wastage and by-product becomes the raw materials for the second process. All by-products are sold off direct from the factory. The following information is obtained from the factory records:

	First Process	*Second Process*
Raw Materials	1,000 tons at ₹ 30 a ton	
Wages	₹ 25,000	₹ 20,000
Factory Overheads	80% of wages	75% of wages
Wastages	10 tons	15 tons
Sale of by-products	190 tons at cost plus 20%	85 tons at cost plus 25%

Give the ledger accounts for the first and second processes, showing at each stage the cost of production and the profit on the sale of by-products.

Ans. Process 1– Cost of output ₹ 60,606. Profit on sale of By-product ₹ 2,879 (Selling price ₹ 17,273).

Process 2 – Cost of Finished product ₹ 85,254; Profit on sale of by-product ₹ 2,588 (Selling Price ₹ 12,940)

15. The following details are available from the books of a factory in which two processes are employed. Prepare necessary ledger accounts.

	Process A	*Process B*
Materials	1,000 tons @ ₹ 50 per ton	—
Wages	₹ 30,000	₹ 20,000
Factory Overhead	50% of wages	30% of wages

Wastage	100 tons	200 tons
By-products	100 tons sold at cost plus 20%	200 tons sold at cost plus 25%

Ans. Profit on sale of by-products A ₹ 2,111 and B ₹ 9,204

16. A certain purifying process yields 80% of the inputs as the main product and 15% as by-product and there is process loss of 5%. The input cost is ₹ 2 per litre and a plant charge of 1,000 litres costs ₹ 1,500 in labour, steam, other indirect materials and overheads. Ascertain the cost of the by-product, having regard for the fact that the steam (which costs ₹ 400) is chargeable to by-product and main product in the ratio 2 : 1.

Ans. Total cost of main product ₹ 2,743.53 and by product ₹ 756.47

17. 10,000 units of Raw Materials are introduced into a process at a cost of ₹ 17,000; wages and overheads for the process are ₹ 5,100 and ₹ 3,400 respectively. 7,500 units were completed, of the remaining 2,500 units on an average 40% work has been done. Ascertain the cost of one complete unit. *[CA Inter]*

Ans. ₹ 3.00

18. In process *A* of a manufacturing concern 10,000 units are introduced during May 2022. The normal loss is estimated to be 4% of the input. At the end of the month, 1,200 units were lying as incomplete. The stagewise completion of the inventory was given as under:

Material: 80%; Labour 60%, Overheads 50%.

You are required to prepare a statement of equivalent production assuming that 8,300 units were transferred to finished stock. *[CS Inter]*

Ans. Equivalent units: Material 9,360 units,

Labour 9,120 units, Overheads 9,000 units.

19. The finished product of a factory passes through two processes. The materials are added at the beginning of the First Process. From the following details, work out the value of closing inventory and the value of materials transferred to the Second Process :

Process *I*	₹
Opening inventory	50,000
Materials	1,37,500
Labour	2,50,000
Overheads	2,00,000
	Units
Opening inventory (25% Complete)	20,000
Put in process	60,000
Transferred to Process *II*	50,000
Closing inventory (20% Complete)	25,000
Spoilage in process	5,000

Ans. Effective Units 50,000; Work-in-Progress ₹ 58,750;

50,000 units valued ₹ 5,78,750 transferred to Process II.

20. Following are the details pertaining to Process *B* for the month of March, 2022:

	₹
Opening Stock 1,000 units at	2,790
Transferred from Process *A* 10,600 units at	10,600
Materials added	3,960
Direct Labour	11,520
Production Overheads	8,640

Transfer to Process *C*	9,600 units
Units Scrapped	400 units
Closing Stock	1,600 units
Normal loss on production	5%

Degree of completion as regards:

	Materials	*Labour*	*Overheads*
Opening Stock	80%	70%	70%
Units Scrapped	100%	80%	80%
Closing Stock	75%	50%	50%

Prepare Process *B* Account for March, 2022 assuming that the scrap realises ₹ 1 for each unit.

Ans. Effective units : for Materials (i) 10,100; for Materials (ii) 9,900; Labour and Overheads 9,600; Cost per completed unit : ₹ 1 for Materials (i); ₹ 0.40 for Materials (ii); ₹ 1.20 for labour, ₹ 0.90 for overheads.

21. The following data pertain to Process *I* of Beta Ltd., for April 2022:

Opening work-in-progress	1,500 units	₹ 15,000
Degree of Completion : Materials 100%, Labour and Overhead 33-1/3%		
Input of Materials 18,500 units		₹ 52,000
Direct Labour		₹ 14,000
Overheads		₹ 28,000

Closing Work-in-Progress 5,000 units

Degree of completion : Materials 90% and Labour and Overheads 30%

Normal loss is 10% of the total input (opening Work-in-Progress + Units put in)

Scrap value ₹ 2.00 per unit.

Units transferred to the next process 15,000 units. You are required to (*a*) Compute the equivalent units of production, *(b)* Compute the cost per equivalent unit, *(c)* Compute cost of finished output and closing Work-in-Progress and *(d)* Prepare the Process and Other Accounts. Assume that *FIFO* method is used.

[CA Inter]

Ans. (a) Equivalent units Materials 16,000, Labour and Overheads 14,000; (b) Cost per unit Materials ₹ 3, Labour ₹ 1 and Overheads ₹ 2; (c) Cost of finished output ₹ 99,000 Work-in-Progress (5,000 units) ₹ 18,000.

22. Following information is available regarding Process *A* for the month of October 2022.

Production Record :

(i)	Opening work-in-progress (Material : 100% complete, 25% complete for labour & overheads)	40,000 Units
(ii)	Units Introduced	1,80,000 Units
(iii)	Units Completed	1,50,000 Units
(iv)	Units in-progress on 31.10.2022 (Material : 100% complete, 50% complete for labour & overheads)	70,000 Units

Cost Record :

Opening Work-in-Progress:	
Material	₹ 1,00,000
Labour	₹ 25,000
Overheads	₹ 45,000

Cost incurred during the month:

Material	₹ 6,60,000
Labour	₹ 5,55,000
Overheads	₹ 9,25,000

Assume that FIFO method is used for W.I.P. inventory valuation.

Required :

(i) Statement of Equivalent Production
(ii) Statement showing cost for each element
(iii) Statement of Apportionment of Cost
(iv) Process *A* Account. *[CA]*

Ans. Equivalent production : Materials, 1,80,000 units, Labour and Overheads 4,75,000 units.
Cost per unit Material ₹ 3,667 per unit Labour ₹ 8.457 per unit.
Transfer to Process II ₹ 12,57,333 closing W.I.P ₹ 5,52,667

23. From the following particulars pertaining to Process *B* for the month of March, 2022, prepare Process Account.

Opening stock 600 units	
(Completed 80% as regards Materials, 60% for Labour and Overheads)	₹ 1,050
Transfer from Process *A* 11,000 units at	₹ 5,500
Transfer to Process *C* 8,800 units	
Direct Materials added	₹ 2,410
Direct Wages	₹ 7,155
Production Overheads	₹ 9,540
Closing Stock (Completed 70% as regards	
Materials and 60% for labour and overheads)	units 1,600
Wastage (completed 100% as regards	
Materials and 70% for labour and overheads)	units 1,200
Normal loss on production	10%
Scrap value of wastage per unit	₹ 0.50

Ans. Effective units : Material (i) 10,000 : Material (ii) 9,640; Labour and overheads 9,540;
Work- in-Progress at end valued at ₹ 2,760.
Cost per unit as regards Material (i) ₹ 0.50; Material (ii) ₹ 0.25; Labour ₹ 0.75;
Overhead ₹ 1; 8,800 units transferred to Process C at a cost of ₹ 22,000.

24. From the following information relating to Process I of a factory for the month of April, 2022, prepare the statement of equivalent production, statement of cost, statement of evaluation and Process Account, using average cost method:

(i) Opening Work-in-progress : 500 units

Materials	₹ 27,000
Labour	₹ 8,000
Overheads	₹ 12,500
	₹ 47,500

(ii) Cost incurred during April 2022:

Input of materials: 14,000 units	₹ 5,74,750
Labour	₹ 1,19,300
Overheads	₹ 1,78,450

(ii) Process loss :
Normal loss : 10%
Value of scrapped unit : ₹ 10 each
Actual loss during April 2022 : 1,500 units
Degree of completion : Materials 100%, Labour and Overheads 60%

(iv) Closing Work-in-Progress : 1,000 units
Degree of completion : Materials 100%, Labour and Overheads 70%
(v) Processed units transferred to Process *II* : 12,000 units during April 2022.

ICMA - Inter]

Ans. Value of closing W.I.P 1,000 units ₹ 62,500,
Transfer to Process II 12,000 units ₹ 8,40,000.

Hints. Equivalent units: Material 13,050, Labour and Overheads 12,730; Abnormal Loss ₹ 3,000.

25. A product passes through three processes to completion. These processes are known as *A, B* and *C*. The output of each process is charged to next process at a price calculated to give a profit of 20 per cent on the transfer price. The output of Process *C* is charged to Finished Stock on a similar basis. There was no partly finished work in any process at 31 st December on which date the following information was obtained:

	Process A	*Process B*	*Process C*
	₹	₹	₹
Materials consumed	2,000	3,000	1,000
Labour	3,000	2,000	4,000
Stock on 31st December	1,000	2,000	3,000

Stock in each process has been valued at prime cost to the process. There were no stocks in hand at 1st January and the absorption of overheads has been ignored. Of the goods passed into Finished Stock, ₹ 2,000 worth remained in hand at 31st December and the balance was sold for ₹ 18,000. Prepare Process Cost Accounts, Finished Stock Account and Profit and Loss Account.

Ans. Reserved for unrealised profit; Process A Nil; Process B ₹ 200; Process C ₹ 560;
Finished stock ₹ 699; Total being ₹ 1459. Total Profit ₹ 11,000, Actual Profit ₹ 9,541

26. Cheap Products Ltd. divides its manufacturing into two processes *A* and *B*. After leaving Process *B*, the product is passed into Finished Stock. The output of Process *A* is transferred to Process *B* at a price which gives Process *A* a profit of 25 per cent thereon, and the output of Process *B* is transferred to Finished stock at a price which gives Process *B* a profit of 20 per cent thereon.

The following information is provided in respect of the year ending 31 st December, 2022:

	Process A	***Process B***
	₹	₹
Stock on 1st January, 2022	3,200	2,000
Materials used	6,400	2,700
Direct Labour	12,500	8,500
Overheads	2,500	1,700
Stock on 31st December, 2022	2,100	900

Process stocks consist of products which passed through the process completely and are valued at prime cost to the process concerned. Finished goods were in stock on 1st January, 2022, to the value of ₹ 10,200 and 31st December, 2022, to the value of ₹ 6,200. Both the opening and closing stocks were valued at the price at which they were transferred from Process B. Sales amounting to ₹ 68,400 were effected during the year and included all the goods in stock at the beginning of the year.

The reserve on 1st January, 2022, for unrealised profit included in stock valuations were : Process *B* ₹ 350 and Finished Goods ₹ 3,430. Prepare the Process Accounts, Finished Goods Account, and Profit and Loss Account for the year ended on 31st December, 2022, showing adjustment for stock reserves.

Ans. Unrealised profit included in the closing stock-Process B ₹ 164,
Finished Goods ₹ 2,103. Total Trading Profit ₹ 29,413

5

Joint Products and By-Products Costing

Chapter Outline

- Meaning of Joint Product and By-Product
- Methods of Apportioning Joint Costs to Products
- *Miscellaneous Illustrations*
- *Objective Questions*
- *Assignments*

MEANING OF JOINT PRODUCT AND BY-PRODUCT

In a process there may be some by-product and joint product along with main product. Joint products and by-products arise in situations where the production of one product makes evitable the production of other products. When a group of individual products is simultaneously produced, and each product has a significant relative sales value, the outputs are usually called *'Joint Products'*.

Those products that are part of the simultaneous production process and have a minor sales value when compared with the joint products are called *'By-Products'*. These result incidentally from the main joint products.

Thus joint products 'represent two or more products separated in the course of the same processing operations, usually requiring further processing, each product being in such proportion that no single product can be designated as a major product.' By-products have been defined as 'any saleable or usual value incidentally produced in addition to the main product.' Thus the main difference between by-products and joint product is that in case of the former, generally no extra expense is to be incurred, whereas in the case of the latter additional expenditure will be necessary before the products can be sold.

Another point of distinction is regarding importance. If the various products are of substantial importance, they are termed as joint products.

For example, in the case of a refinery, diesel oil is a joint product when petrol is produced. If the various products differ greatly in importance, the relatively unimportant articles will be by-products such as molasses and bagasse in a sugar factory.

Joint Cost

The distinguishing feature of the production of joint and by-products is that the products are not identifiable as different individual products until a specific point in the production process is reached, known as the split-off point. Before the split-off point, costs cannot be traced to particular products, it is called Joint Cost. After the split-off point, joint products may be sold or subjected to further processing. If latter is the case, any further processing costs can easily be traced to the specific products involved.

METHODS OF APPORTIONING JOINT COSTS TO PRODUCTS

The methods used to apportion joint cost are based on physical volume and sales value of products.

1. Physical Volume Method

Method assumes to measure benefits received from the joint product costs by the individual products based on *physical measure* such as weights, volume *etc*.

2. Market Value of Products Method

(a) Where by-products are of small value, the effort to calculate their costs is not warranted. Hence either

(*i*) the amount realised (or realisable) may be treated as pure profit and credited to the Costing Profit or Loss A/c; or

(*ii*) the amount realised (or realisable) may be credited to the cost of the main product, thus reducing the cost of main product. This method is preferable.

Both the methods are defective because the true cost of the main product cannot be ascertained. In any case the quantity of the by-product must be put on the credit side of the Process Account, so that the total quantity is accounted for.

(b) Where by-products are of considerable value, an attempt to find out the cost of each product will be necessary and justified. The total must be apportioned between all products (main and by-products). This will require technical knowledge. Merely to divide the total cost by the number of units of all products will be defective.

Illustration 1:

A chemical process yields 70 per cent of the materials introduced as main product and 20 per cent as a by-product, 10 per cent being lost. Technical information reveals that of the materials 75 per cent is absorbed by the main product and 25% by the by-product. One unit of main product needs double the time needed for one unit of by-product and overheads are absorbed in the ratio of 3 : 1.

During a week, 1,000 units of raw materials at a cost of ₹ 5,000 were introduced. Labour totalled ₹ 3,200 and overheads came to ₹ 2,000. Wastage realised ₹ 200.

Ascertain the cost of the two products.

Solution:

Total number of units produced

		Units
Main product	70%	700
By-product	20%	200
Wastage	10%	100
Materials introduced		1,000

Cost Sheet

	Basis of Allocation	*Main Product (700)*		*By Product (200)*	
		Total	*Per unit*	*Total*	*Per unit*
		₹	₹	₹	₹
Materials	75 : 25	3,750	5.36	1,250	6.25
Labour	14 : 2	2,800	4.00	400	2.00
Overheads (₹ 2,000 *less:* ₹ 200)	3 : 1	1,350	1.93	450	2.25
Total		7,900	11.29	2,100	10.50

Note : Labour is allocated in the ratio of 14:2 because the main product needs double the wages of that required for the by-product. Hence for purpose of allocation of labour, 700 units of the main product are equivalent to 1,400 units of by-products.

(c) Where the joint products require further expenditure, such additional expenditure should be added after apportioning joint expenses as explained in *(b)* above.

(d) An alternative to (c) is to apportion the common expenses in the ratio of the market value of the various products at the point of separation. For instance, if *X* and *Y* are two products jointly produced and if *X* sells at ₹ 10 and *Y* at ₹ 8 per unit, the total expenses can be apportioned between *X* and *Y* in the ratio of 10 : 8. If the number of

units produced are different, the total sale proceeds of each product should be the basis of allocation. This is to say that the selling price per unit should be multiplied by the number of units produced.

This method is useful where the subsequent expenditure (*i.e.*, after separation) is disproportionate. Generally, this method will give good results and, therefore, it should be adopted as a rule unless circumstances suggest otherwise.

(e) Another alternative is to apportion the total common expenditure in the ratio of the market value of the various products when finally ready for sale. If the expenditure after separation is disproportionate for each product, this method will not give good results. It is, therefore, not recommended.

(f) Another method is to deduct from the market value of the by-product (*i*) the reasonable margin of profit and (*ii*) the expenditure after separation and then to treat the balance as a reduction of the cost of the main product. Suppose by-product *Y* realises ₹ 2,000 after a special or separate expense on it of ₹ 400 and suppose a profit of 25 per cent on selling price is reasonable in case of this product, then ₹ 1,100 will be credited to the cost of the main product, thus:

	₹
Amount realised by sale of *Y*	2,000
Less: 25% Profit	500
	1,500
Less: Special or separate expenditure	400
Share out of common costs	1,100

Illustration 2:

(*Joint and Separate Exps.*)

A By-product 'Beta' is derived in the course of manufacturing a product 'Alpha'. The by-product is further processed for sale. From the following data available from records, prepare accounting showing the cost per kg of the products 'Alpha' and 'Beta'.

Particulars	*Joint Exps.* ₹	*Separate Expenses*	
		'Alpha' ₹	*'Beta'* ₹
Materials	10,000	6,000	500
Labour	7,000	5,000	2,000
Overheads	2,500	1,500	600

The quantities produced during the period under consideration were : Alpha, 100 kg; and Beta, 50 kg. The selling price of Beta was ₹ 120 per kg, on which the profit earned was estimated at 30% of selling price.

Solution:

The share of joint expenses attributable to the by-product 'Beta' may be calculated as below:

	₹
Selling Price of Beta : 50 Kg @ ₹ 120 per Kg (50 × 120)	6,000
Less Profit 30% of Selling price	1,800
Total Cost of Production	4,200

Less: Cost incurred on processing or separate expenses of Beta—		
Materials	500	
Labour	2,000	
Overheads	600	3,100
Share of Joint Expenses for Beta		1,100

Product 'Alpha' Account

Dr. **(Output : 100 kg)** **Cr.**

Date	*Particulars*	*(₹)*	*Date*	*Particulars*	*(₹)*
	To Joint Expenses:			By Cost of By-product (Beta)	
	Materials	10,000		transferred to Beta	
	Labour	7,000		A/c (Joint Exps.)	1,100
	Overheads	2,500		By Cost of Production of	
	To Materials	6,000		Alpha (Cost per Kg ₹ 309)	30,900
	To Labour	5,000			
	To Overheads	1,500			
		32,000			32,000

By-product Beta Account

Dr. **(Output : 50 kg)** **Cr.**

Date	*Particulars*	*(₹)*	*Date*	*Particulars*	*(₹)*
	To Joint Expenses transferred			By Cost of By - product	
	from Process *I* Alpha	1,100		'Beta' c/d (cost per Kg	
	A/c			₹ 84)	4,200
	To Materials	500			
	To Labour	2,000			
	To Overheads	600			
		4,200			4,200
	To Cost of Production b/d	4,200		By Sales (50 Kg @	
	To Profit	1,800		₹ 120 per Kg)	6,000
		6,000			6,000

Illustration 3:

(Joint and Separate Exps).

Two by-products *X* and *Y* are produced in the course of manufacture of Product *A*. Their expenses are as follows:

Particulars	*Joint Expenses* ₹	*Subsequent or Separate Exps.*		
		A ₹	*X* ₹	*Y* ₹
Materials	800	200	100	80
Labour	1,000	300	125	100
On cost	600	300	100	192
	2,400	800	325	372

Selling Prices are : *A*— ₹ 3,000; *X*— ₹ 1,000; and *Y*— ₹ 800. The estimated profits are 20%, 17.5% and 16% respectively on the turnover. Prepare separate accounts showing the cost of each product.

Solution:

Apportionment of Joint Expenses over A, *X* and *Y*

Particulars	*A*	*X*	*Y*
Selling Price	₹ 3,000	₹ 1,000	₹ 800
Less: Profit on Selling Price	600 [20%]	175 [17.5%]	128 [16%]
Total Cost	2,400	825	672
Less: Separate Expenses	800	325	372
Share in Joint Expenses	1,600	500	300

Dr. ***A* (Main Product) Account** **Cr.**

Date	*Particulars*	*(₹)*	*Date*	*Particulars*	*(₹)*
	To Joint Expenses:			By *X* By - product A/c	
	Materials	800		(Share in Joint Exps.)	500
	Labour	1,000		By *Y* By - product A/c	
	On cost	600		(Share in Joint Exps.)	300
	To Materials	200		By Cost of Production of	
	To Labour	300		A (Main Product) c/d	2,400
	To On cost	300			
		3,200			3,200
	To Cost of Production b/d	2,400		By Sales	3,000
	To Profit (20% on Sales)	600			
		3,000			3,000

Dr. ***X* (By-Product) Account** **Cr.**

Date	*Particulars*	*(₹)*	*Date*	*Particulars*	*(₹)*
	To Joint Expenses:			By Cost of Production of	
	transferred from *A*			*X* (By - product) c/d	825
	(Main Product A/c)	500			
	To Materials	100			
	To Labour	125			
	To On cost	100			
		825			825
	To Cost of Production b/d	825		By Sales	1,000
	To Profit (17.5% on Sales)	175			
		1,000			1,000

Dr. ***Y* (By-Product) Account** **Cr.**

Date	*Particulars*	*(₹)*	*Date*	*Particulars*	*(₹)*
	To Joint Expenses:			By Cost of Production of	
	transferred from *A*			*Y* (By - product) c/d	672
	(Main Product A/c)	300			
	To Materials	80			
	To Labour	100			
	To On cost	192			
		672			672
	To Cost of Production b/d	672		By Sales	800
	To Profit (16% on Sales)	128			
		800			800

Alternative Method: There may be an alternative method. A Joint Exps. Account is prepared as below:

Joint Expenses Account

Date	*Particulars*	*(₹)*	*Date*	*Particulars*	*(₹)*
	To Materials	800		By *A*	1,600
	To Labour	1,000		By *X*	500
	To On cost	600		By *Y*	300
		2,400			2,400

A, X and *Y* Accounts will be prepared accordingly. Allocated joint expenses of each will be debited to these accounts.

Illustration 4:

A Company producing an article *P* also produces by-products *Q* and *R*. The cost of manufacture is given below:

Particulars	*Joint Expenses*	*Separate Expenses*		
		P	*Q*	*R*
Materials	10,000	1,100	1,300	1,000
Labour	12,000	200	150	100
Overheads	8,000	800	550	400
	₹30,000	2,100	2,000	1,500
Sales value		28,000	24,000	20,000
Estimated profit on selling price		30%	25%	20%

Show how would you propose to apportion joint expenses of manufacture and prepare necessary accounts relating to *P, Q* and *R*.

Solution:

Particulars	*P*	*Q*	*R*	*Total*
Sales	28,000	24,000	20,000	72,000
Less: Profit	8,400	6,000	4,000	18,400
Total Cost	19,600	18,000	16,000	53,600
Less: Separate Expenses	2,100	2,000	1,500	5,600
Share in Joint Exps.	17,500	16,000	14,500	48,000

Since the above shares in Joint Exps. are ₹ 48,000, while given Joint Expenses are ₹ 30,000, hence the difference *i.e.,* ₹ 18,000 will be taken as selling overheads which will be allocated among products in their sales ratio *i.e.,* 28 : 24 : 20 or 7 : 6 : 5.

Particulars	*P*	*Q*	*R*	*Total*
Share in Joint Exps. Allocated	17,500	16,000	14,500	48,000
Less: Selling Overheads	7,000	6,000	5,000	18,000
Share in Joint Exps. (given)	10,500	10,000	9,500	30,000

Dr. **Main Product (*P*) Account** **Cr.**

Date	*Particulars*	*(₹)*	*Date*	*Particulars*	*(₹)*
	To Joint Exps.				
	Materials	10,000		By By - product *Q*	10,000
	Labour	12,000		By By - product *R*	9,500

	Overheads	8,000		By Cost of Production c/d	19,600
	To Separate Exps.				
	Materials	1,120			
	Labour	200			
	Overheads	800			
	To Selling Overheads	7,000			
		39,100			39,100
	To Cost of Production b/d	19,600		By Sales	28,000
	To Profit	8,400			
		28,000			28,000

Dr. **By-Product (*Q*) Account** **Cr.**

Date	*Particulars*	*(₹)*	*Date*	*Particulars*	*(₹)*
	To Main Product *P*			By Cost of Production c/d	18,000
	Account	10,000			
	To Separate Exps.				
	Materials	1,300			
	Labour	150			
	Overheads	550			
	To Selling Overheads	6,000			
		18,000			18,000
	To Cost of Production b/d	18,000		By Sales	24,000
	To Profit	6,000			
		24,000			24,000

Dr. **By-Product (*R*) Account** **Cr.**

Date	*Particulars*	*(₹)*	*Date*	*Particulars*	*(₹)*
	To Main Product *P* Account	9,500		By Cost of Production c/d	16,000
	To Separate Exps.				
	Materials	1,000			
	Labour	100			
	Overheads	400			
	To Selling Overheads	5,000			
		16,000			16,000
	To Cost of Production b/d	16,000		By Sales	20,000
	To Profit	4,000			
		20,000			20,000

Illustration 5:

In manufacturing the main product *A*, a company processes the resulting waste material into two by-products M_1 and M_2. You are required to apportion total cost up to separation point among *A*, M_1 and M_2 from the following data. Total cost up to separation point was ₹ 1,36,000.

	A	M_1	M_2
(*i*) Sales	3,28,000	32,000	48,000
(*ii*) Cost after separation		9,600	14,400
(*iii*) Percentage on net profit to sales		20%	30%
(*iv*) Percentage of selling expenses to sales	20%	20%	20%

[*CMA Inter*]

Solution:

Cost Charged to By-Product

Particulars		M_1 ₹		M_2 ₹
Sales		32,000		48,000
Less: Profit	6,400		14,400	
Selling Exps.	6,400	12,800	9,600	24,000
Cost of Production		19,200		24,000
Less: Cost after separation		9,600		14,400
		9,600		9,600

Statement Showing Cost and Profit

Particulars		*A*	M_1	M_2
Joint Cost		1,36,000		
Less: Charged to M_1 and M_2 (as per above statement)		19,200	9,600	9,600
		1,16,800	9,600	9,600
Cost after separation			9,600	14,400
Cost of Production		1,16,800	19,200	24,000
Selling Exps. (20% of Sales)		65,600	6,400	9,600
Total Cost		1,82,400	25,600	33,600
Profit		1,45,600	6,400	14,400
Sales	₹	3,28,000	32,000	48,000

Illustration 6:

The yield of a certain process is 80% as to the main product, 15% as to the by-product and 5% as to the process loss. The material put in process (5,000 units) cost ₹ 23.75 per unit and all other charges are ₹ 14,250, of which power cost accounted for $33\frac{1}{3}\%$. It is ascertained that power is chargeable as to the main product and by-product in the ratio of 10 : 9. Draw up a statement showing the cost of the by-product. *[C.A. Inter]*

Solution:

Working Notes:

Material put in process	5,000 units at ₹ 23.75
	₹ 1,18,750
Power ($33^1/_3\%$ of 14,250)	₹ 4,750
Other charges (14,250 – 4,750)	₹ 9,500
Joint Cost	₹ 1,33,000
Main product 80% of 5,000	4,000 Units
By-product 15% of 5,000	750 Units
Process loss 5% of 5,000	250 Units

Statement Showing the Cost of the By-product

Particulars	*Total*	*Main Product*	*By - product*
Production -Units		4,000	750
	₹	₹	₹
Materials (4,000 : 750 units)	1,18,750	1,00,000	18,750
Power (10 : 9 ratio)	4,750	2,500	2,250
Other charges (400 : 750)	9,500	8,000	1,500
Total cost	1,33,000	1,10,500	22,500

Illustration 7:

JB Limited produces four joint products. *A, B, C* and *D*, all of which emerge from the processing of *one raw material*. The following are the relevant data:

Production for the period:

Joint product	*Number of units*	*Selling price per unit* ₹
A	500	18.00
B	900	8.00
C	400	4.00
D	200	11.00

The company budgets for a profit of 10% of sales value. The other estimated costs are:

	₹
Carriage inwards	1,000
Direct wages	3,000
Manufacturing Overhead	2,000
Administration Overhead	10% of sales value.

You are required to:

(*a*) Calculate the maximum price that may be paid for the raw material.

(*b*) Prepare a comprehensive cost statement for each of the products allocating the materials and other costs based upon:

(*i*) Number of units (*ii*) Sales value.

[C.A. Inter]

Solution:

(*a*) Joint Product Cost

Joint product		*No. of units*	*S.P. per unit* ₹	*Sales value* ₹
	A	500	18	9,000
	B	900	8	7,200
	C	400	4	1,600
	D	200	11	2,200
	Total Sale Value			20,000
Less:	Budget profit 10% of sales value.			2,000
	Joint product cost			18,000
Less:	Other costs:			
	Carriage inwards	1,000		
	Direct Wages	3,000		
	Mfg. Overheads	2,000		
	Admn. Overhead	2,000		8,000
	Raw Material			10,000

Thus maximum price that may be paid for raw material is ₹ 10,000.

(*b*) (*i*) Statement of Cost

(Based upon number of units)

Joint product No. of units	*A 500* ₹	*B 900* ₹	*C 400* ₹	*D 200* ₹	*Total* ₹
Raw Material	2,500	4,500	2,000	1,000	10,000
Carriage Inwards	250	450	200	100	1,000

Direct Wages	750	1,350	600	300	3,000
Mfg. Overheads	500	900	400	200	2,000
Admn. Overheads	500	900	400	200	2,000
Total Costs	4,500	8,100	3,600	1,800	18,000

(*b*) (*ii*) Statement of Cost (Based upon Sales Value)

Joint product	*A*	*B*	*C*	*D*	*Total*
Sales Value	₹ *9,000*	*7,200*	*1,600*	*2,200*	*20,000*
Raw Material	4,500	3,600	800	1,100	10,000
Carriage Inwards	450	360	80	110	1,000
Direct Wages	1,350	1,080	240	330	3,000
Mfg. Overheads	900	720	160	220	2,000
Admn. Overheads	900	720	160	220	2,000
Total Costs	₹ 8,100	6,480	1,440	1,980	18,000

Illustration 8:

In a concern engaged in process industry four products emerge from a particular process of operation. The total **cost of input for the** period ended 30th September 2022 is ₹ 2,53,500. The details of output, **additional cost after "split-off point" and sales value** of the product are appended below:

Particulars	*Output*	*Additional processing cost after split-off point*	*Sales value*
	Kgs.	₹	₹
A	8,000	60,000	1,68,000
B	5,000	10,000	1,10,000
C	3,000	—	60,000
D	4,000	20,000	90,000

If the products are **sold at "the split-off point"** without further processing, the sales value would have been

	₹
A	1,15,000
B	90,000
C	55,000
D	80,000

You are required to prepare a statement of profitability based on the products being sold:
(*i*) After further processing (*ii*) At the split-off point. *[C.M.A. Inter]*

Solution:

Statement Showing Profitability at the Split-off Point

Particulars	*Sale value at the split-off point (₹)*	*Joint cost Apportioned (₹)*	*Profit (₹)*
A	1,15,000	85,743	29,257
B	90,000	67,103	22,897
C	55,000	41,007	13,993
D	80,000	59,647	20,353
Total	3,40,000	2,53,500	86,500

Note: Joint Cost is apportioned in the ratio of sales because joint cost has been incurred up to the split-off point.

$$A = 2{,}53{,}500 \times \frac{1{,}15{,}000}{3{,}40{,}000} = ₹85{,}743 \text{ and so on for } B, C \text{ and } D.$$

Statement Showing Profitability after Further Processing

Product	*Sales value after Further Processing*	*Additional processing cost*	*Net Sales value (₹)*	*Joint cost (₹)*	*Profit (₹)*
A	1,68,000	60,000	1,08,000	85,743	22,257
B	1,10,000	10,000	1,00,000	67,103	32,897
C	60,000	—	60,000	41,007	18,993
D	90,000	20,000	70,000	59,647	10,353
Total	4,28,000	90,000	3,38,000	2,53,500	84,500

Product	*Additional processing cost*	*Incremental Revenue (₹)*
A	60,000	1,68,000 – 1,15,000 = 53,000
B	10,000	1,10,000 – 90,000 = 20,000
C	—	60,000 – 55,000 = 5,000
D	20,000	90,000 – 80,000 = 10,000

Incremental revenue is greater than additional processing cost in case of *B* and *C*. These may be sold after further processing. *A* and *D* may be sold at the split-off point. Thus profit may be improved.

Particulars	*Profit (₹)*	
A	29,257	To be sold at split-off point
B	20,353	To be sold after additional processing
C	32,897	To be sold after additional processing
D	18,993	To be sold on split off profit
Total	1,01,500	Maximum profit

Illustration 9:

In a chemical manufacturing company, three products *A, B* and *C* emerge at a single split-off stage in department *P*. Product *A* is further processed in department *Q*, product *B* in department *R* and product *C* in department *S*. There is no loss in further processing of any of the three products. The costs for a month are as under:

Cost of raw materials introduced in department P	₹ 12,68,800
Direct Wages in Departments	
P	₹ 3,84,000
Q	96,000
R	64,000
S	36,000

Factory overheads of ₹ 4,64,000 are to be apportioned to the departments on direct wages basis.

During the month under reference, the company sold all three products after processing them further as under:

Product	*A*	*B*	*C*
Output sold (kg.)	44,000	40,000	20,000
Selling Price per Kg. (₹)	32	24	16

There are no Opening or Closing Stocks. If these products were sold at the split-off stage, that is without further processing, the selling prices would have been ₹ 20, ₹ 22 and ₹ 10 each per kg respectively for *A, B* and *C.*

Required:

(*i*) Prepare a statement showing the apportionment of joint costs to joint products.
(*ii*) Present a statement showing product wise and total profit for the month under reference as per the company's current processing policy.
(*iii*) What processing decision should have been taken to improve the profitability of the company?
(*iv*) Calculate the product wise and total profit arising from your recommendation in (*iii*) above. *[CA - Inter]*

Solution:

(*i*) Statement Showing the Apportionment of Joint Costs

Particulars	*Product*			Total
	A	*B*	*C*	
Output sold (kg.)	44,000	40,000	20,000	
S.P. per kg. at split-off stage (₹)	20	22	10	
Sales value at split-off stage (₹)	8,80,000	8,80,000	2,00,000	19,60,000
Joint costs incurred in Deptt P (₹) (Apportioned on sales value basis at the split-off point - Ratio 22 : 22 : 5)	8,80,000	8,80,000	2,00,000	19,60,000

Note: Total joint cost of Dept *P* ₹ 19,60,000 (See Working Note)

(*ii*) Statement Showing Product-wise and Total Profit for the Month (Current Position)

Particulars	*Products*			*Total*
	A	*B*	*C*	
Output sold (Kg)	44,000	40,000	20,000	
S.P. per Kg. after further Processing (₹)	32	34	16	
(*a*) Sales value after further processing (₹) (*a*)	14,08,000	9,60,000	3,20,000	26,88,000
Joint costs at split-off (₹)	8,80,000	8,80,000	2,00,000	19,60,000
Further process costs (See working note)	1,72,800	1,15,200	64,800	3,52,800
(*b*) Total Costs (₹) (*b*)	10,52,800	9,95,200	2,64,800	23,12,800
Profit/Loss (*a*) — (*b*)	(₹) 3,55,200	(35,200)	55,200	3,75,200

(*iii*) **Processing decision to improve the profitability of the company**

Products *A* and *C* should be sold after further processing as both the products are yielding profit after further processing. However, product *B* should be sold at split-off point as further processing cost of this product is more than its sales value and it is yielding loss.

(*iv*) **Product-wise and total profit arising from the recommendation at (*iii*) above**

Profit after further processing:

Product *A*	₹ 3,55,200
Product *C*	55,200
Total profit after further processing	4,10,400

Working Note:

Statement Showing Department-wise Costs

Particulars	*Departments*			
	P	*Q*	*R*	*S*
Raw Materials (₹)	12,68,800			
Wages (given) (₹)	3,84,000	96,000	64,000	36,000
Overheads apportioned (₹) (96 : 24 : 16 : 9)	3,07,200	76,800	51,200	28,800
Total costs	19,60,000	1,72,800	1,15,200	64,800

It is noted from the above statement that costs incurred in Dept. *P* are the joint costs at split-off of products *A, B* and *C*. The joint costs at split-off point are ₹ 19,60,000. However, costs incurred in Depts. *Q, R* and *S* are further processing costs of products *A, B* and *C*. Further processing costs of products *A, B* and *C* are ₹ 1,72,800, ₹ 1,15,200 and ₹ 64,800 respectively.

Illustration 10:

Tee Pee Ltd. in the course of refining crude oil obtains four joint products, *A, B, C* and *D*. The total cost till the split-off point was 97,600. The output and sales in the year 2022 were as follows:

Product	*Output (Gallons)*	*Sales (₹)*	*Separate costs (₹)*
A	5,00,000	1,15,000	30,000
B	10,000	10,000	6,000
C	5,000	4,000	—
D	9,000	30,000	1,000

You are required to:

(*i*) Calculate the net income for each of the products if the joint costs are apportioned on the basis of sales value of the different products.

(*ii*) What would be the net income of the company from each product if it decides to sell the products at the split-off point itself @ *A* 15 paise; *B* 50 paise; *C* 80 paise and *D* ₹ 3 per gallon?

(*iii*) In case the company expects to operate at the same level of production and sales in the year 2022, could the company increase the net income by altering its processing decisions? If so, what would be the expected overall net income? Which products should be processed further and which should be sold at split-off? Assume that all costs incurred after the split-off are variable.

[CS (Inter)]

Solution:

(*i*) Statement of Net Income for Each of the Products

Product	*Sales Value* ₹	*Joint Cost* ₹	*Separate Cost* ₹	*Total Cost* ₹	*Sales Value* ₹	*Profit* ₹
A	1,15,000	70,592	30,000	1,00,592	1,15,000	14,408
B	10,000	6,138	6,000	12,138	10,000	(-)2,138
C	4,000	2,455	—	2,455	4,000	1,545
D	30,000	18,415	1,000	19,415	30,000	10,585
Total	1,59,000	97,600	37,000	1,34,600	1,59,000	24,400

Note: Joint cost has been apportioned to product on the basis of Sales Values

$= \frac{97,600 \times 1,15,000}{1,59,000}$ ₹ 70,592 will be of *A*. For *B, C* & *D*, similar calculations may be made.

(*ii*) Statement of the Net Income

Product	*Sales Value at Split-off Point* ₹	*Joint Cost* ₹	*Profit* ₹
A	5,00,000 × 0.15 = 75,000	70,592	4,408
B	10,000 × 0.50 = 5,000	6,138	(-) 1,138
C	5000 × 0.80 = 4,000	2,455	1,545
D	9,000 × 3.00 = 27,000	18,415	8,585
Total	1,11,000	97,600	13,400

In case of *A* and *D* there is incremental gain after further processing.

	A	*D*
Incremental Sales Value	= 40,000	3,000
Separate Cost	30,000	1,000
Incremental gains	10,000	2,000

Note: Incremental Sales Value Product *A* ₹ 1,15,000 – 75,000 = 40,000 and Product *D* 30,000 – 27,000 = 3,000.

Statement Showing Overall Income

Product	*Sales Value* ₹	*Joint Cost* ₹	*Separate Cost* ₹	*Total Cost* ₹	*Profit* ₹
A	1,15,000	70,592	30,000	1,00,592	14,408
B	5,000	6,138	—	6,138	(-)1,138
C	4,000	2,455	—	2,455	1,545
D	30,000	18,415	1,000	19,415	10,585
Total	1,54,000	97,600	31,000	1,28,600	25,400

By altering the processing decisions, the overall net income would be ₹ 25,400.

Illustration 11:

Three joint products are produced by passing chemicals through two processes. Output from process *I* is transferred to process *II* from which the three joint products are produced and immediately sold. The data regarding the processes for April 2022 is given below:

	Process 1	*Process 2*
Direct Material 2,500 kgs at ₹ 4 per kg	₹ 10,000	—
Direct Labour	₹ 6,250	₹ 6,900
Overheads	₹ 4,500	₹ 6,900
Normal loss	10% of input	Nil
Scrap value of loss	₹ 2 per kg	—
Output	2300 kg	Joint products A — 900 kgs B — 800 kgs C — 600 kgs

There were no opening or closing stocks in either process and the selling prices of the output from Process 2 were:

Joint Product *A*	₹ 24 per kg
Joint Product *B*	₹ 18 per kg
Joint Product *C*	₹ 12 per kg

Required:

(*a*) Prepare an account for Process *I* together with any Loss or Gain Account you consider necessary to record the month's activities.

(*b*) Calculate the profit attributable to each of the joint products by apportioning the total costs from Process *II*: (*i*) According to weight of output, (*ii*) By the market value of production.

[C.A. (Inter)]

Solution:

Process 1 Account

Particulars	*Kg.*	*Rate* (₹)	*Amt.* (₹)	*Particulars*	*Kg.*	*Rate* (₹)	*Amt.* (₹)
To Direct Material	2,500	4	10,000	By Normal Loss			
To Direct Labour			6,250	(10% of 2,500)	250	2	500
To Overheads			4,500	By Output			
	2,500		20,750	Process 2	2,300	9	20,700
To Abnormal Gain	50	9	450				
	2,550		21,200		2,550		21,200

$$\text{Cost per unit} = \frac{\text{Total cost} - \text{Value of normal scrap}}{\text{Input} - \text{Normal Loss}} = \frac{20{,}750 - 500}{2{,}500 - 250}$$

$$= \frac{20{,}250}{2{,}250} = ₹\ 9 \text{ per unit}$$

Abnormal Gain Account

Particulars	*Kg.*	*Rate* (₹)	*Amt* (₹).	*Particulars*	*Kg*	*Rate* (₹)	*Amt.* (₹)
To Normal Loss	50	2	100	By Process 1	50	9	450
To Costing P&L			350				
	50		450		50		450

Normal Loss Account

Particulars	*Kg.*	*Rate* (₹)	*Amt.* (₹)	*Particulars*	*Kg.*	*Rate* (₹)	*Amt.* (₹)
To Process 1	250	2	500	By Debtors/Cash			
				(Sale of actual scrap)	200	2	400
				By Abnormal Gain	50	2	100
	250		500		250		500

(*b*) Joint Cost of Products

	₹
Cost of output from Process *I* (2,300 Kg. @ 9)	20,700
Direct Labour in Process 2	6,900
Overheads in Process 2	6,900
Joint Costs of Products	34,500

Output - Joint Products (Kg.)

A	900
B	800
C	600
	2,300

(*i*) Apportionment of Joint Costs According to Weight and Calculation of Profit

Joint	*Output Kg.*	*Apportionment Joint Cost* (₹)	*Sales Value* (₹)	*Profit or (loss)* ₹
A	900	13,500	900 × 24 = 21,600	8,100
B	800	12,000	800 × 18 = 14,400	2,400
C	600	9,000	600 × 12 = 7,200	(–) 1,800
Total	2,300	34,500	43,200	8,700

Calculations of Joint Cost of The basis of weight:

$$A = \frac{900 \times 34,500}{2,300} = 13,500$$

$$B = \frac{800 \times 34,500}{2,300} = 12,500$$

$$C = \frac{600 \times 34,500}{2,300} = 9,000$$

(*ii*) Apportionment of Joint Costs by Marked Value and Calculation of Profit

Joint Product	*Sales Value* (₹)	*Apportionment Joint Costs* (₹)	*Profit* (₹)
A	21,600	17,250	4,350
B	14,400	11,500	2,900
C	7,200	5,750	1,450
Total	43,200	34,500	8,700

Calculation of Joint Cost on Sale Value:

$$A = \frac{21,600 \times 34,500}{43,200} = 17,250$$

$$B = \frac{14,400 \times 34,500}{43,200} = 11,500$$

$$C = \frac{7,200 \times 34,500}{43,200} = 5,750$$

Illustration 12:

A company's plant processes 1,50,000 kgs of raw material in a month to produce two products, viz. '*P*' and '*Q*'. The cost of raw material is ₹ 12 per kg. The process costs per month are:

	₹
Direct Materials	90,000
Direct Wages	1,20,000
Variable Overheads	1,00,000
Fixed Overheads	1,00,000

The loss in process is 5% of input and the output ratio of *P* and *Q* which emerge simultaneously is 1 : 2. The selling prices of the two products at the point of split-off are *P* : ₹ 12 per kg. and *Q* ₹ 20 per kg. A proposal is available to process *P* further by mixing it with other purchased materials. The entire current output of the plant can be so processed further to

obtain a new product '*S*'. The price per kg of *S* is ₹ 15 and each kg. of output of *S* will require one kilogram of input *P*. The cost of processing of *P* into *S* (including other materials) is ₹ 1,85,000 per month.

You are required to prepare a statement showing the monthly profitability based both on the existing manufacturing operations and on further processing.

Will you recommend further processing?

[CA (Inter)]

Solution:

Working Notes:

		Kg.
1.	*Input*	1,50,000
	Less: Loss in process 5%	7,500
	Total output	1,42,500
	P = 1/3 of 1,42,500	47,500
	Q = 2/3 of 1,42,500	95,000
2.	*Joint costs:*	₹
	Raw materials 1,50,000 × 12	18,00,000
	Direct materials	90,000
	Direct wages	1,20,000
	Variable overheads	1,00,000
	Fixed overheads	1,00,000
		22,10,000
3.	*Sales*:	
	P = 47,500 × 12	5,70,00
	Q = 95,000 × 20	19,00,00
	Total	24,70,000
	Ratio of sales = 57 : 190 *i.e.*, 3 :10	
4.	*Joint Cost in Sales Ratio*	
	P = 22,10,000 × 3/13 = ₹ 5,10,000	
	Q = 22,10,000 × 10/13 = ₹ 17,00,000	

Statement Showing the Monthly Profitability

Particulars	*Based on existing manufacturing operation products*			*Based on further processing of P into S Product*		
	P	*Q*	*Total*	*S*	*Q*	*Total*
Sales quantity (kg.)	47,500	95,000	1,42,500	47,500	95,000	1,42,500
	₹	₹	₹	₹	₹	₹
Sales Revenue	5,70,000	19,00,000	24,70,000	7,12,500	19,00,000	26,12,500
Less: Joint Costs	5,10,000	17,00,000	22,10,000	6,95,000	17,00,000	23,95,000
Profit	60,000	2,00,000	2,60,000	17,500	2,00,000	2,17,500

5,10,000 + 1,85,000 further processing = ₹ 6,95,000

Recommendation : Further processing of *P* is not recommended as it results in a lower profit of *P* by ₹ 42,500:

Additional Sales Revenue 47,500 × 3 =	1,42,500
Further Processing	1,85,000
Loss on processing of *P* into *S* =	(–) 42,500

Illustration 13:

Bright Chemicals Ltd. electrolyses common salt to obtain 3 joint products, Caustic Soda, Chlorine and Hydrogen. During a costing period, the expenditure relating to the inputs for the common process amounted to 3,50,000. After separation, expenses amounting to ₹ 1,60,000, ₹ 75,000 and ₹ 10,000 were incurred for caustic soda, chlorine and hydrogen respectively. The entire production was sold and ₹ 3,75,000 ₹ 2,50,000 and ₹ 60,000 were realised form caustic soda, chlorine and hydrogen respectively. The selling expenses were estimated at 5% of realisations from sale. The management expected profits at 15%, 10% and 5% of realisations from sale of caustic soda, chlorine and hydrogen respectively.

Draw a columnar statement showing the apportionment of Joint Costs and the profitability of each product.

[CMA (Inter)]

Solution:

Statement Showing the Apportionment of Joint Costs and the Profitability of Each Product

Particulars	*Caustic Soda*	*Chlorine*	*Hydrogen*	*Total*
	₹	₹	₹	₹
Sales Realisations	3,75,000	2,50,000	60,000	6,85,000
Less : Expected Profit (15%, 10% and 5%)	– 56,250	– 25,000	– 3,000	– 84,250
Less : Selling Expenses at 5% on sales	– 18,750	– 12,500	– 3,000	– 34,250
Estimated Cost of Production	3,00,000	2,12,500	54,000	5,66,500
Less : After Separation Exp.	– 1,60,000	– 75,000	– 10,000	– 2,45,000
Estimated Joint Costs	1,40,000	1,37,500	44,000	3,21,500
Percentage of Joint Costs	43.546%	42.768%	13.686%	100%
Apportionment of Joint Costs of on the basis of above percentage	1,52,411	1,49,688	47,901	3,50,000
Add : After Separation Exp.	1,60,000	75,000	10,000	2,45,000
Actual Cost of Production	3,12,411	2,24,688	57,901	5,95,000
Add: Selling expenses @ 5% on sales	18,750	12,500	3,000	34,250
Total Cost	3,31,161	2,37,188	60,901	6,29,250
Sales	3,75,000	2,50,000	60,000	6,85,000
Profit (Loss)	43,839	12,812	(901)	55,750

Illustration 14:

In a manufacturing Company 10,000 kilolitres of '*A*' is processed to produce 6,000 kilolitres of '*B*' and 4,000 kilolitres of '*C*'. The joint cost before separation point came to an amount of ₹ 24,000. From the following particulars, calculate the apportionment of joint cost and the profit of each product under (*a*) physical measurement, (*b*) market value at separation point, and (*c*) market value after further processing.

	B	*C*
	₹	₹
Unit selling price at separation point	5.00	3.75
Unit selling price after further processing	7.00	7.50
Further processing costs after separation	5,000	7,500

[CMA (Inter)]

Solution:

(*a*) Apportionment of Joint Cost and Profit Under Physical Measurement

Total quantity *A* 10,000 kl is processed to produce *B* 6,000 *kl* & *C* 4000 *kl*.
Ratio of *A* in *B* and *C* = 3 : 2

Particulars	*B* ₹	*C* ₹	*Total* ₹
Allocation of Joint Cost of ₹ 24,000 in the ratio of 3 : 2	14,400	9,600	24,000
Selling price @ ₹ 5.00 × 6,000 =	30,000		30,000
@ ₹ 3.75 × 4,000 =		15,000	15,000
Profit	15,600	5,400	21,000

(*b*) Apportionment of Joint Cost and Profit Under Market Value at Separation Point

Particulars	*B* ₹	*C* ₹	*Total*
Market value @ ₹ 5.00 × 6,000	30,000		30,000
@ ₹ 3.75 × 4,000		15,000	15,000
Allocation of joint cost of ₹ 24,000	30,000	15,000	45,000
in the ratio of sales *i.e.*, 30 : 15	16,000	8,000	24,000
Profit	14,000	7,000	21,000

(*c*) Apportionment of Joint Cost and Profit Under Market Value after Further Processing

Particulars	*B* ₹	*C* ₹	*Total*
Market value @ 7.00 × 6,000	42,000		42,000
@ 7.50 × 4,000		30,000	30,000
	42,000	30,000	72,000
Allocation of joint cost of ₹ 24,000 in ratio market value	14,000	10,000	24,000
Add: Further processing cost	5,000	7,500	12,500
Total cost	19,000	17,500	36,500
Profit	23,000	12,500	35,500

Illustration 15:

Sun Moon Ltd. produces 2,00,000, 30,000, 25,000, 20,000 and 75,000 units of its five products *A, B, C, D* and *E* respectively in a manufacturing process and sells them at ₹ 17, ₹ 13, ₹ 8, ₹ 10 and ₹ 14 per unit. Except product *D* remaining products can be further processed and then can be sold at ₹ 25, ₹ 17, ₹ 12 and ₹ 20 per unit in case of *A, B, C* and *E* respectively.

Raw material costs ₹ 35,90,000 and other manufacturing expenses cost ₹ 5,47,000 in the manufacturing process which are absorbed on the products on the basis of their 'Net realisable value'. The further processing costs of *A, B, C* and *E* are ₹ 12,50,000; ₹ 1,50,000; ₹ 50,000 and ₹ 1,50,000 respectively.

Fixed costs are ₹ 4,73,000.

You are required to prepare the following in respect of the coming year:

(*a*) Statement showing income forecast of the company assuming that none of its products are to be further processed.

(*b*) Statement showing income forecast of the company assuming that products *A, B, C* and *E* are to be processed further.

Can you suggest any other production plan whereby the company can maximise its profits? If yes, then submit a statement showing income forecast arising out of adoption of that plan. [*CA Inter*]

Solution:

Working Note:

Statement Showing Apportionment of Joint Costs on Net Realisable Value Basis

Products	*Sales value*	*Post separation*	*Net realisable value*	*Apportioned joint costs*
	(1) ₹	(2) ₹	(1) – (2) = (3) ₹	(4) ₹
A.	50,00,000 (2,00,000 units × ₹ 25)	12,50,000	37,50,000	26,25,000
B.	5,10,000 (30,000 units × ₹ 17)	1,50,000	3,60,000	2,52,000
C.	3,00,000 (25,000 units × ₹ 12)	50,000	2,50,000	1,75,000
D.	2,00,000 (20,000 units × ₹ 10)	—	2,00,000	1,40,000
E.	15,00,000 (75,000 units × ₹ 20)	1,50,000	13,50,000	9,45,000
			59,10,000	41,37,000

Total Joint Cost = Raw Material costs + Manufacturing expenses
= ₹ 35,90,000 + ₹ 5,47,000 = ₹ 41,37,000

$$\text{Apportioned Joint Cost} = \frac{\text{Total joint cost}}{\text{Total net realisable value}} \times \text{Net realisable value of each product}$$

$$\text{Apportioned Joint cost for Product A} = \frac{₹\ 41,37,000}{₹\ 59,10,000} \times ₹\ 37,50,000 = 29,26,000$$

Similarly, the apportioned joint cost for products *B, C, D* and are 2,52,000, ₹ 1,75,000, ₹ 1,40,000 and ₹ 9,45,000 respectively.

(*a*) Statement showing income forecast of the company assuming that none of its products are further processed

	Products					
	A ₹	*B* ₹	*C* ₹	*D* ₹	*E* ₹	*Total* ₹
Sales Revenue	34,00,000 (2,00,000 units × ₹ 17)	3,90,000 (30,000 units × ₹ 13)	2,00,000 (25,000 units × ₹ 8)	2,00,000 (20,000 units × ₹ 10)	10,50,000 (75,000 units × ₹ 14)	52,40,000
Less: Apportioned Joint Cost (See working note)	26,25,000	2,52,000	1,75,000	1,40,000	9,45,000	41,37,000
Excess of revenue over joint cost of manufacturing	7,75,000	1,38,000	25,000	60,000	1,05,000	11,03,000

Less: Fixed cost	4,73,000
Profit	6,30,000

(*b*) Statement showing income forecast of the company: assuming that products ₹ *A,B,C* and *E* are further processed (See working note)

	Products					
	A ₹	*B* ₹	*C* ₹	*D* ₹	*E* ₹	*Total* ₹
Sales revenue: (*X*)	50,00,000	5,10,000	3,00,000	2,00,000	15,00,000	75,10,000
Apportioned joint cost :	26,25,000	2,52,000	1,75,000	1,40,000	9,45,000	41,37,000
Further processing cost:	12,50,000	1,50,000	50,000		1,50,000	16,00,000
Total manufacturing cost: (*Y*)	38,75,000	4,02,000	2,25,000	1,40,000	10,95,000	57,37,000
Excess of sales revenue over total manufacturing cost: [(*X*) – (*Y*)]	11,25,000	1,08,000	75,000	60,000	4,05,000	17,73,000
Less: Fixed cost						4,73,000
Profit						13,00,000

Illustration 16:

ABC Ltd. operates a simple chemical process to convert a single material into three separate items, referred to here as *X, Y* and *Z*. All the three end-products are separated simultaneously at a single split-off point.

Products *X* and *Y* are ready for sale immediately upon split-off without further processing or any other additional costs. Product *Z*, however, is processed further before being sold. There is no available market price for *Z* at the split-off point.

The selling prices quoted here are expected to remain the same in the coming year. During 2022-21, the selling prices of the items and the total amounts sold were:

X- 186 tons sold for ₹ 1,500 per ton

T - 527 tons sold for ₹ 1,125 per ton

Z - 736 tons sold for ₹ 750 per ton

The total joint manufacturing costs for the year were ₹ 6,25,000. An additional ₹ 3,10,000 was spent to finish product *Z*.

There were no opening inventories of *X, Y* or *Z*. At the end of the year, the following inventories of complete units were on hand:

X 180 tons: *Y* 60 tons; *Z* 25 tonsS

There was no opening or closing work-in-progress.

Required:

(*i*) Compute the cost of inventories of *X, Y* and *Z* for Balance Sheet purposes and cost of goods sold for income statement purpose as on March 31, 2021, using:

(*a*) Net realizable value (NRV) method of joint cost allocation.

(*b*) Constant gross-margin percentage NRV method of joint cost allocation.

(*ii*) Compare the gross margin percentages for *X, Y* and *Z* using two methods given in requirement (*i*).

[CA - PE II]

Solution:

(*i*) (*a*) Statement of Joint Cost Allocation of Inventories of *X, F* and *Z* for Balance Sheet Purpose (By Using Net Realizable Value Method)

Particulars	*Products*			*Total* ₹
	X ₹	*Y* ₹	*Z* ₹	
Final sales value of total production	5,49,000	6,60,375	5,70,750	17,80,125
Less: Additional cost	—	—	3,10,000	3,10,000
Net realizable value at split-off	5,49,000	6,60,375	2,60,750	14,70,125
Joint cost allocated in proportion of NRV at split-off	2,33,398	2,80,748	1,10,854	6,25,000

Cost of Goods Sold for Income Statement Purposes as on March 31, 2021 (By Using Net Realizable Value Method)

Particulars	*Products*			*Total* ₹
	X ₹	*Y* ₹	*Z* ₹	
Allocated Joint Cost	2,33,398	2,80,748	1,10,854	6,25,000
Additional Cost	—	—	3,10,000	3,10,000
	2,33,398	2,80,748	4,20,854	9,35,000
Less: Cost of year-end inventory (Note 1 *X* 49.18%; *Y* 10.22%; *Z* 3.29%)	1,14,785	28,692	13,846	1,57,323
Cost of goods sold	1,18,613	2,52,056	4,07,008	7,77,677

Income Statement (Showing Gross Margin and Gross Margin Percentage) (By Using Net Realizable Value Method)

	Products			*Total* ₹
	X ₹	*Y* ₹	*Z* ₹	
Sales Revenue	2,79,000	5,92,875	5,52,000	14,23,875
Less: Cost of Goods Sold	1,18,613	2,52,056	4,07,008	7,77,697
Gross Margin	1,60,387	3,40,819	1,44,992	6,46,178
Gross Margin %	57.49%	57.49%	26.27%	

(*b*) Statement of Joint Cost Allocation of Inventories of *X, Y* and *Z* for Balance Sheet Purpose (By Using Constant Gross Margin Percentage NRV Method)

Particulars	*Products*			*Total* ₹
	X ₹	*Y* ₹	*Z* ₹	
Final sales value of total production	5,49,000	6,60,375	5,70,750	17,80,125
Less: Gross Margin {Note 2) 47.4756%	2,60,641	3,13,517	2,70,967	8,45,125
	2,88,359	3,46,858	2,99,783	9,35,000
Less: Additional Cost	—	—	3,10,000	3,10,000
Joint Cost Allocated	2,88,359	3,46,858	(10,217)	6,25,000

Note: The negative joint cost allocation to product *Z* is peculiar feature of Constant Gross Margin NRV Method.

Cost of Goods Sold for Income Statement Purposes
(By Using Constant Gross Margin Percentage NRV Method)

Particulars	*Products*			*Total* ₹
	X ₹	*Y* ₹	*Z* ₹	
Allocated Joint Cost	2,88,359	2,46,858	(10,217)	6,25,000
Additional Cost	—	—	3,10,000	3,10,000
Cost of Goods available for sale	2,88,359	3,46,858	2,99,783	9,35,000
Less: Cost of year-end inventory (Note *L*) *X* 49.18%; *Y* 10.22%; *Z* 3.29%	1,41,815	35,449	9,863	1,87,127
Cost of Goods Sold	1,46,544	3,11,409	2,89,920	7,47,873

Income Statement
(Showing Gross Margin and Gross Percentage by Using Constant Gross Margin Percentage NRV Method)

	Products			*Total* ₹
	X ₹	*Y* ₹	*Z* ₹	
Sales Revenue (₹)	2,79,000	5,92,875	5,52,000	14,23,875
Less: Cost of Goods Sold	1,46,544	3,11,409	2,89,920	7,47,873
Gross Margin	1,32,456	2,81,466	2,62,080	6,76,002
Gross Margin %	47.475%	47.475%	47.475%	47.475%

(*ii*) Comparative Statement of Gross Margin Percentage for *X*, *Y* and *Z*
(Using Net Realizable Value and Constant Gross Margin Percentage NRV Methods)

	Products Gross Margin Percentages		
	X	*Y*	*Z*
Net Realizable Value Method	57.49%	57.49%	26.27%
Constant Gross Margin NRV Method	47.48%	47.48%	47.48%

Working Notes:

1. Total production of three products for the year 2020-21

Items/ Products (1)	*Quantity sold in tons (2)*	*Quantity of year-end inventory in tons (3)*	*Total Production (4) = (2) + (3)*	*Percentage by year-end inventory to total production (5) = (3)/(4) × 100*
X	186	180	366	49.18
Y	527	60	587	10.22
Z	736	25	761	3.29

2. Gross Margin Percentage:

Final Sales Value of Total Production	₹ 17,80,125
Less: Joint Cost and Additional Cost (₹ 6,25,000 + ₹ 3,10,000)	9,35,000
Gross Margin	8,45,125

Gross Margin Percentage (8,45,125/17,80,125) × 100 = 47.4756% or 47.48%.

Illustration 17:

A company produces two joint products *X* and *Y*, from the same basic materials. The processing is completed in three departments.

Materials are mixed in department *I*. At the end of this process *X* and *Y* get separated. After separation *X* is completed in the department *II* and *Y* is finished in department *III*. During period 2,00,000 kgs of raw material were processed in department *I*, at a total cost of ₹ 8,75,000, and the resultant 60% becomes *X* and 30% becomes *Y* and 10% normally lost in processing.

In department *II* 1/6 of the quantity received from department *I* is lost in processing. *X* is further processed in department *II* at a cost of ₹ 1,80,000.

In department *III* further new material added to the material received from department *I* and weight mixture is doubled, there is no quantity loss in the department and further processing cost (with material cost) is ₹ 1,50,000.

The details of sales during the year were:

	Product X	*Product Y*
Quantity sold (Kgs.)	90,000	1,15,000
Sales price per kg (₹)	10	4

There were no opening stocks. If these products sold at split-off-point, the selling price of *X* and *Y* would be ₹ 8 and ₹ 4 per kg. respectively.

Required:

(*i*) Prepare a statement showing the apportionment of joint cost to *X* and *Y* in proportion of sales value at split-off point.

(*ii*) Prepare a statement showing the cost per kg. of each product indicating joint cost, processing cost and total cost separately.

(*iii*) Prepare a statement showing the product-wise profit for the year.

(*iv*) On the basis of profits before and after further processing of products *X* and *T*, give your comment that products should be further processed or not. *[CA PE II]*

Solution:

(*i*) Statement showing apportionment of joint costs
(Joint cost incurred in Dept 1 - ₹ 8,75,000)

	Product X	*Product Y*
Output in kg (*Working Note*)	1,20,000	60,000
Selling price per unit at split-off point (given)	₹ 8	₹ 4
Sales value	₹ 9,60,000	₹ 2,40,000
Ratio	4	1
Apportioned joint cost (₹ 8,75,000) in 4 : 1	₹ 7,00,000	₹ 1,75,000

(*ii*) Statement showing cost per kg. of output in Deptt. *II* and Dept. *III*

	Dept. X	*Dept. Y*
Shared joint cost (Dept. *I*)	₹ 7,00,000	₹ 1,75,000
Output (Kgs.) in Dept. *II* and Dept. *III*	1,00,000	1,20,000
Joint cost per kg.	₹ 7.00	₹ 1.458
Further processing cost per kg.*	1.80	1.250
Total cost per kg	8.80	2.708

* ₹ 1,80,000/1,00,000 kg = ₹ 1.80; ₹ 50,000/1,20,000 = ₹ 1.250

(*iii*) Statement showing product-wise profit

	Product X	*Product Y*
Output (kg.)	1,00,000	1,20,000
Sales (kg.)	90,000	1,15,000
Closing Stock (kg.)	10,000	5,000
Sales @ ₹ 10 and ₹ 4 per kg. for products *X* and *Y* respectively.	₹ 9,00,000	₹ 4,60,000
Add: Closing stock at full cost (@ ₹ 8.80 and ₹ 2.708)	88,000	13,540
Value of production	9,88,000	4,73,540
Less: Share of joint cost	(7,00,000)	(1,75,000)
Further processing cost	(1,80,000)	(1,50,000)
Profit	1,08,000	1,48,540

(*iv*) Statement showing product-wise profitability before/after further processing (See Statement *III*)

Particulars	*Before further processing X*	*After further processing X*	*Before further processing Y*	*After further processing Y*
Sales value as in (*i*) above	₹ 9,60,000		₹ 2,40,000	
Less: Shared joint cost	7,00,000		1,75,000	
Profit	2,60,000	1,08,000	65,000	1,48,540

Recommendation. Product *X* should be sold at split-off point and Product *Y* should be sold after further processing.

Working Notes:

Statement showing the quantity produced of each product in the three departments

Particulars	*Dept. I*	*Dept. II*	*Dept. III*
Input (Kgs.)	2,00,000	1,20,000	60,000
Process loss/weight added	(20,000)	(20,000)	60,000
	1,80,000	1,00,000	1,20,000
Product *X* (60% of input)	1,20,000	1,00,000	–
Product *Y* (30% of input)	60,000	–	1,20,000

Illustration 18:

Pokemon Chocolates manufactures and distributes chocolate products. It purchases cocoa beans and processes them into two intermediate products:

- Chocolate powder liquor base
- Milk-chocolate liquor base.

These two intermediate products become separately identifiable at a single split-off point. Every 500 pounds of cocoa beans yields 20 gallons of chocolate powder liquor base and 30 gallons of milk-chocolate liquor base.

The chocolate powder liquor base is further processed into chocolate powder. Every 20 gallons of chocolate powder liquor base yields 200 pounds of chocolate powder. The milk-chocolate liquor base is further processed into milk-chocolate. Every 30 gallons of milk-chocolate liquor base yields 340 pounds of milk-chocolate.

Production and sales data for October 2022 are :

Cocoa beans processed			7,500 pounds
Costs of processing cocoa beans to split-off point (including purchase of beans)			₹ 7,12,500
	Production	*Sales*	*Selling Price*
Chocolate Powder	3,000 pounds	3,000 pounds	₹ 190 per pound
Milk Chocolate	5,100 pounds	5,100 pounds	₹ 237.50 per pound

The October 2022 separable costs of processing chocolate powder liquor into chocolate powder are ₹ 3,02,812.50. The October 2022 separable costs of processing milk-chocolate liquor base into milk-chocolate are ₹ 6,23,437.50.

Pokemon fully processes both of its intermediate products into chocolate powder or milk-chocolate. There is an active market for these intermediate products. In October 2022 Pokemon could have sold the chocolate powder liquor base for ₹ 997.50 a gallon and the milk-chocolate liquor base for ₹ 1,235 a gallon.

Required:

(*i*) Calculate how the joint cost of ₹ 7,12,500 would be allocated between the chocolate powder and milk-chocolate liquor bases under the following methods:
  (*a*) Sales value at split-off point
  (*b*) Physical measure (gallons)
  (*c*) Estimated net realisable value (NRV)
  (*d*) Constant gross-margin percentage (NRV)

(*ii*) What is the gross-margin percentage of the chocolate powder and milk-chocolate liquor bases under each of the methods in requirement (*i*) ?

(*iii*) Could Pokemon have increased its operating income by a change in its decision to fully process both of its intermediate products ? Show your computations.

[CA PE II]

Solution:

1. Comparison of Alternative Joint Allocation Methods

(*a*) Joint cost allocation on the basis of sales value at split-off point

Sales value of chocolate powder liquor base

$$3{,}000 \text{ Pounds} = 3{,}000 \times \frac{20}{200} = 300 \text{ gallons}$$

Sales value of 300 gallons @ ₹ 997.5 = ₹ 2,99,250

Sales value of milk-chocolate liquor base

$$5{,}100 \text{ Pounds} = 5{,}100 \times \frac{30}{340} = 450 \text{ gallons}$$

Sales value of 450 gallons @ 1,235 = ₹ 5,55,750

Ratio of Sales Value 2,99,250 : 5,55,750 = 35 : 65

Joint Cost Allocation (₹)

$$\text{Chocolate powder } ₹\ 7{,}12{,}500 \times \frac{30}{100} = ₹\ 2{,}49{,}375$$

$$\text{Mail-Chocolate } ₹\ 7{,}12{,}500 \times \frac{65}{100} = ₹\ 4{,}63{,}125$$

(*b*) Physical Measure Method (gallons)

Chocolate powder	: 300 gallons
Milk-chocolate	: 450 gallons
Ratio of gallons = 300/750	: 450/750
	: 2 : 3

Joint Cost Allocation

Chocolate Powder ₹ 7,12,500 × $\frac{2}{5}$ = ₹ 2,85,00

Malik-Chocolate ₹ 7,12,500 × $\frac{3}{5}$ = ₹ 4,27,500

(*c*) Net Realisable Value Method

	Chocolate powder	*Milk-chocolate*
Final Sales	3,000 × 190	5,100 × 237.5
	₹ 5,70,000.00	₹ 12,11,250.00
Deduct Separable Cost	₹ 3,02,812.50	₹ 6,23,437.50
Net realisable value at split-off	₹ 2,67,187.50	₹ 5,87,812.50
Ratio	0.3125	0.6875
Joint cost allocation	7,12,500 × 0.3125	7,12,500 × 0.6875
On the bases of above ratio	= 2,22,656.25	= 4,89,843.75

(*d*) Constant Gross Margin Percentage Method

Final sale value of total production (5,70,000 + 12,11,250)	₹ 17,81,250
Deduct total joint and separate cost (7,12,500 + 9,26,250)	16,38,750
Gross Margin	1,42,500

Gross Margin Percentage (1,42,500/17,81,500) × 100 = 8%

Particulars	*Chocolate powder liquor base (₹)*	*Milk-chocolate liquor base (₹)*	*Total*
Final sales value	5,70,000	12,11,250	17,81,250
Less: Gross margin @ 8%	45,600	96,900	1,42,500
Cost of goods available for sale	5,24,400	11,14,350	16,38,750
Deduct separable cost	(3,02,812.50)	(6,23,437.50)	(9,26,250)
Joint Cost Allocated	2,21,587.50	4,90,912.50	7,12,500

(*ii*) Gross Margin Percentages

Particulars	*Chocolate powder liquor base (₹)*	*Milk-chocolate liquor base (₹)*	*Total (₹)*
Sales value at split-off point	3.125%	10.294%	8%
Physical measure method	(3.125%)	13.235%	8%
NRV method	7.812%	8.088%	8%
Constant gross margin % NRV method	8%	8%	8%

(*iii*) Further processing of chocolate powder liquor base into chocolate powder-

Incremental revenue - ₹ 5,70,000 – (997.5 × 300)	= ₹ 2,70,750.00
Incremental Cost	3,02,812.50
Incremental Operating Loss	(32,062.50)

Since incremental operating income is negative after further processing it should not be processed further but sold only at split-off point:

Further processing of milk chocolate liquor base into milk-chocolate

Incremental revenue ₹ 12,11,250 – ₹ 5,55,750	= ₹ 6,55,500.00
Incremental Cost	6,23,437.50
Incremental Operating Income	32,062.50

Pokemon Chocolates could increase operating income by ₹ 32,062.50 if chocolate liquor base is sold at split-off point and milk-chocolate liquor base is further processed into milk-chocolate.

Illustration 19:

Sell well Ltd. operates a chemical process which produces four products *A, B, C* and *D* from a basic raw material. The company's budget for a month is as under:

	₹
Raw materials consumption	17,520
Initial processing wages	16,240
Initial processing overheads	16,240

Product	*Production (Kgs.)*	*Sales (₹)*	*Additional Processing cost after split-off (₹)*
A	16,000	1,09,600	28,800
B	200	5,600	—
C	2,000	30,000	16,000
D	360	21,600	6,600

The company presently intends to sell product *B* at the point of split-off without further processing. The remaining products *A, C* and *D* are to be further processed and sold. However, the management has been advised that it would be possible to sell all the four products at the split-off point without further processing and if this course was adopted, the selling prices would be as under:

Product	*A*	*B*	*C*	*D*
Selling Price per kg. (₹)	4.00	28.00	8.00	40.00

The joint costs are to be apportioned on the basis of the sales value realisation at the point of split- off.

You are required to:

(*a*) Prepare a statement showing the apportionment of joint costs.

(*b*) Prepare a statement showing the product-wise and total budgeted profit or loss based on the proposal to sell product *B* at the split-off point and products *A, C* and *D* after further processing.

(*c*) Prepare a statement to show the product-wise and total profit or loss if the alternative strategy to sell all the products at split-off stage was adopted.

(*d*) Recommend any other alternative which, in your opinion, can increase the total profit further. Calculate the total profit as also the product-wise profit or *loss*, based on your recommendation. *[CA (Inter)]*

Solution:

(*a*) Statement Showing the Apportionment of Joint Costs

Total Joint Costs 17,520 + 16,240 + 16,240 = ₹ 50,000

Product	*Sales Value at split-off point (₹)*	*Joint Costs Apportioned in the ratio of sales (₹)*
A	16,000 × 4 = 64,000	32,000
B	200 × 28 = 5,600	2,800
C	2,000 × 8 = 16,000	8,000
D	360 × 40 = 14,400	7,200
Total	₹ 1,00,000	₹ 50,000

(*b*) Statement Showing Budgeted Profit or Loss

Product	*Joint cost* ₹	*Additional Processing cost* ₹	*Total cost* ₹	*Sales value* ₹	*Profit* ₹
A	32,000	28,800	60,800	1,09,600	48,800
B	2,800	—	2,800	5,600	2,800
C	8,000	16,000	24,000	30,000	6,000
D	7,200	6,600	13,800	21,600	7,800
Total	50,000	51,400	1,01,400	1,66,800	65,400

(*c*) Statement of Profit or Loss at Split-off Point (₹)

Product	*Joint Cost* (₹)	*Sales Value* (₹)	*Profit* (₹)
A	32,000	64,000	32,000
B	2,800	5,600	2,800
C	8,000	16,000	8,000
D	7,200	14,400	7,200
Total	50,000	1,00,000	50,000

(*d*) Product *B* requires no further processing. In case of Product *C*, if further processed, the incremental sales value will be ₹ 14,000 *i.e.*, ₹ 30,000 – 16,000. Thus *C* should not be processed. In case of Products *A* and *D*, the position will be as below:

	A	*D*
Incremental Sales Value	45,600	7,200
Additional Processing Costs	(28,800)	(6,600)
Incremental Gain	16,800	600

Hence, *A* & *D* should be processed further, *B* & *C* should be sold at split-off point.

Statement Showing Profit

Product	*Sales Value* ₹	*Total Cost* ₹	*Profit* ₹
A	1,09,600	60,800	48,800
B	5,600	2,800	2,800
C	16,000	8,000	8,000
D	21,600	13,800	7,800
Total	1,52,800	85,400	67,400

Illustration 20:

Inorganic Chemicals purchases salt and processes it into more refined products such as Caustic Soda, Chlorine and PVC. In the month of July, Inorganic Chemicals purchased salt for ₹ 40,000. Conversion cost of ₹ 60,000 were incurred up to the split-off point, at which time two saleable products were produced. Chlorine can be further processed into PVC.

The July production and sales information is as follows:

	Production (tonnes)	*Sales quantity (tonnes)*	*Selling price (per tonne)*
Caustic Soda	1,200	1,200	₹ 50
Chlorine	800	—	—
PVC	500	500	₹ 200

All 800 tonnes of Chlorine were further processed, at an incremental cost of ₹ 20,000 to yield 500 tonnes of PVC. There were no beginning or ending inventories of Caustic Soda, Chlorine or PVC in July.

There is active market for Chlorine: Inorganic Chemicals could have sold all its July production of Chlorine at ₹ 75 per tonne.

Required:

1. To calculate how joint cost of ₹ 1,00,000 would be apportioned between Caustic Soda and Chlorine under each of the following methods:
   (*a*) Sales value at split-off,
   (*b*) Physical measure (method), and
   (*c*) Estimated net realisable value.
2. Lifetime Swimming Pool Products offers to purchase 800 tonnes of Chlorine in August at ₹ 75 per tonne. This sale of Chlorine would mean that no PVC would be produced in August. How the acceptance of this offer for the month of August would affect operating income? *[CA Inter]*

Solution:

(*a*) Sales value at split-off method

Products	*Sales in tonnes*	*Selling price per tonne (₹)*	*Sales revenue (₹)*	*Joint Cost apportioned* (₹)*
	(a)	*(b)*	*(c) = (a) × (b)*	
Caustic Soda	1,200	50	60,000	50,000
Chlorine	800	75	60,000	50,000
			1,20,000	1,00,000

$$\text{*Apportioned joint cost} = \frac{\text{Total joint cost}}{\text{Total sale value}} \times \text{Net realisable value of each product}$$

$$\text{Joint cost apportioned to Caustic Soda} = \frac{₹\ 1,00,000}{₹\ 1,20,000} \times ₹\ 60,000 = ₹\ 50,000$$

$$\text{Joint cost apportioned to Chlorine} = \frac{₹\ 1,00,000}{₹\ 1,20,000} \times ₹\ 60,000 = ₹\ 50,000$$

(*b*) Physical measure method

Products	*Sale in (tonnes)*	*Joint cost apportioned***
Caustic Soda	1,200	60,000
Chlorine	800	40,000
	2,000	1,00,000

$$\text{**Apportioned joint cost} = \frac{\text{Total Joint cost}}{\text{Total physical value}} \times \text{Physical units of each product}$$

$$\text{Joint cost apportioned to Caustic Soda} = \frac{₹\ 1,00,000}{2,000\ \text{tonnes}} \times 1,200\ \text{tonnes} = ₹\ 60,000$$

$$\text{Joint cost apportioned to Chlorine} = \frac{₹\ 1,00,000}{2,000\ \text{tonnes}} \times 800\ \text{tonnes} = ₹\ 40,000$$

(*c*) Estimated net realisable value method

Products	*Sale revenue*	*Further processing cost (₹)*	*Net realisable value (₹)*	*Apportioned *** Joint cost (₹)*
	(a)	*(b)*	*(c) = (a) – (b)*	
Caustic Soda (1,200 tonnes × ₹ 50)	60,000	—	60,000	42,857
Chlorine (500 tonnes of PVC × ₹ 200)	1,00,000	20,000	80,000	57,143
			1,40,000	1,00,000

***Apportioned joint cost $= \frac{\text{Total joint cost}}{\text{Total net realisable value}} \times$ Net realisable value of each product

Apportioned Joint cost for Caustic Soda $= \frac{₹\ 1,00,000}{₹\ 1,40,000} \times ₹\ 60,000$ ₹ 42,857

Apportioned Joint cost for Chlorine $= \frac{₹\ 1,00,000}{₹\ 1,40,000} \times ₹\ 80,000$ ₹ 57,143

2. Incremental revenue from further processing of Chlorine into PVC

(500 tonnes × 200 – 800 tonnes × 75)	₹ 40,000
Less: Incremental cost of further processing of Chlorine into PVC	₹ 20,000
Incremental operating income from further processing	20,000

The operating income of Inorganic Chemicals will be reduced by ₹ 20,000 in August if it sells 800 tonnes of Chlorine ,instead of further processing of Chlorine into PVC for sale.

Illustration 21:

JKL Limited produces two products - *J* and *K* together with a by-product *L* from a single main process (Process *I*). Product *J* is sold at the point of separation for 55 per kg, whereas product *K* is sold for ₹ 77 per kg, after further processing into product K_2. By-product *L* is sold without further processing for ₹ 19.25 per kg.

Process I is closely monitored by a team of chemists, who planned the output per 1,000 kg of input materials to be as follows:

Product *J*	500 Kg
Product *K*	350 Kg
Product *L*	100 Kg
Toxic waste	50 kg

The toxic waste is disposed of at a cost of ₹ 16.50 per kg, and arises at the end of processing.

Process *II*, which is used for further processing of product *K* into product K_2, has the following cost structure:

Fixed costs	₹ 2,64,000 per week
Variable cost	₹ 16.50 per kg processed

The following actual data relate to the first week of the month:

Process I	
Opening Work-in-Progress	Nil
Material input	40,00,Kg costing ₹ 6,60,000
Direct labour	₹ 4,40,000
Variable Overheads	₹ 1,76,000
Fixed Overheads	₹ 2,64,000
Output:	
Product *J*	19,200 Kg
Product *K*	14,400 Kg
Product *L*	4,000 Kg
Toxic waste	2,400 Kg
Closing Work-in-Progress	Nil
Process II	
Opening Work-in-Progress	Nil
Input of product *K*	14,000 Kg

Output of product K_2	13,200 Kg
Closing Work-in-Progress (50% converted and conversion costs were incurred in accordance with the planned cost structure)	1,200 Kg

Required:

(*i*) Prepare Process *I* Account for the first week of the month using the final sales value method attribute the pre-separation costs to joint products.

(*ii*) Prepare the Toxic Waste Account and Process *II* Account for the first week of the month.

(*iii*) Comment on the method used by the *JKL* Limited to attribute the pre-separation costs to joint products.

(*iv*) Advise the management of *JKL* Limited whether or not, on purely financial grounds, it should continue to process product *K* into product K_2:

(*a*) If product *K* could be sold at the point of separation for ₹ 47.30 per kg; and

(*b*) If the 60% of the weekly fixed costs of Process *II* were avoided by not processing product *K* further.

[*CA PE II]*

Solution:

(*i*) Process I Account

Particulars	*Qty in kg*	*Rate per kg* ₹	*Amount* ₹	*Particulars*	*Qty in kg*	*Rate per kg* ₹	*Amount* ₹
To Material input	40,000	16.50	6,60,000	By Product *L* sales	4,000	19.25	77,000
To Direct labour			4,40,000	By Toxic waste	2,000	16.50	(33,000)
To Variable Overheads			1,76,000	By Abnormal loss	400	44	17,600
To Fixed Overheads			2,64,000	By Joint Product *J* (Refer to Working Note 2)	19,200		7,21,171
				By Joint product *K* (Refer to Working Note 2)	14,400		7,57,229
	40,000		15,40,000		40,000		15,40,000

Note: Toxic waste is not sold, it is disposed of by incurring expenses @ ₹ 16.50 per kg.

$$\text{Valuation of abnormal loss per kg} = \frac{₹\ 15,40,000 - ₹\ 77,000 + ₹\ 33,000}{40,000\text{Kgs.} \times 0.85}$$ (Using physical measure method)

$$= ₹\ 14,96,000/34,000 \text{ kgs.} = ₹\ 44 \text{ per kg.}$$

(*ii*) Toxic Waste Account

Particulars	*Qty in kg*	*Rate/ kg* ₹	*Amount* ₹	*Particulars*	*Qty in kg*	*Rate/ kg* ₹	*Amount* ₹
To Process I A/c	2,000	16.50	(–)33,000	By Balance		16.50	(–) 33,000

Process *II* Account

Particulars	*Qty in kg*	*Rate/ kg* ₹	*Amount* ₹	*Particulars*	*Qty in kg*	*Rate/ kg* ₹	*Amount* ₹
To Process *I* A/c (Product K)		52.585	7,57,236	By Product K_2 account	13,200		11,73,924
To Variable Overheads		16.50	2,37,600	By Closing W.I.P (Refer to			
To Fixed Overheads			2,64,000	Working Note 3)	1,200		84,912
	14,400		12,58,836		14,400		12,58,836

Working Notes:

1. Calculation of joint cost of the output:

= ₹ 15,40,000 – ₹ 77,000 – ₹ (–) 33,000 – ₹ 17,600

= ₹ 14,78,400

2. Allocation of joint cost over joint products *J* & *K*
(By using final sales value method)

Products	*Quantity* (Kgs)	*Sales value* ₹	*Joint cost* ₹
J	19,200	10,56,000 (19,200 kgs × ₹ 55)	7,21,171
K	14,400	11,08,800 (14,400 kgs × ₹ 77)	7,57,229
Total		21,64,800	14,78,400

3. Valuation of 1200 Kgs. of Closing W.I.P :

		₹
Material *I*	100% complete (1,200 kgs × 52.5858)	63,103
Fixed & variable overheads	$\left(\frac{₹\ 5,01,600}{13,800\ \text{units}}\right) \times 600\ \text{units}$	21,809
Total valuation of 1,200 kgs of closing W.I.P		84,912

(*iii*) Comment on the method used by the *JKL* Ltd :

(To attribute the pre-separation costs to joint products)

For attributing the joint costs over joint products *J* and *K, JKL* Ltd., used the basis of final sales value. This is one of the popular methods used in the industry.

Other methods can also be used for the purpose:

(*i*) Physical Measure Method (if both the products are equally complex).

(*ii*) Constant Gross Margin Percentage Method.

(*iii*) Net Realizable Value Method.

(*iv*) Advice to the Management of JKL Ltd.:

	₹
Incremental sales revenue per kg. from further processing	29.70
Less: Incremental variable cost per kg. of further processing	16.50
Incremental contribution per kg from further processing	13.20
At an output of 14,400 kgs the incremental contribution will be:	1,90,080

Less: Avoidable fixed cost (60% × ₹ 2,64,000)	1,58,400
Net benefit (₹)	31,680

$$\text{Break-Even-Point} = \frac{\text{Avoidable fixed cost}}{\text{Incremental contribution per Kg.}} = \frac{₹1,58,400}{₹13.20}$$

= 12,000 Kg.

Hence further processing should be undertaken if output is expected to exceed 12,000 kgs. per week.

MISCELLANEOUS ILLUSTRATIONS

Illustration 22 :

A Factory produces two products, '*A*' and '*B*' from a single process. The joint processing costs during a particulars month are :

Direct Materials	₹ 30,00
Direct Labour	₹ 9,600
Variable Overheads	₹ 12,000
Fixed Overheads	₹ 32,000

Sales: *A*– 100 units @ ₹ 600 per unit; *B* – 120 unit @ ₹ 200 per unit

Apportion joints costs on the basis of:

(*i*) Physical Quantity of each product

(*ii*) Contribution Margin Method, and

(*iii*) Determine Profit of *Loss* under both the methods. *[CA Inter]*

Solution :

(*i*) Apportionment of Joint Cost on the basis of Physical Quantity of each product:

Total Cost = ₹ 30,000 + ₹ 9,600 + ₹ 12,000 + ₹ 32,000 = ₹ 83,600

Total Units = 100 units + 120 units

= 220 units

$$A = ₹\ 83,600 \times \frac{100}{220} = ₹\ 38,00$$

$$B = ₹\ 83,600 \times \frac{120}{220} = ₹\ 45,600$$

(*ii*) Apportionment of Joint Cost on the basis of Contribution Margin Method.

Total Cost = ₹ 30,000 + ₹ 9,600 + ₹ 12,000 = ₹ 51,600 Apportionment a per units

$$A = ₹\ 51,600 \times \frac{100}{220} = ₹\ 23,455$$

$$B = ₹\ 51,600 \times \frac{120}{220} = ₹\ 28,145$$

Total fixed cost is allocated to A = ₹ 32,000

(*iii*) Profit or loss under both method :

(*i*) Physical Quantity

A = (₹ 60,000 – ₹ 38,000) = ₹ 22,000

B = (₹ 24,000 – ₹ 45,600) = (₹ 21,600) loss

(*ii*) Contribution Margin Method :

A = (₹ 60,000 – ₹ 23,455 – ₹ 32,000) = ₹4,545

B = (₹ 24,000 – ₹ 28,145) = (₹ 4,145) *loss*

Illustration 23:

A company's plant processes 6,750 units of a raw materials in a month to produce two products '*M*' and '*N*'.

The process yield is as under.

Product *M*	80%
Product *N*	12%
Product Loss	8 %

The cost of raw material is ₹ 80 per unit.

Processing cost is ₹ 2,25,000 of which labour cost is accounted for 66 %.

Labour is chargeable to product '*M*' and '*N*' in the ratio of 100 : 80.

Prepare a Comprehensive Cost Statement for each product showing :

(*i*) Apportionment of joint cost among '*M*' and '*N*' and

(*ii*) Total cost of the product ' *M*' and '*N*'

Solution:

(*i*) Apportionment of Joint Cost among M & N

Particulars	*M*	*N*	*Wastages*	*Total*
Output + Wastages.	5,400	810	540	6,750
[5,400 × 540/6,210]	470	70	(540)	—
[5,400 × 810/6,210]				
Net Weight	5,870	880	—	6,750
Share of Joint cost @ ₹ 80 P.U.	4,69,600	70,400	—	5,40,000
Labour cost				
[2,25,000 × 66 %] 100 : 80	85,500	66,000	—	1,48,500
Processing Cost	66,527	9,973	—	76,500
[2,25,000 – 1,48,500] × 5,870:880	6,18,627	1,46,373	—	7,65,000

Comprehensive Cost Statement

Particulars	*Total Cost (₹)*	*Product-M (₹)*	*Product-N (₹)*
No. of units produced*		5,400 units	810 units
Cost of raw material (₹ 80 × 6,750 units)	5,40,000		
Processing cost:			
- Labour cost (₹ 2,25,000 66 %)	1,48,500		
- Other cost (₹ 2,25,000 – 1,48,500)	76,500		
Total joint cost	7,65,000		
(i) Apportionment of joint costs between	1,48,500	82,500	66,000
the joint product Labour cost in the ratio of 100 : 80		$\left(\frac{1,48,500 \times 100}{180}\right)$	$\left(\frac{1,48,500 \times 80}{180}\right)$
Other joint costs (including material	6,16,500	5,36,087	80,413
in the ratio of output)	$\left(\frac{6,16,500 \times 5,400}{6,210}\right)$		$\left(\frac{6,16,500 \times 810}{6,210}\right)$
(5,400 : 810)			
(*ii*) Total product cost	7,65,000	6,18,587	1,46,413

* No. of units produced of Product *M* = 6,750 units × 80 % = 5,400 units

No. of units produced of Product *N* = 6,750 units × 12% = 810 units

Illustration 24:

Mayura Chemicals Ltd. buys a particulars raw materials at ₹ 8 per liter. At the end of the processig in Department - 1, this raw materials splits-off into products *X* ,*Y* and *Z* Product *X* is sold at the split-off point, with no further processing. Product *Y* and *Z* require further processing before they can be sold. Product *Y* is processed in Department - 2, and Product *Z* is processed in Department - 3. Following is a summary of the costs and other related data for the year 2020-21.

Particulars	*Department*		
	1	*2*	*3*
Cost of Raw Materials	₹ 4,80,000	—	—
Direct Labour	₹ 70,000	₹ 4,50,000	₹ 6,50,000
Manufacturing Overheads	₹ 48,000	₹ 2,10,000	₹ 4,50,000
	Products		
	X	*Y*	*Z*
Sales (litres)	10,000	15,000	22,500
Closing inventory (liters)	5,000	—	7,500
Sales price per liter (₹)	30	64	50

There were no opening and closing inventories of basic raw materials at the beginning as well as the end of the year. All finished goods inventory in litres was complete as to processing. The company uses the Net-realisable Value Method of allocating joint costs.

You are required to prepare:

(*i*) Schedule showing the allocation of joint costs.

(*ii*) Calculate the cost of goods sold of each product and the cost of each item in inventory

(*iii*) A comparative statement of Gross Profit. *[CA Inter Jan 2021]*

Solution:

(*i*) Statement of Joint Cost allocation of inventories of *X,Y* and *Z*

Particulars	*Product*			*Total (₹)*
	X (₹)	*Y (₹)*	*Z (₹)*	
Finial sales value of total production (Working Note 1)	4,50,000 (15,000 × ₹ 30)	9,60,000 (15,000 × ₹ 64)	15,00,000 (30,000 × ₹ 50)	29,10,000
Less: Additional cost	—	6,60,000	11,00,000	17,60,000
Net realisable value (at split-off point)	4,50,000	3,00,000	4,00,000	11,50,000
Joint cost allocated (Working Note 2)	2,34,000	1,56,000	2,08,000	5,98,000

(*ii*) Calculation of Cost of Goods and Closing Inventory

Particulars	*Product*			*Total (₹)*
	X (₹)	*Y (₹)*	*Z (₹)*	
Allocated joint cost	2,34,000	1,56,000	2,08,000	5,98,000
Add: Additional costs	—	6,60,000	11,00,000	17,60,000
Cost of goods sold (COGS)	2,34,000	8,16,000	13,08,000	23,58,000
Less: Cost of closing inventory (Working Note 1)	78,000 (COGS × 100/3%)	—	3,27,000 (COGS × 25%)	4,05,000
Cost of goods sold	1,56,000	8,16,000	9,81,000	19,53,000

(*iii*) Comparative Statement of Gross Profit

Particulars	*Product*			*Total* (₹)
	X (₹)	*Y* (₹)	*Z* (₹)	
Sales revenue	3,00,000 (10,000 × ₹ 30)	9,60,000 (15,000 × ₹ 64)	11,25,000 (22,500 × ₹ 50)	23,85,000
Less: Cost of goods sold	1,56,000	8,16,000	9,81,000	19,53,000
Gross Profit	1,44,000	1,44,000	1,44,000	4,32,000

Working Notes:

1. Total production of three production for the year 2020-21

Production	*Quantity sold in litres*	*Quantity of closing inventory in litres*	*Total production*	*Closing inventory percentage (%)*
(1)	(2)	(3)	(4) = {(2)+(3)}	(5) = (3)/(4)
X	10,000	5,000	15,000	100/3
Y	15,000	—	15,000	—
Z	22,500	7,500	30,000	25

2. Joint cost apportioned to each product:

$$= \frac{\text{Total Joint Cost}}{\text{Total Net Realisable Value}} \times \text{Net Realisable Value of Each Product}$$

$$\text{Joint cost of product } X = \frac{₹\,5,98,000}{₹\,11,50,000} \times ₹\,4,50,000 = ₹\,2,34,000$$

$$\text{Joint cost of product } Y = \frac{₹\,5,98,000}{₹\,11,50,000} \times ₹\,3,00,000 = ₹\,1,56,000$$

$$\text{Joint cost of product } Z = \frac{₹\,5,98,000}{₹\,11,50,000} \times ₹\,4,00,000 = ₹\,2,08,000$$

Illustration 25:

In an Oil Mill four product emerge from a refining process. The total cost of input during the quarter ending March 2022 is ₹ 1,48,000. The output, sales and additional processing costs are as under:

Products	*Output in Litres*	*Additional processing cost after split off* (₹)	*Sales value* (₹)
ACH	8,000	43,000	1,72,500
BCH	4,000	9,000	15,000
CSH	2,000	—	6,000
DSH	4,000	1,500	45,000

In case these product were disposed-off at the split off point that is before further processing, the selling price per litre would have been:

ACH (₹)	*BCH* (₹)	*CSH* (₹)	*DSH* (₹)
15.00	6.00	3.00	7.50

Produce a statement of profitability based on:

(*i*) If the product is sold after further processing is carried out in the mill.

(*ii*) If they are sold at the split off point.

Solution:

Statement of profitability of the Oil Mill (after carrying out further processing) for the quarter ending 31st March,2022

Products	*Sales Value after further processing* ₹	*Share of Joint cost* ₹	*Additional processing cost* ₹	*Total cost after processing* ₹	*Profit (loss)* ₹
ACH	1,72,500	98,667	43,000	1,41,667	30,833
BCH	15,000	19,733	9,000	28,733	(13,733)
CSH	6,000	4,933	—	4,933	1,067
DSH	45,000	24,667	1,500	26,167	18,833
	2,38,500	1,48,000	53,500	2,01,500	37,000

(*ii*) Statement of profitability at the split off point

Products	*Selling price of split off* ₹	*Output in units* ₹	*Sales value at split off point* ₹	*Share of Joint cost* ₹	*Profit at split off point* ₹
ACH	15.00	8,000	1,20,000	98,667	21,333
BCH	6.00	4,000	24,000	19,733	4,267
CSH	3.00	2,000	6,000	4,933	1,067
DSH	7.50	4,000	30,000	24,667	5,333
			1,80,000	1,48,000	32,000

Note: Share of Joint Cost has been arrived at by considering the sales value at split off point.

Illustration 26:

A company processes a raw material in its Department *1* to produce three product, viz *A, B* and *X* at the same split-off stage. During a period 1,80,000 Kgs of raw materials were processed in Department *1* at a total cost of ₹ 12,88,000 and the resultant output of *A,B* and *X* 18,000 Kgs, 10,000 Kgs and 54,000 Kgs respectively. *A* and *B* were further processed in Department 2 at a cost of ₹ 1,80,000 and ₹ 1,50,000 respectively.

X was further processed in Department 3 at a cost of ₹ 1,08,000. There is no waste in further processing. The details of sales affected during the period were as under

Particulars	*A*	*B*	*X*
Quantity Sold (kgs.)	17,000	5,000	44,000
Sales Value (₹)	12,24,000	2,50,000	7,92,000

There was no opening stock. If these products were sold at split-off stage, the selling prices of *A,B* and *X* would have been ₹ 50, ₹ 40 and ₹ 10 per Kg respectively.

(*i*) Prepare a statement showing the apportionment of joint costs to *A,B* and *X*.

(*ii*) Present a statement showing the cost per Kg of each product indicating joint cost and further processing cost and total cost separately.

(*iii*) Prepare a statement showing the product wise and total profit for the period.

(*iv*) State with supporting calculations as to whether any or all the products should be further processed or not.

Solution:

(*i*) statement showing the apportionment of joint costs to *A,B* and *X*

Products	*A*	*B*	*X*	*Total*
Output (kg)	18,000	10,000	54,000	
Sales value at	9,00,000	4,00,000	5,40,0000	18,40,000

the profit of split off (₹)	(₹ 50 × 18,000)	(₹ 40 × 10,000)	(₹ 10 × 54,000)	
Joint Cost	6,30,000	2,80,000	3,78,000	12,88,000
Apportionment on the basic of sales value at the point of split off (₹)	$\left(\frac{₹\,12,88,000}{₹\,18,50,000} \times 9,00,000\right)$	$\left(\frac{₹\,12,88,000}{₹\,18,50,000} \times 4,00,000\right)$	$\left(\frac{₹\,12,88,000}{₹\,18,50,000} \times 5,40,000\right)$	

(*ii*) Statement showing the cost per kg. of each product (indicating joint cost; further processing cost and total separately)

Products	*A*	*B*	*X*
Joint costs apportioned (₹) : (*I*)	6,30,000	2,80,000	3,78,000
Product (kg) : (*II*)	18,000	10,000	54,000
Joint cost per kg (₹) : (*I* ÷ *II*)	35	28	7
Further processing Cost per kg. (₹)	10	15	2
	$\left(\frac{₹\,1,80,000}{₹\,18,000Kg}\right)$	$\left(\frac{₹\,1,50,000}{₹\,10,000\ Kg}\right)$	$\left(\frac{₹\,1,08,000}{₹\,54,000\ Kg}\right)$
Total Cost Per kg. (₹)	45	43	9

(*iii*) Statement showing the product wise and total profit for the period

Product	*A*	*B*	*X*	*Total*
Sales value (₹)	12,24,000	2,50,000	7,92,000	
Add: Closing stock value (₹) (Refer to Working note 2)	45,000	2,15,000	90,000	
Value of production (₹) (*a*)	12,69,000	4,65,000	8,82,000	26,16,000
Apportionment of joint cost (₹)	6,30,000	2,80,000	3,78,000	
Add: Further processing cost (₹)	1,80,000	1,50,000	1,08,000	
Total cost (₹) (*b*)	8,10,000	4,30,000	4,86,000	17,26,000
Profit (₹) (*a*) – (*b*)	4,59,000	35,000	3,96,000	8,90,000

Working Notes:

1.

Products	*A*	*B*	*X*
Sales value (₹)	12,24,000	2,50,000	7,92,000
Quantity sold (Kgs.)	17,000	5,000	44,000
Selling price₹/Kg	70	50	18
	$\left(\frac{₹\,12,24,000}{₹\,17,000\ Kg}\right)$	$\left(\frac{₹\ 2,50,000}{₹\,5,0000\ Kg}\right)$	$\left(\frac{₹\,7,92,000}{₹\,44,000\ Kg}\right)$

2. Valuation of closing stock:
Since the selling per kg of products, *A, B* and *X* is more than their total costs, therefore closing stock will be valued at cost.

Products	*A*	*B*	*X*	*Total*
Closing stock (kgs.)	1,000	5,000	10,000	
Cost per (kg) ₹	45	43	9	
Closing stock value (₹)	45,000	2,15,000	90,000	3,50,000
	(₹ 45 × 1,000 Kg)	(₹ 43 × 5,000 Kg)	(₹ 9 × 10,000 Kg)	

(*iv*) Calculation for processing decision

Products	*A*	*B*	*X*
Selling pries per kg at the point of split off (₹)	50	40	10
Selling price per kg after further processing (₹) (Refer to working Note 1)	72	50	18
Incremental selling price per kg (₹)	22	10	8
Less: Further processing cost per kg (₹)	– 10	– 5	– 2
Incremental profit (loss) per kg (₹)	12	– 5	6

Product *A* and *X* has an incremental profit per unit after further processing, hence, these two products may be further processed. However, further processing of product *B* is not profitable hence, product *B* shall be sold at split off point

Illustration 27:

A company manufactures one main product (M_1) and two by- Product B_1 and B_2. For the month of January 2022, following details are available:

Total Cost up to separation point ₹ 2,12,400

	Products		
	M_1	B_1	B_2
Cost after separation	—	₹ 35,000	₹ 24,000
No. of units produced	4,000	1,800	3,000
Selling price per unit	₹ 100	₹ 40	₹ 30
Estimated net profit as percentage to sales value	—	20%	30%
Estimated selling expenses as percentage to sales value	20%	15%	15%

There are no beginning or closing inventories.

Prepare statement showing:

(*i*) Allocation of joint cost; and

(*ii*) Product-wise and overall profitability of the company for January 2022.

Solution:

(*i*) Statement Showing Allocation of joint Cost

Particulars	B_1	B_2
No. of Units Produced	1,800	3,000
Selling Price Per unit (₹)	40	30
Sales Value (₹)	72,000	90,000
Less: Estimated Profit (B_1 – 20% & B_2 – 30%)	(14,400)	(27,000)
Cost of Sales	57,600	63,000
Less: Estimated Selling Expenses (B_1 – 15% & B_2 – 15%)	(10,800)	(13,500)
Cost of Production	46,800	49,500
Less: Cost after separation	(35,000)	(24,000)
Joint Cost allocated	11,800	25,500

(*ii*) Statement of Profitability

Particulars	M_1 (₹)	B_1 (₹)	B_2 (₹)
Sales Value (*A*)	4,00,000 (4,000 × ₹ 100)	72,000	90,000
Less: Joint Cost	1,75,100 (2,12,400 – 11,800 – 25,600)	11,800	25,500
Cost after separation	—	35,000	24,000

Selling Expenses (M_1 – 2% B_1 – 15% & B_2 – 15%)	80,000	10,800	13,500
Total Cost (*B*)	2,55,100	57,600	63,000
Profit (*A* – *B*)	1,44,900	14,400	27,000
Overall Profit = 1,44,900 + 14,400 + 27,000 = ₹ 1,86,300			

Illustration 28:

A Ltd. produces '*M*' as a main product and gets two byproduct - '*P*' and '*Q*' in the course of processing:

Following information are available for the month of October, 2022:

Particulars	*M*	*P*	*Q*
Cost after separation	—	₹ 60,000	₹ 30,000
No. of units produces	4,500	2,500	1,500
Selling price (per unit)	₹ 170	₹ 80	₹ 50
Estimates net profit to sales	—	30%	25%

The Joint cost of manufacture up to separation point amount to ₹ 2,50,000. Selling expenses amounting to ₹ 85,000 are to be apportioned to the three product in the ratio of sales units.

There is no opening and closing stock. Prepare the statements showing:

(*i*) Allocation of joint cost.

(*ii*) Product wise overall profitability and

(*iii*) Advise the company regarding results if the byproduct '*P*' is not further processed and is sold at the point of separation at ₹ 60 per unit without incurring selling expenses.

Solution:

(*i*) Statement Showing allocation of Joint Cost

Particulars	*P*	*Q*
No. of units produced	2,500	1,500
Selling price per unit (₹)	80	50
Sales value (₹)	2,00,000	75,000
Less: Estimated profit (P – 30%, Q – 25%)	60,000	18,750
Cost of sales	1,40,000	56,250
Less: Estimated Selling Exp.	25,000	15,000
Cost of Production	1,15,000	41,250
Less: Cost after separation	60,000	30,000
Joint Cost allocated	55,000	11,250

Working Note:

Calculation of selling exp.

$$P = \frac{85,000}{8,500} \times 2,500 = 25,000$$

$$Q = \frac{85,000}{8,500} \times 1,500 = 15,000$$

$$M = \frac{85,000}{8,500} \times 4,500 = 45,000$$

(*ii*) Statement of Profitability

Particulars	*M* (₹)	*P* (₹)	*Q* (₹)
Sales value (A)	7,65,000	2,00,000	75,000
Les: Joint Cost	(4,500 × ₹ 170)		

	1,83,750 (2,50,000 – 55,000 – 11,250)	55,000	11,250
Cost after separation	—	60,000	30,000
Selling Expenses	45,000	25,000	15,000
Total Cost (*B*)	2,28,750	1,40,000	56,250
Profit (*A* – *B*)	5,36,250	60,000	18,750

Overall profit = ₹ 5,36,250 + ₹ 60,000 + 18,750
= ₹ 6,15,000

(*iii*) If the by-product P is not further processed and is sold at the point of separation

Particulars	*Amount (₹)*
Sales value st the point separation (2,500 units × ₹ 60)	1,50,000
Less: Joint cost	55,000
Profit	95,000
Profit after further processing	60,000
Incremental Profit	35,000

If the by-product *P* is sold at the point of separation, it will give an additional profit of ₹ 35,000 to the company, hence, the company should sell by-product *P* without further processing.

Illustration 29:

A Factory is engaged in the production of chemical Bomex and in the course of its manufacture a by-product Cromex is produced which after further processing has a commercial value. For the month of April 2022, the following are the summarised cost data:

Particulars	*Joint Expenses (₹)*	*Separate Expenses (₹)*	
		Bomex	*Cromex*
Materials	1,00,000	6,000	4,000
Labour	50,000	20,000	18,000
Overheads	30,000	10,000	6,000
Selling Price per unit		100	40
Estimated profit per unit on sale of Cromex			5
Number of units produced		2,000 units	2,000 units

The factory uses net realised value method for apportionment of joint cost to by-products.

You are required to prepare statements showing:

(*i*) Joint cost allocable to Cromex

(*ii*) Product wise and overall profitability of the factory for April 2022.

Solution:

(*i*) Statement Showing Joint Cost Allocation to 'Cromex'

Particulars	*Cromex (₹)*
Sales (₹ 40 × 2,000 units)	80,000
Less: Post Split off Costs (4,000 + 18,000 + 6,000)	(28,000)
Less: Estimated Profit (₹ 5 × 2,000 units)	(10,000)
Joint cost allocable	42,000

(*ii*) Statement Showing Product Wise and Overall Profitability

Particulars	*Bomex (₹)*	*Cromex (₹)*	*Total (₹)*
Sales	2,00,000	80,000	2,80,000
Less: Share in Joint Expenses	(1,38,000)*	(42,000)	(1,80,000)
Less: Post Split off Costs	(36,000)	(28,000)	(64,000)
Profit	26,000	10,000	36,000

(*) 1,80,000 – 42,000

OBJECTIVE QUESTIONS

Which of the following statement is True or False.

1. Joint Product and By Product are not different.
2. If the various products are of substantial importance, they are termed as Joint Product.
3. By products are any saleable or usual value produced in addition to main product.
4. Relatively unimportant product articles will be by-products.
5. Before the split-off point, cost cannot be traced to particular product, such cost is called joint cost.
6. The methods used to apportion joint cost are based on physical volume and sales volume of products.

Ans 1. False 2. True 3. True 4. True 5. True 6. False

ASSIGNMENTS

Theoretical Questions

1. Explain the methods to be adopted in the treatment of joint products and by-products.
2. How would you deal with by-products in costing : (*a*) where they are of small value, (*b*) where they are of considerable value, (*c*) where they require further processing.
3. Describe briefly how joint cost up to the point of separations may be apportioned amongst the joint products under following methods (*i*) Average unit cost method (*ii*) Contribution margin method (*iii*) Market value at the point of separation (*iv*) Market value after further processing (*v*) Net realisable value method.

Numerical Questions

1. Work out the estimated pre-separation cost per tonne of by-products *Y* and *Z* from the following data:

   Costs of manufacture before separation : ₹ 25,60,000

   Main Product is *X*

   There are two by-products *Y* and *Z* whose normal selling prices are as under :

   Sales price of *Y* : ₹ 500 per tonne

   Sales price of *Z* : ₹ 800 per tonne

   Selling and distribution expenses have been estimated to be 25% of selling price and the net profit is expected to be 10% of selling price. Costs to manufacture each tonne after separation from the main products are :

   ₹ 95 for By-product *Y*

   ₹ 145 for By-product *Z*

   Assume equal weight for *Y* and *Z*.

   Ans. Pre-separation cost per tonne Y ₹ 230; Z ₹ 375.

2. In a manufacturing process, in the course of manufacture of the product *X*, the by-products *P* and *Q* also emerge. The pre-separation expenses amount to ₹ 1,19,550. All the three products are processed further and sold in the market (details given below).

Particulars	*Main product*	*By-products*	
	X	*P*	*Q*
Sales value (₹)	90,000	60,000	40,000
Post-separation costs (₹)	6,000	5,000	4,000
Profit as a percentage of sales	25	20	15

Total fixed selling and distribution expenses are 10% of the total cost of sales and are apportioned to the three products in the ratio of 20:40:40.

(*i*) Prepare a statement showing the apportionment of pre-separation costs to the main product and the two by-products.

(*ii*) If the by-product *P* is not processed further and can be sold just after separation at ₹ 58,500 without incurring any selling and distribution expenses, would you advise its disposal at that stage? *[CMA (Inter)]*

Ans. (i) Pre-separation cost; Main Product x ₹ 58,510; By-product P ₹ 37,020, Q ₹ 24,020. (ii) Profit without further processing P ₹ 21,480. Profit after further processing 20% of sales ₹ 12,000 then further processing cost ₹ 9,480]

3. A factory is engaged in the production of a chemical Bomex and in the course of its manufacture, a by-product Brucil is produced, which after further processing has a commercial value. For the month of April, the following are the summarised cost data:

	Joint Expenses	*Separate Expenses*	
		Bomex	*Brucil*
	₹	₹	₹
Materials	1,00,000	6,0000	4,000
Labour	50,000	20,000	18,000
Overheads	30,000	10,000	6,000
Selling price per unit		98	34
Estimated profit per unit on sale of Brucil			4
No. of Units Produced		2,000 Units	2,000 Units

The factory uses reverse cost method of accounting for by-products whereby the sales value of by-products after deduction for the estimated profit, post-separation costs and selling and distribution expenses relating to the by-products is credited to the joint process cost account.

You are required to prepare statements showing.

(*i*) The joint cost allocable to Bomex.

(*ii*) The product-wise and overall profitability of the factory for the month of April.

Ans. (i) ₹ 1,48,000 (ii) Bomex ₹ 12,000 + Brucil ₹ 8,000 = ₹ 20,000

4. In a process line of *XY* Company three joint products are produced. For the month of May the following data were available:

Products	*L*	*M*	*N*
	₹	₹	₹
Sales price per Kg	5	10	20
Post-separation point cost	10,000	5,000	15,000
Output in Kg	2,500	1,000	1,500
Pre-separation point costs amounted to ₹ 20,000			

The joint products are manufactured in one common process, after which they are separated and may undergo further individual processing. The pre-separation point costs are apportioned to joint products according to weight. You are required to prepare a statement showing the estimated profit or loss for each product and in total. *[CM.A. Inter]*

Ans. Loss ₹ 7,500, M Profit ₹ 1,000, N Profit ₹ 9,000. Total Profit ₹ 2,500, Joint Cost L ₹ 10,000 M ₹ 4,000, N ₹ 6,000.

5. In an Oil Mill four products emerge from a refining process. The total cost of input during the quarter ending March 2022 is 1,48,000. The output, sales and additional processing costs are as under :

Product	*Output in Litres*	*Additional processing cost after split-off point*	*Sales value*
AOXE	8,000	₹ 43,000	₹ 1,72,500
BOXE	4,000	9,000	15,000
COXE	2,000	—	6,000
DOXE	4,000	1,500	45,000

In case these products were disposed of at the split-off point, that is before further processing, the selling price would have been :

AOXE	BOXE	COXE	DOXE
₹ 15.00	₹ 6.00	₹ 3.00	₹ 7.50

Prepare a statement of profitability based on :

1. If the products are sold after further processing is carried out in the mill.
2. If they are sold at the split-off point.

Ans. Profits after further processing AOXE ₹ 30,833, BOXE Loss ₹ 13,733, COXE Profit ₹ 1,067, DOXE Profit ₹ 18,833, Total ₹ 37,000, Profit at split-off point AOXE ₹ 21,333, BOXE ₹ 4,267, COXE ₹ 1,067, DOXE ₹ 5,333 Total ₹ 32,000.

IV
UNIT

Operation Costing

6

Operation Costing

Chapter Outline

- Definition
- Meaning
- Relationship With Unit Costing, Process Costing and Service Costing
- Salient Features
- Cost Accumulation Procedure
- Use of Control Ratios
- Advantages and Disadvantages
- Transport Costing
- Boiler House Costing
- Power House Costing
- Hospitals Costing
- *Objective Questions*
- *Assignments*

DEFINITION

The Official *CIMA* Terminology defines operation costing as "the costing method applicable where goods or services result from a sequence of continuous or repetitive operations or processes. Costs are averaged over the units produced during the period, being initially charged to the operation or process".

As could be seen from the definition above, the Terminology does not define operation costing independently of process costing. In the backdrop of the two basic methods of costing, the Terminology distinguishes only specific order costing and continuous operations costing. Just as job costing, batch costing and contract costing fall under 'specific order costing', both process costing and operating or service costing fall under 'continuous operations costing'. Thus, process costing, unit costing and operating costing are only different forms of continuous operations costing.

MEANING

The term 'operation costing' is a generic term. It includes within its fold a group of costing methods of varying complexity. It includes, for instance, unit or output costing applicable to concerns producing a single article on a large scale. The process of production comprises a single operation and the units produced are homogeneous and identical. It also includes process costing under which costs are accumulated for each process by time periods. The average cost per unit is determined by dividing the total cost of each process by the number of units produced during the same period. Operation costing also includes by-product and joint product costing. Besides, operation costing also includes operating or service costing.

It is of interest to note in this context that the terms 'operation costing' and 'operating costing' are, sometimes used interchangeably. This is because of the reason that operation costing includes operating costing and the latter is applicable to the costing of a unit of service rather than a unit of product. Thus, service costing, or function costing, or operating costing is also a part of operation costing since the same uses similar principles of averaging the cost per unit of service.

Thus, in a broad sense, operation costing is one of the basic methods of costing like specific order costing. Operation costing as applied to a single operation is called unit or output costing. Where a process consists of a number of operations, the method applied is called process costing, although, the same is operations costing in principle. In other words, process industries in which each process can be split into a number of operations, the method of costing applied is called operations costing. Where, however, a process is a unified whole and cannot be sub-divided into parts, the method applied is called process costing. It may thus be said that operation costing is a refinement of process costing.

In the case of process costing treated as operation costing, each operation is considered to be a cost centre for purposes of cost accumulation and cost ascertainment. As such, instead of accumulating costs for each process, the same are accumulated for each of its parts. Thus, the distinction between process costing and operation costing is very narrow. It is, for this reason that the official *CIMA* Terminology does not distinguish between the two.

RELATIONSHIP WITH UNIT COSTING, PROCESS COSTING AND SERVICE COSTING

As pointed above, unit costing, process costing and operating or service costing are closely related to one another since all of them fall under the category of operation costing. The relationship lies in the cost unit selected. If the cost unit is a single operation the cost of which is to be ascertained, unit costing method is adopted. Where, however, the article to be produced passes through distinct stages of production and it is necessary to ascertain the cost of each process, the method of costing applied is process costing.

Where a process consists of a number of operations and the cost unit is an operation like blanking, piercing, facing, cutting, knurling, bending, *etc*., each operation is costed as a separate cost unit. The method of costing applied is operation costing.

Where an industry does not produce goods but render service which is measured in one uniform unit such as kilometre, mile, bed, meal, *etc*., the costing procedure is the same as that in the case of any operation or stage of production. Accordingly, operation costing may well be applied although, in the case of such services, the term 'operating' costing is more commonly used.

Thus, operation costing includes within its fold not merely process costing, but unit costing as well as operating costing. Unit costing for one stage and one operation with regard to production of an article on a mass scale; operation costing for each of the operations of a single process; process costing for several operations or stages and each stage comprising several operations treated as one unit; and operating costing where service is rendered and the cost unit, whether simple or composite, is a unit of service such as kilometre, mile, bed, meal, show, day, *etc*.

SALIENT FEATURES

Operation costing is generally applied to an industry in which the product is of a standard nature and passes through several sequential operations before it comes out as finished product. For instance, in a steel component manufacturing company steel billets may be pressed into metal sheets, the sheets may be cut into particular sizes, the cut-sheets may further undergo such operations as shearing, stamping, *etc*., before the emergence of the final product.

Similarly, in cases where production is of a continuous nature and scrap and waste arise at the end of each operation, operation costing is most suitable.

Further, in the case of engineering industries and those engaged in wood-working, toy making, *etc*., in which the raw material passes through several operations, and the entire output of each operation is not passed on to the next operation, and a part of it is held in stock as components and sub-assemblies to be used at a later stage for completion of work, operation costing is best suited.

Thus, operation costing reveals the following essential features:

(*a*) Operation costing is neither purely a specific order costing system nor purely process costing system. In a majority of cases, the system installed may combine the features of both job or batch and process costing systems. Since operation costing does not fall neatly either under specific order costing or process costing, the same may be termed as 'hybrid' costing system.

(*b*) The system demands standardisation of work so that the product passes uniformly from the first operation to the last operation.

(*c*) There is also the need to determine exactly the number of operations involved so that one can know where exactly a process ends and another one begins.

(*d*) It is equally necessary to clearly define and lay down the input-output ratio for each process. This becomes necessary for ascertaining in advance, the normal levels of wastage and scrap.

(*e*) Proper up-keep and maintenance of plant and equipment is also necessary to ensure continuous flow of production without any interruption.

COST ACCUMULATION PROCEDURE

The costing procedure in the case of operation costing is similar to that of process costing. But yet, the cost centre in the case of operation costing being much smaller than that of process costing, costs have to be accumulated in respect of the operation cost centre. A cost centre based on similarity of operations is known as an 'operation cost centre'.

After having defined and established a cost centre for each operation, it is necessary to attribute the relevant costs in respect of materials, labour and overhead to each operation and transfer the total cost to the next operation. The cost per unit of each operation is obtained by the method of averaging.

Where it is inexpedient to open an account for each operation either because of the clerical labour involved or financial impact, the system may suitably be modified as to reduce labour or cost. This may be achieved by maintaining only analysis sheet for the operations and process accounts in the general ledger.

Sometimes, the operations may reveal only the cost of conversion per unit. In such a case, the cost of materials is added to the conversion cost of each operation and the total will be the aggregate cost of the finished product. The cost per unit of the finished product will then be the total cost divided by the total number of units manufactured.

USE OF CONTROL RATIOS

Operation costing is applicable to process type of industries, in which successive operations are uniform. Further, in the case of such type of industries, there is a direct relationship between the input and output consequent upon both input and output capable of being expressed in the same quantitative measurement. Therefore, material input may be compared with the predetermined material content of the output. This is done by determining the input-output ratio.

The wastage and scrap of each operation may be expressed as a fixed percentage of the input (sometimes, output also). This facilitates control of efficiency of output. The input-output ratio may be established for each operation on the assumption that the entire output of the previous operation is passed on to the next operation, or even if the input of each operation is different from the output of the previous operation.

ADVANTAGES AND DISADVANTAGES

Operation costing secures the following advantages:

(*a*) Since operation costing is a refinement of process costing, costs arrived at under the former are more accurate than those under process costing.

(*b*) By creating operation cost centres, even for narrow fields or areas of activity, it is possible to exercise a greater degree of control over costs.

(*c*) In case the number of operations is limited, operation costing will be much cheaper or less expensive than job costing in the case of which costs have to be ascertained for each work order and for each operation through which the work order passes.

However, operation costing suffers from the following disadvantages:

(*i*) The method is more expensive than process costing. The method demands maintenance of detailed records and involves much clerical work.

(*ii*) It is less accurate than job costing although, more accurate than process costing.

(*iii*) It does not offer much scope for cost control when compared to job costing.

Illustration 1:

An article undergoes three successive operations from raw materials to finished product stage. The following information is available from the production records of a particular month:

Operation No.	*Number of piece Input*	*Number of piece rejected*	*Number of pieces of output*
1	12,000	4,000	8,000
2	13,200	1,200	12,000
3	9,600	1,600	8,000

Find out what should be the input in the first operation in number of pieces to obtain a finished product of 100 pieces after the last operation.

Calculate the cost of raw material required to produce one piece of finished product from the following particulars:

Weight of the finished piece	..	100 gm. per piece
Price of raw material	..	₹ 10 per kg.

Solution:

Number of pieces rejected in relation to the output in each operation is 50%, 10% and 20%. Input of the third operation should be the same as the output of the second operation. Similarly, input of the second operation should be the same as the output of the first operation. Input of the first operation can be found out by working backwards.

If the output of the third operation were 100 pieces, the percentage of rejection being 20% of the output, the input to the operation should be 120 pieces which is also the output of the second operation. Accordingly,

Operation	*Input*	*No. of pieces rejected*	*% Rejections on output*	*Output*
1	198	66	50%	132
2	132	12	10%	120
3	120	20	20%	100

Thus, when the input is 198 pieces in the first operation, the output will be 100 pieces in the third operation.

Weight of the finished piece being 100 gms. per piece, the total quantity of raw materials required is 19,800 gms. Price of raw materials is ₹ 10 per kg. *i.e.*, per 1,000 gms. ₹ 10. Hence, for 19,800 gms. cost should be ₹ 198 and for one piece ₹ 198/100 = ₹ 1.98.

Illustration 2:
In a mass producing factory, an article is obtained through two operations, *viz*., internal boring and facing. Production and labour records for March, 2022 showed the following particulars:

No.	*Operation*	*Input pieces*	*Rejections pieces*	*Labour cost (₹)*
1	Internal boring	30,000	5,000	300
2	Facing	18,750	3,750	75

You are required to calculate the direct labour cost per 100 units of the product on (*a*) Gross of each operation, (*b*) net of each operation, and (*c*) on final net of each operation.

Solution:

Operation Cost Sheet

Operation	*Input*	*Rejection*	*Output*	*Percentage rejection*	*Labour Cost (₹)*	*Labour cost per 100 pieces*		
						Gross (₹)	*Net (₹)*	*Total (₹)*
1	30,000	5,000	25,000	20%	300	1.00	1.20	1.50
2	18,750	3,750	15,000	25%	75	0.40	0.50	0.50
					375	1.40	1.70	2.00

Working backwards, if output of operation No. 2 were 100 units, wastage being 25% of output, input should be 125 units. If 125 units were the output of operation No. 1, wastage being 20% of output, 150 units should have been the input.

Thus, to obtain a final output of 100 units, gross input of the first operation should be 150 units.

Labour cost per 100 units: $\frac{300 \times 100}{30,000}$ = ₹ 1 Gross

$\frac{300 \times 100}{25,000}$ = ₹ 1.20 Net

Since the input should be 150 units for a final output of 100 units, it is necessary to add 50% on direct labour cost, *i.e*., ₹ 1 + 50% = ₹ 1.50. Thus, on final net, direct labour cost is ₹ 1.50.

Illustration 3:
In a manufacturing company, a product passes through 5 operations. The output of the fifth operation becomes the finished product. The input, rejection, output and labour and overheads of each operation for a period are as under:

Operation	*Input (units)*	*Rejection (units)*	*Output (units)*	*Labour and Overhead (₹)*
1	21,600	5,400	16,200	1,94,400
2	20,250	1,350	18,900	1,41,750
3	18,900	1,350	17,550	2,45,700
4	23,400	1,800	21,600	1,40,400
5	17,280	2,880	14,400	86,400

You are required to:

(*i*) Determine the input required in each operation for one unit of final output.

(*ii*) Calculate the labour and overhead cost at each operation for one unit of final output and the total labour and overhead cost of all operations for one unit of final output.

(*C.A. Inter*)

Solution:

Statement of Input Requirement

Operation	*Input (units)*	*Rejection (units)*	*Output (units)*	*Rejection as a % of output*	*Input required for final output*
1	21,600	5,400	16,200	33.33	2.00
2	20,250	1,350	18,900	7.14	1.50
3	18,900	1,350	17,550	7.69	1.40
4	23,400	1,800	21,600	8.33	1.30
5	17,280	2,880	14,400	20.00	1.20

Input required for each operation:

Operation	*Output (units)*	*Rejection of output in %*	*Input required*
5	1	20	$1 \times \frac{120}{100} = 1.20$
4	1.20	8.33	$1.20 \times \frac{108.33}{100} = 1.30$
3	1.30	7.69	$1.30 \times \frac{107.69}{100} = 1.40$
2	1.40	7.14	$1.40 \times \frac{107.14}{100} = 1.50$
1	1.50	33.33	$1.50 \times \frac{133.33}{100} = 2.00$

Statement of Labour and Overhead Cost

Operation	*Input (units)*	*Labour and Overheads*	*Labour and Overhead per unit of input*	*Input units required for one unit of final output*	*Labour and overhead per unit of final output*
		(₹)	*(₹)*		*(₹)*
(A)	*(B)*	*(C)*	*(D) = (C) ÷ (B)*	*(E)*	*(F) = (D) × (E)*
1	21,600	1,94,400	9	2.00	18.00
2	20,250	1,41,750	7	1.50	10.50
3	18,900	2,45,700	13	1.40	18.20
4	23,400	1,40,400	6	1.30	7.80
5	17,280	86,400	5	1.20	6.00
				Total	60.50

Total labour and overhead cost of all operations for one unit of final output is ₹ 60.50.

TRANSPORT COSTING

Transportation of goods and services happens to be a major economic activity in every country. In a transport operating company, costing consists of determining the cost of operating vehicle and the application of cost thus determined to a particular unit, *i.e.*, per tonne, per kilometre, per-tonne-kilometre *etc.* The cost per unit is carefully, selected by taking into account such factors as type and bulk of goods carried and

distance covered, *etc.* In most of the transport operating companies, often composite units are chosen, for example, per tonne-km, per passenger-km and so on.

Cost Classification

The operating cost of a transport company is classified under the following three categories.

(*a*) **Operating and Running Charges:** Running costs are really the cost of operation, which may vary more or less in direct proportion of distance covered. This may include costs of fuel, lubricants, grease, wear and tear of tyres and wages and salaries of drivers and cleaners. These expense are variable in nature, because they are dependent on distance covered and trips made.

(*b*) **Maintenance Charge:** These are semi-variable in nature and include wear on tyres, repairs and overhauls, painting, hire of spare vehicles, when firm's own vehicles are under repair and garaging, *etc.*

(*c*) **Fixed or Standing Charges:** These charges are incurred whether vehicle is operating or not. Insurance, tax, depreciation and part of driver's wages, interest on capital, general supervision, salary of operating managers are items that come under the category of fixed or standing charges. It is difficult to lay down hard and fast rules for above classification and the same will have to be attempted with regard to actual prevailing circumstances. The same item of cost will fall in the category of 'variable' in some circumstances and 'fixed' in other circumstances. Wages to drivers may be considered as an example. If wages are fixed and wage payment is not linked with actual operation of vehicle, the wages of drivers will obviously be treated as fixed charges or standing charges. If wage payment to drivers is directly linked with miles covered, the wages to drivers will fall in the category of variable expenses.

For each vehicle a daily log sheet is given by the manager by its driver. The manager collects the information and posts it appropriately to exercise control. The manager pays particular attention to avoidance of idleness of vehicle, wastage of capacity and duplication of journeys. Based on information available in daily log sheets, manager can prepare monthly vehicle log sheet and performance statements. These statements contain useful data regarding costs, maintenance and performance of each vehicle. In order to compare the operational efficiency for each period, the total costs for the period may be divided by the bases (or units) such as hours or days, number of kilometres run, *etc.* The data for the highlight areas for improvement, *viz.*, securing optimum use of vehicles, regular maintenance as a planned operation and prevention of duplicate journeys, *etc.*

In most cases, the transport department is a service department. All its cost is collected and apportioned to other departments on some suitable basis like commercial tonne-miles. Generally, commercial tonne-km (or miles) is obtained by multiplying the total tonnage carried by the kilometres travelled and dividing the products by two. Commercial tonne-km is determined when vehicle returns empty. The rate for the charges to be made from other departments is determined with reference to cost summary figures for past data, *etc.*

Representative Cost Sheet for Transport Company

It may be useful for a transport company to compile cost in the cost proforma given below. (This proforma may be adapted suitably according to the given situations).

ABC Transport Company Ltd.
Cost Sheet for the Month of..... 20 .....

Expenses	*Vehicle No.* *Capacity (Te)*	*0007* *10*	*0009* *5*	*00011* *6*	*Total*
1.	**Operating Costs:**	(₹)	(₹)	(₹)	(₹)
	Pertol				
	Engine oil				
	Lubricating Oil				
	Wages of Drivers				
	Wages of Cleaners				
	Depreciation*				
	Total				
2.	**Maintenance Costs:**				
	Tyres and Tubes				
	Repairs				
	Painting Charges				
	Overhauls				
	Total				
3.	**Fixed Costs:**				
	Garage rent				
	Insurance				
	Motor Vehicle Tax				
	Licence Fee				
	General Supervision				
	Interest on Capital				
	Total				
	Grand Total (1 + 2 + 3)				
	Mileage run				
	Load carried (tonnes)				
	Days on Road				
	Capacity Utilisation (%)				
	Tonne-mile run				
	Cost per Tonne-mile				
	Operating				
	Maintenance				
	Fixed				
	Total				

Figure 1: Representative Cost Sheet of a Transport Company

* It is assumed that the depreciation is charged on operating time

Illustration 4:

The following statistical data are available regarding the monthly cost of operating two trucks by a transport company:

Particulars	*Truck No. 01*	*Truck No. 02*
Drivers' Salaries	₹ 250	₹ 275
Cleaners' Wages	150	160
Petrol	300	350
Mobile Oil	25	30
Garage Rent	125	125
Taxes & Insurance	50	50
Depreciation	560	620
Expenses of Supervision	100	100
Repairs	120	140
Miscellaneous Overhead	40	40

The two trucks carried 150 tonnes of goods each during the month of November 2025. The distance covered were 3,500 kms. and 5,000 kms. respectively.

You are required to prepare an operating cost sheet for November 2025 from the above data.

Solution:

Tonne-kms. of operation of the two trucks are as follows:
Truck No. 01 = 150 tonnes × 3,500 kms = 5,25,000 tonne-kms.
Truck No. 02 = 150 tonnes × 5,000 kms = 7,50,000 tonne-kms.

Operating Cost Sheet
for the month of November 2020

	Particulars	*Truck No. 01*	*Truck No. 02*
	Tonne-kms.	*5,25,000* (₹)	*7,50,000* (₹)
1.	**Fixed Costs:**		
	Garage Rent	125.00	125.00
	Taxes and Insurance	50.00	50.00
	Supervision	100.00	100.00
	Drivers Salaries	250.00	275.00
	Cleaners' Wages	150.00	160.00
	Total	675.00	710.00
2.	**Variable Costs:**		
	Petrol	300.00	350.00
	Mobil Oil	25.00	30.00
	Depreciation	560.00	620.00
	Repairs	120.00	140.00
	Misc. Overheads	40.00	40.00
	Total	1,045.00	1,180.00
	Total cost of operation (1 + 2)	1,720.00	1,890.00
	Cost per tonne-km. (Paise)	0.33	0.25

Note: It is assumed that depreciation is charged based on distance covered.

BOILER HOUSE COSTING

A boiler is used for generating steam. In many organisation, boiler house is a service department. The necessity for boiler house costing arises to arrive at the cost of per unit of steam produced. The fundamental principle remains the same. Total cost of steam produced is related to the quantity of steam produced to arrive at the cost per unit of steam, which may be say, "cost per 1,000 lbs of steam."

Main Items of Cost in Boiler House Costing

Following are the important items of costs relating to boiler house costing:

(*a*) ***Supervision:*** It includes the wages of foreman and a portion of the salary of works engineer, who supervises this service besides other services in the factory.

(*b*) ***Labour:*** The labour involved is categorised as (*i*) Coal handlers (*ii*) Stokers, and (*iii*) Ash removers.

(*c*) ***Maintenance:*** The maintenance of boiler house requires furnace repairs, renewals of fire bars and replacement of fire irons.

(*d*) ***Indirect Material:*** This may include numerous items of small value ranging from service materials to small tools.

(*e*) ***Fuel:*** Fuel cost is the major cost in boiler house. The fuel may include coal or furnace oil.

(*f*) ***Water:*** This will include the cost of purification, softening and the cost of supply.

(*g*) ***Fixed Overhead:*** This will include rates and taxes, depreciation of plant and building, insurance and possibly interest on capital.

The costs associated with steam production are recorded in a boiler house cost statement. A specimen of boiler house cost statement is given below:

ABC & Co.
Boiler House Cost Sheet

Period .....

Steam produced in 1,000 lbs .....
Less Boiler House use .....
Line losses .....
Total Consumption .....

	Items	*Total Cost*		*Cost per 1,000 lbs Steam*		*Remarks*
		This month	*Year to date*	*This month*	*Year to date*	
1.	**Fuel and Labour:**					
	Coal or Fuel Oil					
	Electric Power					
	Fuel handling					
	Ash removal and disposal					
	Stokers and Coal wheelers					
2.	**Water:**					
	Purchased					
	Softening					
3.	**Miscellaneous Expenses:**					
	Supervision					
	Sweepers, Cleaners					
	General labour					
	Boiler cleaning					
4.	**Maintenance:**					
	Fixed Plant					
	Meters					
	Boilers					

	Softening Plant					
	Economisers					
	Coal Bunkers					
	Furnace					
	Mechanical Stokers					
	Steam Service Pipe					
	Barriers					
	Weighing machine *etc.*					
	Other accessories					
5.	**Fixed Overhead:**					
	Rent, rates, *etc.*					
	Depreciation of Plant					
	Building *etc.*					
	Interest on capital					
	Steam Mains					
	Allocation of general factory overhead					
	Total					
	Remarks				Prepared by..... Checked by.....	

Figure 2: Boiler House Cost Sheet

POWER HOUSE COSTING

Electricity can be generated by use of either steam or fuel oil. If steam has been used for power generation only, there is no need for preparing a Boiler House Cost Sheet, because Power House Cost Sheet will include cost of steam generated. A study of the format (given below) will illustrate the point.

The cost department will particularly notice fuel costs, labour costs and the maintenance costs relating to steam raised. Other information of technical nature is watched by engineers.

The cost information relating to boiler house/power house is collected on the above mentioned pattern. There are mainly two outlets of a boiler, *i.e.*, the mains and service pipes. A technical assessment is made to determine the rate of consumption of steam in pounds per hour for each appliance connected with the mains and service pipes. Then, consumption of steam by each sub-unit in the organisation is found out either by estimate or by records and charges are made for steam consumption.

Power House Operating Statement of Cost

Period: ..... Steam used for Generation of Electricity:
Steam produced: ..... Units of electricity generated:.....

Particulars	*Total Cost*		*Cost per unit*		*Remarks*
	Current period (₹)	*Previous period* (₹)	*Current period* (₹)	*Previous period* (₹)	
Steam Production Costs:					
Coal					
Water					
Water softeners					

Wages					
Coal handling					
Stoking					
Stores					
Repairs and maintenance					
Depreciation					
Supervision					
Total					
Less: Used for heating purpose					
Steam used for electricity generation					
Electricity Generation Cost:					
Steam					
Wages					
Stores					
Repairs and Maintenance					
Depreciation					
Supervision					
Total					

Figure 3: Power House Operating Statement of Cost

HOSPITALS COSTING

Many organisations maintain hospital to provide effective and timely medical facilities to their workers. Big companies, which are widely dispersed geographically, maintain separate hospital in each division. Thus, arises the need of *Hospital Costing*. For costing purposes, the hospital service can be divided into following categories:

(*i*) Out-patient department.

(*ii*) Wards.

(*iii*) Medical service departments, such as Radiotherapy, Diagnostic X-ray and Pathology, *etc.*

(*iv*) General services, such as boiler-house, power, heating, lighting, catering, laundering, medical records and administration.

(*v*) Other service departments such as dispensary, transport, cleaning *etc.* Cost of departments from (*i*) to (*iv*) can be accumulated on the basis of cost procedure, which is used for cost accumulation of services. The cost of departments mentioned at (*v*) will have to be apportioned to other departments on suitable basis.

Units to be Used

Determining the cost unit presents main difficulty in hospital costing. Following units can be used for this purpose:

Out-patients	Per out-patient, per unit,
Per new out-patient,	
Per patient per week	
Wards	Per case.
Radiotherapy	Per course of treatment per day.
Diagnostic X-ray	Per 100 units.

On these lines, suitable cost units are determined.

Cost Statement

The expenses of a hospital can be broadly categorised as follows:

(*i*) *Capital Expenditure*

Building, Blocks
Operation theatres
Sophisticated machines

(*ii*) *Maintenance Expenses*

Salaries and wages	Fuel, light and power
Provisions	Laundry
Staff uniform	Water
Patients clothing	*etc. etc.*

All items of costs are collected appropriately in various categories to show the cost per unit of a specific hospital service.

Illustration 5:

Mr. Jai owns fleet of taxis and the following information is available from the records maintained by him.

Number of taxies	10
Cost of each taxi	₹ 20,000
Salary of manager	600 p.m.
Salary of accountant	500 p.m.
Salary of cleaner	200 p.m.
Salary of mechanic	400 p.m.
Garage rent	600 p.m.
Insurance premium	5% p.a.
Annual tax	600 per taxi
Driver's salary	200 p.m. per taxi
Annual repair	1,000 per taxi.

Total life of a taxi is, about 2,00,000 kms. A taxi runs in all 3,000 kms in a month of which 30% it runs empty. Petrol consumption is one litre for 10 kms. @ ₹ 1.80 per litre. Oil and other sundries are ₹ 5 per 100 kms.

Calculate the cost of running a taxi per km.

Solution:

Operating Cost Sheet

Effective km. per Taxi = 2,100

Standing Expenses	
(*For entire fleet of 10 taxies*)	
Salary: Manager	₹ 600
Accountant	500
Cleaner	200
Mechanic	400
Garage rent	600
Insurance premium 5/100 × 2,00,000 × 1/2	833
Drivers' salaries (₹ 200 × 100)	2,000
Tax (600 × 10)/12	500

Total standing expenses	5,633	
Standing charges per km = ₹ 5,633 ÷ (10 × 2,100)		0.268
Operating Expenses per Taxi		
Petrol (3,000 km × ₹ 1.80) ÷ 10 km	₹ 540	
Repairs (₹ 1,000 p.a. ÷ 12)	83	
Oil and other sundries (₹ 5 × 3,000 km) ÷ 100	150	
*Depreciation (₹ 20,000 ÷ 2,00,000) × 3,000	300	
	1,073	
Operating per taxi per km. (₹ 1,073 ÷ 2,100)		0.511
Total cost per taxi per km.		0.779

* Life of taxi is given in Km and, therefore, depreciation thereon has been considered as operating expense.

Illustration 6:

A practising Chartered Accountant now spends ₹ 0.90 per km on taxi for his clients' work. He is considering two other alternatives, the purchase of a new small car or an old bigger car. The estimated cost figures are:

Items	*New Small Car*	*Old Bigger Car*
Purchase price	₹ 35,000	₹ 20,000
Sale price, after 5 years	19,000	12,000
Repairing and servicing per annum	1,000	1,200
Taxes and insurance per annum	1,700	700
Petrol consumption, per litre	10 km	7 km
Petrol price, per litre	3.50	3.50

He estimates that he goes 10,000 km annually. Which of the three alternatives will be the cheapest? If his practice expands and he has to do 19,000 kms. per annum, what should be his decision?

At how many kms. per annum, will the cost of the two cars break-even and why? Assume petrol only as variable cost. Ignore interest and income tax.

Solution:

Statement Showing Operating Cost of New and Old Cars

	New Small Car		*Old Bigger Car*	
Standing charges per annum	10,000 km	19,000 km	10,000 km	19,000 km
Repairing and servicing	₹ 1,000	₹ 1,000	₹ 1,200	₹ 1.200
Taxes and insurance	1,700	1,700	700	700
Depreciation	3,200*	3,200	1,600*	1,600
Total standing charges	5,900	5,900	3,500	3,500
Operating expenses:				
Petrol (10,000 km ÷ 10 km) × 3.50	3,500			
(19,000 km ÷ 10 km) × 3.50		6,650		
Petrol (10,000 km ÷ 7) × 3.50			5,000	
(19,000 km ÷ 7) × 3.50				9,500
Total operating expenses	3,500	6,650	5,000	9,500
Total cost (fixed + operating)	9,400	12,550	8,500	13,000
Total cost per km.	0.940	0.661	0.850	0.684
Taxi cost per km.	0.900	0.900	0.900	0.900
Operating expenses per km.	0.350	0.350	0.500	0.500

Conclusions: For 10,000 km. old car is the cheapest alternative
For 19,000 km. new car is the cheapest alternative.

$$\text{B.E. Point} = \frac{\text{Difference in Fixed Cost}}{\text{Difference in Operating Expenses per km.}}$$

= (₹ 5,900 – 3,500) ÷ (0.50 – 0.35) = 16,000 km.

At 16,000 km., cost of operating new car and old car will be the same.

Illustration 7:

(***Goods***). A Transport Co. charges ₹ 120 per tonne for a 5 tonnes lorry load from *A* station to *B* station. The charges for return trip are ₹ 110 per ton. In the month of July, 2025, a truck has made 10 outward journeys with full load out of which 3 tonnes were unloaded twice at *C* station on the way. It returned without any load once only from *C* station to *A* station. The expenses incurred were:

Annual fixed charges ₹ 38,400; annual maintenance ₹ 19,200; and monthly running charges ₹ 2,404. You are required to find the cost per tonne-kilometer (absolute) and the profit for the month of July 2025, assuming that no concession is made for delivery at the intermediate stations.

Distance from *A* station to *B* station is 210 kms. and from *A* to *C* station 120 kms. The truck carried a load of 8 tonnes 5 times in the month while returning from *B* Station but was once caught by the police and was fined ₹ 2,000.

Solution:

(*i*) *Costs Incurred*

Fixed charges	₹ 38,400
Total Annual charges	19,200
	57,600
Charge for month (57,600 ÷ 12) =	4,800
Monthly running charges	2,404
Total monthly running cost	7,204
Fine (Note 1)	2,000
Total monthly cost	9,204
Tonnes-Kms per month	23,010
Cost per tonnes-km (absolute or pure)	₹ 0.40

(*ii*) *Statement of Profit*

Receipts:		
10 outward journey × 5 tonnes × ₹ 120 per tonne		₹ 6,000
5 return journey × 8 tonnes × ₹ 110 per tonne		4,400
5 return journey × 5 tonnes × ₹ 110 per tonne		2,750
		13,150
Less: Costs	7,204	
Fine	2,000	9,204
Profit during July 2020		3,946

(*iii*) *Calculation of tonne-kms.*

For Outward Trip.

(*a*) From *A* station to *C* station
120 km × 5 tonnes × 2 times — 1,200 tonne-kms

(*b*) From *C* station to *B* station
(210 – 120) kms × 2 tonnes × 2 times — 360 tonne-kms

(*c*) From *A* station to *B* station	
210 km × 5 tonnes × 8 times	8,400 tonne-kms
For outward trips	9,960 tonne-kms
For Return Trips	
(*d*) From *B* station to *C* station	
210 – 120 = 90 km × 5 tonne × 1 time	450 tonne-km
(*e*) From *B* station to *A* station	
210 km × 5 tonnes × 4 times	4,200 tonne-km
(*f*) From *B* station to *A* station	
210 km × 8 tonnes × 5 times	8,400 tonne-km
For return trip	13,050 tonne-km
Total = 9,960 tonne-km + 13,050 tonne-km	23,010 tonne-kms

Notes:

1. Transporters often carry overloads, which attract fines and penalties, the absolute cost per tonne-kilometer is required. This can be arrived at by considering both the extra receipts from overloading as well as fine paid.
2. Normally fines will not form part of cost. It is to be debited to profit and loss account directly.

Illustration 8:

(***Transport Costing***). Prakash Automobiles distributes its goods to a regional dealer using a single Lorry. The dealers premises are 40 kilometres away by road. The Lorry has a capacity of 10 tonnes and makes the journey twice a day fully loaded on the outward journeys and empty on return journey. The following information is available for a *Four Weekly Period* during the year 2025:

Petrol consumption	8 kilometres per litre.
Petrol cost	₹ 13 per litre
Oil	₹ 100 per week
Drivers wages	₹ 400 per week
Repairs	₹ 100 per week
Garage rent	₹ 150 per week
Cost of Lorry (Excluding Tyres)	₹ 4,50,000
Life of Lorry	₹ 80,000 Kilometres
Insurance	₹ 6,500 per annum
Cost of Tyres	₹ 6,250
Life of Tyres	25,000 kilometres
Estimated sale value of Lorry at end of its life	₹ 50,000
Vehicle Licence cost	₹ 1,300 per annum
Other overhead cost	₹ 41,600 per annum
The Lorry operates on a five-day week.	

Required

(*a*) A statement to show the total cost of operating the vehicle for the four-weekly period analysed into running costs and fixed costs.

(*b*) Calculate the vehicle cost per kilometre and per tonne kilometre.

Solution:

(*a*) Before computing the total cost, it is necessary to find out the basic data as under:

1. *Distance travelled in 4-week period*: 40 km one way × 2 (return) × 2 trips × 5 days × 4 week = 3,200 km.

2. *For Tonne km. working* = Empty on return and as such for Tonne-km = 3,200 ÷ 2 = 1,600
3. *Total consumption in 4 weeks* = 3,200 km ÷ 8 km/Ltr. = 400 Ltr.
4. *Tyre Cost* = (₹ 6,250 = 25,000 km) × 3,200 km = ₹ 800
5. *Depreciation of Lorry in 4 weeks* = $\frac{(₹\,4,50,000 - ₹\,50,000)}{80,000} \times 3,200 = ₹\,16,000$

Operating cost Statement of a Lorry of M/s Parkash Automobile
(*for the 4 week period*)

Running Costs	
Cost of petrol (400 litres × ₹ 13)	₹ 5,200
Oil (₹ 100 per week × 4)	400
Drivers wages (₹ 400 per week × 4)	1,600
Repairs (₹ 100 × 4)	400
Cost of tyres (as at 4 above)	800
Depreciation (as at 5 above)	16,000
Total running cost – (*i*)	24,400
Fixed Costs	
Garage rent (₹ 150 × 4)	600
Insurance (₹ 6,500 ÷ 52) × 4	500
Licence cost (₹ 1,300 ÷ 52) × 4	100
Other overheads (₹ 41,600 ÷ 52) × 4	3,200
Total fixed cost – (*ii*)	4,400
Total cost (*i*) + (*ii*)	28,800
(*b*) Cost per tonne-km = ₹ 28,800 ÷ (1,600 × 10 Tonne) =	₹ 1.80

Illustration 9:

(***Generation Cost of Electricity***). The Iron and Steel Works which generates its own electricity for the purpose of using the same for running the factory, gives the following information:

1. Fuel-Coal consumed during the month 1,000 quintals @ ₹ 12 per quintal.
2. Oil 15 quintals @ ₹ 1,000 per quintal.
3. Water 2,00,000 litres @ ₹ 1.00 per 1,000 litres.
4. Cost of Steam Boiler ₹ 50,000 which has the residual value of ₹ 2,000. The life of steam boiler is 10 years.
5. Salaries and wages for the Boiler House:
   20 men @ ₹ 150 per month.
   40 women @ ₹ 60 per month.
6. Share of Administration charges ₹ 1,050 per month.
7. Sale of ash ₹ 300.
8. Generating plant cost ₹ 1,50,000. Depreciation @ 10%.
9. Repair and Maintenance of Steam Boiler and Generating Plant ₹ 1,000.
10. Salaries and Wages for Generating plant:
    10 skilled workers @ ₹ 300 per month.
    15 unskilled workers @ ₹ 100 per month.
11. No. of units generated 2,00,000.
12. 1/10 of units generated were used by Generating Department itself.

Calculate cost per unit for electricity generated.

Solution:

Cost Sheet of Iron and Steel Works

		Per Month	*Total*
Coal: Consumed: 1,000 × 12		₹ 12,000	
Oil: 15 × ₹ 1,000		15,000	
Water: 2,00,000 litres @ ₹ 1 per 1000 litres		200	
Depreciation of steam boiler: {(50,000 – 2,000) ÷ 10 year} ÷ 12 months		400	
			27,600
Less Sale of ash (for the month-assumed)			300
			27,300
Salaries and wages of Boiler House:			
20 man × ₹ 150 per month	3,000		
40 women × ₹ 60 per month	2,400	5,400	
Salaries and wages of Generating Plant:			
10 skilled workers × ₹ 300 p.m.	3,000		
15 unskilled workers × ₹ 100 p.m.	1,500	4,500	
Repair and maintenance		1,000	
Depreciation of Generating Plant ((1,50,000 × 0.10) ÷ 12		1,250	
Share of Administration charges		1,050	13,200
			40,500
Add Cost of electricity used in generation (Note 1)			4,500
			45,000

No. of units generated (net output) = 2,00,000 – 20,000 = 1,80,000 units

Cost per unit = ₹ 45,000 ÷ 1,80,000 = ₹ 0.25

Note:

1. Cost of electricity used in generators

Suppose cost of electricity used in generator = x and total cost of generator = y

$\therefore$ $x = 1/10$ of y ... (*i*)

$y =$ ₹ 40,500 + 1/10 (40,500 + x) ... (*ii*)

Putting the value of (*ii*) in (*i*)

$$x = \frac{1}{10}\ \{40{,}500 + \frac{1}{10}\ (40{,}500 + x)\} = ₹\ 4{,}500$$

Illustration 10:

(***Boiler-house Costing***). The boiler-house is one of the service departments of a company. Steam is raised and then transferred to production departments and other service departments as required.

The basic monthly budget figures for 2025 are as follows:

Boiler operating hours:	480
Steam raised:	80,00,000 kg
Costs:	
Fuel (*V*)	₹ 19,200
Chemicals (*V*)	₹ 960
Wages (*F*)	₹ 2,400
Sundry overheads (*F*)	₹ 3,000

The actual figures for February 2025 are as follows:

Boiler Operating hours:	432

	Steam raised:	67,50,000 kg
Costs:		
	Fuel (*V*)	₹ 18,000
	Chemicals (*V*)	₹ 990
	Wages (*F*)	₹ 2,200
	Sundry overhead (*F*)	₹ 3,000

It is expected that the price of chemicals for all output will fall by 2% where the boiler operates in excess of 480 hours per month. Sundry fixed costs are expected to fall by ₹ 200 where the boiler is operated for less than 425 hours and to increase from the normal level by ₹ 250 where the boiler is operated for more than 480 hours.

Variable costs vary in proportion to boiler hours.

Required:

(*a*) Prepare a budget summary which shows the cost of the boiler house in total and per '000 kg steam for boiler operating levels of 400, 432, 480, and 540 hours.

(*b*) Prepare a control statement which compares budget with actual cost of the boiler-house for February where a flexible budgeting system is in operation. Comment on the variances in the statement.

Solution:

(*a*) **Flexible Budget Summary**

Boiler operating hours:	400	432	480	540
Steam raised ('000 kg)	6,667	7,200	8,000	9,000
Costs				
Fuel (*V*)	16,000	₹ 17,280	₹ 19,200	₹ 21,600.0
Chemicals (*V*)	800	864	960	1,058.4
Wages (*F*)	2,400	2,400	2,400	2,400.0
Sundry overheads (*F*)	2,800	3,000	3,000	3,250.0
Total	22,000	23,544	25,560	28,308.4
Cost/'000 kg	3.30	3.27	3.195	3.145

(*b*) **Control S**tatement for the Month

	Budget	*Actual*	*Variances*	
Boiler operating hours	432	432		
Steam raised ('000)	7,200	6,750	450	(A)
Costs:	₹	₹	₹	
Fuel (*V*)	17,280	18,000	720	(*A*)
Chemical (*V*)	864	990	126	(*A*)
Wages (*F*)	2,400	2,200	200	(*F*)
Sundry overhead (*F*)	3,000	3,000	nil	
	23,544	24,190	646	(A)

OBJECTIVE QUESTIONS

I. Say whether the following statements are true or false:

1. Operation costing is the same as operating costing.
2. There is no difference between process costing and operation costing.
3. 'Operation' is the alternative term for a 'process'.

4. Operation costing is a basic method of costing.
5. Operation costing is a generic term.
6. Process costing is a form of continuous operation costing.
7. Where production process consists of a single operation the method of costing applicable is 'unit' costing.
8. Operation costing and operating costing are, sometimes, used interchangeably.
9. Operation costing also includes by-product and joint product costing.
10. Operation costing is a refinement of process costing.
11. Operation costing is applied for each of the operations of a single process.
12. Industries where operation costing is used, the operations itself is a cost centre.
13. Operation costing is neither purely process costing nor purely specific order costing.
14. In the case of industries adopting operation costing, operations of minor importance are totally ignored.
15. The cost per unit of each operation is determined by the process of averaging.
16. Cost centre in the case of operation costing is much smaller than that in process costing.
17. In a large number of cases, the different operations may disclose only conversion cost per unit.
18. Wastage and scrap in each operation is pre-determined by the establishment of input-output ratio.
19. Operation costing facilitates greater degree of control of costs by creating cost centres even for narrow fields of activity.
20. One operation (unit) costing is applied in those industries where different products are produced simultaneously.
21. In the cement industries the unit of cost is per tonne.
22. Scrap is a residue which arises in a manufacturing process but has no recoverable value.
23. Service costing is applicable in canteens.
24. Motor cost for passengers is ascertained with reference to per passenger per kilometer.
25. Service costing is one of the basic methods of operation costing.
26. Operating cost statement is prepared to calculate the cost in case of service costing.
27. There is no difference between service costing and process costing.

Ans. *1. False* *2. False* *3. False* *4. True* *5. False* *6. True*
7. True *8. True* *9. True* *10. True* *11. True* *12. True*
13. True *14. False* *15. True* *16. True* *17. True* *18. True*
19. True *20. False* *21. True* *22. False* *23. True* *24. True*
25. True *26. True* *27. False*

II. For each of the following, select the most appropriate answer from those suggested:

1. In the case of operation costing, the cost centre for which costs are accumulated is:
   (*a*) Operation cost centre
   (*b*) Process cost centre
   (*c*) Service cost centre
   (*d*) Any of these
2. In an industry in which operation costing is used, the cost unit may be:
   (*a*) A metric tonne
   (*b*) Kilowatt Hour
   (*c*) Engine cylinder
   (*d*) Any of these
3. Industry in which operation costing is used may be:
   (*a*) Engineering

(*b*) Oil Mill
(*c*) Hospital
(*d*) All of these

4. A pin making industry intends to introduce a suitable system of costing. Which of the following methods do you recommend?
   (*a*) Unit costing
   (*b*) Process costing
   (*c*) Operating costing
   (*d*) Operation costing
5. Cost per unit is found out by the process of averaging in:
   (*a*) Job costing
   (*b*) Contract costing
   (*c*) Batch costing
   (*d*) Operation costing

Ans: 1. *(a),* 2. *(d),* 3. *(a),* 4. *(d),* 5. *(d).*

III. Which of the suggested solutions is the correct one in each of the following questions?

1. A lorry delivers goods to intermediate destinations on a journey from *A* to *B* where vehicle space is the limiting factor. Which of the following is the most appropriate cost charge-rate?
   (*a*) Per tonne mile. (*b*) Per mile.
   (*c*) Per cubic metre mile. (*d*) Per cubic metre.
2. In a polytechnic cost analysis which of the following is the most useful cost unit comparison exercise?
   (*a*) Overall average cost per graduate from one year to another.
   (*b*) Cost per graduate for one degree with cost per graduate for other degree courses.
   (*c*) Overall average cost per graduate compared with that of other polytechnics.
   (*d*) Cost per graduate for each degree examined over a number of years.
3. As capacity utilisation of a service increases, the average total cost per unit of service will:
   (*a*) Fall as the impact of fixed costs per cost unit is reduced.
   (*b*) Increase since additional costs are incurred.
   (*c*) Remain constant unless price levels change.
   (*d*) Fluctuate on a random basis.
4. The under-absorption of the actual cost of a maintenance department where the charge to users of the service is at a planned rate per hour will be due to:
   (*a*) Demand for maintenance work being in excess of that planned.
   (*b*) An increase in expenditure levels which has been only partly offset by increased capacity utilisation.
   (*c*) A rise in both expenditure levels and capacity utilisation of the service.
   (*d*) A reduction in capacity utilisation which has been more than offset by reduced expenditure levels.

Ans: 1. (*c*) 2. (*d*) 3. *(a*) 4. *(b).*

ASSIGNMENTS

Theoretical Questions

1. Write short notes on 'operation costing'. (*C.A. Inter*)
2. Give the meaning of operation costing.
3. Distinguish between unit costing and operation costing.

4. Distinguish between operation costing and process costing.
5. Distinguish between operating costing and operation costing. (*C.S. Inter*)
6. Define operation costing. To which type of industries is it applicable?
7. Comment on the statement that operation costing is the refined version of process costing.
8. Give a proforma cost sheet of an undertaking in which raw material passes through four operations to finished product.
9. What do you mean by operating costing?
10. What is operating cost? To what industries is this method of costing applicable?
11. (*a*) What do you understand by composite unit in service costing?
    (*b*) A transport company runs a number of buses on a particular route. Suggest the records the company should maintain in respect of each bus in order to determine the cost per unit service rendered. Draw up a proforma cost sheet of such a company.
12. What is operating cost? Draw a statement with imaginary figures for working out the running cost per kilometre of a taxi?
13. What do you understand by operating costs? Describe its essential features and state where it can be usefully implemented.
14. A manufacturing company maintains its own fleet for various reasons favourable to it. Design a format through which it could know expenses vehicle-wise, to take remedial measures, as and when necessary, to control cost.

Numerical Questions

1. A factory uses in its process *P* a particular raw material. There are three operations, *I, II* and *III* involved in this process. The data relating to inputs, output and rejections during the month of April 2025 are given below:

Operation	*Input (in pieces)*	*Rejections (in pieces)*	*Output (in pieces)*
1	18,000	6,000	12,000
2	19,800	1,800	18,000
3	20,400	3,400	17,000

   Determine what should be the input in Operation *I* when the final product transferred from Operation *III* is 1,000 pieces. Calculate the cost of raw materials to produce one piece of the finished product in Process *P* when (*a*) the weight of the finished product is 10 gms. and (*b*) the price of the raw material is ₹ 1 per kg.

   Ans: (a) 19.8 gms. (b) ₹ 0.02

2. An article which is manufactured on mass scale has to pass through five operations for completion. From the following particulars in relation to the article for a particular period, determine the labour cost per 100 articles.

Operation No.	*Number of articles worked upon (gross)*	*Number of defectives*	*Total wages*
1	5,000	1,250	150
2	3,750	250	75
3	3,500	250	105
4	3,250	250	65
5	3,000	500	90

   Ans: ₹ 19.40

3. A company manufactures a component which passes through four operations, *viz.*, Cutting, Trimming, Pressing, and Finishing. During April 2025, it manufactured 2,000 units of the component. The relevant cost data is respect of the same for April are as under:

Material:

Mild steel sheet, 2′ × 3′ : 200 sheets at ₹ 50 per sheet.

Special metal paint : 800 lbs. at ₹ 2 per lb.

Labour:

Cutting operation: 200 Hrs. at ₹ 2 per hour.

Trimming operation: 200 Hrs. at ₹ 1.50 per hour.

Pressing operation: 400 Hrs. at ₹ 1 per hour.

Finishing operation: 250 Hrs. at ₹ 2 per hour.

Manufacturing overhead is charged at 100% of direct labour. Calculate the conversion cost of each operation and cost per unit of finished output.

Ans: ₹ *800,* ₹ *600,* ₹ *800,* ₹ *1,000;* ₹ *7.40*

4. A component shop manufactures Part-*S* 1090 in two operations called Operation *A* and Operation *B*. After inspection for quality, whole of the accepted output from Operation *A* is passed on to Operation *B* for further processing. The whole of the raw materials are introduced in Operation *A*. The rejection rate and realisation (at scrap value) from the rejects for the two operations are as under:

Operation	*Rejected rate*	*Scrap value (per piece)*
A	10%	₹ 6.50
B	15%	₹ 13.00

Two pieces from Operation *A* are combined to produce one piece in Operation *B*.

Prepare:

(*a*) a statement showing gross production, rejection and accepted production for the two operations;

(*b*) a cost sheet showing total cost, quantities and cost per piece of accepted output for Operation *A* and Operation *B* from the given data:

Operation *A*:

Raw material cost	:	₹ 10 lakh
Labour and overheads	:	₹ 10 lakh
Accepted output	:	90,000 pieces

Operation *B*:

Labour and overheads	:	₹ 5 lakh
Accepted output	:	38,250 pieces

(*I.C.W.A. Inter*)

Ans: (a) Operation A: Gross production 1,00,000, rejection 10,000;

Operation B: Gross production 45,000 (two pieces from A are combined to produce one piece in (B) rejection 6,750;

(b) Total cost: A ₹ *19,35,000, per piece* ₹ *21.50;*

B ₹ *23,47,250, per piece* ₹ *61.37).*

5. Mr. Puttanna runs a tempo service in the city. He furnishes you with the following data and wants you to compute the cost per running km:

Cost of vehicle	₹ 25,000
Road licence fee per annum	750
Supervisor's salary per annum	1,800
Driver's wage per hour	4
Cost of fuel per litre	6.50
Repairs and maintenance per km.	1.50
Tyre allocation per km.	2.00

Garage rent per annum	3,200
Annual insurance premium	1,200
Kms. run per litre	6
Kms. run during year	12,000
Estimated life of vehicle in kms.	1,00,000

The vehicle runs 20 kms per hour on an average.

Ans: ₹ 5,612.

6. A lorry owner supplies the following particulars in respect of a lorry of 5 tonne capacity: Cost of the lorry ₹ 2,50,000.

Estimated life 10 years.
Diesel oil, *etc.* ₹ 75 per trip each way.
Repair and maintenance ₹ 2,500 per month.
Drivers wages ₹ 1,000 per month.
Cleaners wages ₹ 400 per month.
Insurance ₹ 18,000 per annum.
Tax ₹ 15,000 per annum.
General supervision charges ₹ 6,000 per annum.

The lorry carries goods to and from the city every day covering a distance of 80 kms. each way. On onward trip freight is available to the extent of full capacity and on return 25% of capacity. The lorry operates on an average of 25 days a month. Work out operating cost per tonne kilometer and rate per tonne per trip that he has to charge if a profit of 25% on freightage is to be earned.

Ans: 500 tonne-kms. per day; 12,500 tonne-kms. per month; operating cost ₹ 1.22; rate per trip ₹ 815 @ ₹ 1.63 per tonne-km.

7. A company having a fleet of trucks undertakes to carry waste material. They have the following capacity vehicles:

No. of vehicles	Capacity
40	5 Tonnes
20	4 Tonnes
50	3 Tonnes

On an average each lorry makes five trips a day and in each trip covers an average distance of five km. each. The truck carries only 75% of its capacity. 20% of the lorries are laid up for repair every day.

Following charges are incurred during the month:

Salary of the Supervisor	₹ 2,000
Salary for Foreman 3 Nos.	600 each
Wages of driver	200 each for 110 drivers
Wages for cleaners	100 each for 220 cleaners
Consumable stores	16,000
Petrol	60,000
Lubricants	14,000
Replacement of tyres	6,000
Garage rent	3,000
Electricity charges	1,000
Other expenses	12,000

During the month, old tubes and tyres were auctioned for ₹ 3,000. Assuming that a month consists of 30 days, calculate the cost per ton km. for conveying waste.

Ans: Ton-kms. 1,93,500; Total cost ₹ 1,56,800; Cost per tonne-km ₹ 0.810.

Fixing the Bus Charges for Students

8. *SMS* is a public school having five buses each plying in different directions for the transport of its school students. In view of a large number of students availing of the bus service, the buses work two shifts daily both in the morning and in the afternoon. The buses are garaged in the school. The work load of the students has been so arranged that in the morning the first trip picks up senior students and the second trip plying an hour later picks up the junior students. Similarly, in the afternoon the first trip drops the junior students and an hour later the second trip takes the senior students home.

The distance travelled by each bus one way is 8 kms. The school works 25 days in a month and remains closed for vacation in May, June and December. Bus fee, however, is payable by the students for all the 12 months in a year.

The details of expenses for a year are as under:

Driver's salary	₹ 450 per month per driver
Cleaner's salary	350 per month per cleaner
(Salary payable for all 12 months — one cleaner employed for all the five buses)	
Licence fee. taxes, *etc.*	860 per bus per annum
Insurance	1,000 per bus per annum
Repairs and maintenance	3,500 per bus per annum
Purchase price of the bus	1,50,000 each
Life	12 years
Scrap value	₹ 30,000
Diesel cost	2.00 per litre

Each bus gives an average mileage of 4 km. per litre of diesel.

The seating capacity is fully occupied during the whole year.

Seating capacity of each bus — 50 students.

Students picked up and dropped within a range up to 4 km. of distance from the school are charged half-fare and fifty per cent of the students travelling in each trip are in this category. Ignore interest. Since the charges are to be based on average cost, you are required to:

(*i*) Prepare a statement showing the expenses of operating a single bus and the fleet of five buses for a year;

(*ii*) Work out the average cost per student per month in respect of: (*a*) Students coming from a distance of up to 4 km. from the school, and (*b*) Students coming from a distance beyond 4 km. from the school.

Ans: (*i*) *Operating cost per bus per annum* ₹ *28,800;*
Fleet of 5 buses per annum ₹ *1,44,000*
(*ii*) *Operating cost per half fare student* ₹ *16;*
Operating cost per full fare student ₹ *32.*

Fixing Operating Charges for Tank Lorries

9. A chemical factory runs its boiler on furnace oil obtained from Indian Oil and Bharat Petroleum, whose depots are situated at a distance of 12 km. and 8 km. from the factory site. Transportation of furnace oil is made by the company's own tank lorries of 5 tonne capacity each. Onward trips are made only on full load and the lorries return empty. The filling in time takes an average 40 minutes for Indian Oil and 30 minutes for Bharat Petroleum. But the emptying time in the factory is only 40 minutes for all. From the records available, it is seen that the average speed of the company's lorries works upto to 24 km per hour. The varying operating charges average 60 paise per km covered and fixed charges give an incidence of ₹ 7.50 per hour operation. Calculate the cost per tonne mile from each source.

Ans: Cost per tonne km Indian Oil ₹ *0.53;*
Bharat Petroleum ₹ *0.58.*

Fare Structure of Minibus – Profit as a percentage of Net Sales

10. Carry Enterprises has been permitted to run a Minibus on a route covering 20 kms. The Minibus has been purchased at a cost of ₹ 1 lakh part of which was financed through bank loan and balance by loan from other sources.

The annual charges for the Minibus are Insurance ₹ 4,000, Road Tax ₹ 2,000 and Garage Rent ₹ 1,200. Cost of repairs and maintenance is estimated at ₹ 6,000 per annum while replacement of tyre and tube will cost ₹ 480 per month. Office expense are estimated at ₹ 600 per month. Petrol and oil will cost @ 45 paise per km.

Two drivers and two conductors are engaged at a monthly salary of ₹ 500 and ₹ 350 respectively. In addition, drivers and conductors are entitled to 5% of the sale of tickets.

The effective life of the vehicle is estimated at 5 years, at the end of which the vehicle will have scrap value of ₹ 10,000. The Minibus is 24 seater and is expected to run 6 two-way trips during the day for 25 days in a month.

You are required to submit passenger fare structure for approval by the transport authority which allows 20% profit on net sales. Interest on loan is allowed as cost, if instalments are paid regularly, assume the amount of interest to be ₹ 6,720 p.a.

Ans: Rate per passenger km ₹ 0.08, Sales ₹ 11,520, Commission ₹ 576, Profit ₹ 2,304.

Reimbursement for Using Own Car

11. Mr. Harry is a Travelling Inspector for the Environmental Protection Agency. He uses his own car and the agency reimburses him at ₹ 1.80 per kilometre. Mr. Harry claims he needs ₹ 2.20 per kilometre just to break even. A scrutiny of his expenses by the agency reveals the following:

Oil change every 4,800 kms.	₹ 120
Maintenance (other than oil) every 9,600 kms.	1,800
Yearly insurance (comprehensive with accident benefits)	4,000

Cost of car, with an average residual value of ₹ 60,000 and with a useful life of 3 years ₹ 1,08,000.

Petrol is ₹ 5 a litre and Harry gets 8 kms. per litre in his car. When Harry is on the road, he averages 192 kilometres a day. He works 5 days a week, has 10 days vacation in a year besides 6 holidays and spends 15 working days a month, in the office.

You are required to determine:

(*a*) An equitable rate of reimbursement on the basis of the schedule he presently follows and

(*b*) The number of kilometres a year he would have to travel to break-even at the current rate of reimbursement.

Ans: Cost per km to break even ₹ 2.44;
Number of km required to break-even 20,779 km

12. Find out the cost of each unit of production of the service departments from the following data for 2025:

Service Departments	*Steam*	*Water*	*Power*
Production	*18,000 MT*	*7.00,000 CM*	*30,00,000 kWh*
Direct materials	₹ 2,50,000	₹ 2,00,000	₹ 50,000
Direct labour	1,00,000	1,90,000	1,50,000
Direct expenses	1,60,000	1,24,000	1,20,000
Overheads	1,74,240	1,58,000	2,72,000
Steam	—	—	10,000 MT
Water	56,000 CM	—	1,05,000 CM
Power	1,46,400 kWh	4,20,000 kWh	80,000 kWh

Ans: Steam ₹ 45.00 per M.T.; Water ₹ 1.20 per CM.; Power ₹ 0.40 per kWh.

UNIT V

Standard Costing and Variance Analysis

7

Standard Costing and Variance Analysis

Chapter Outline

- Standard Costing and Standard Cost
- Development of Standard Costing
- Standard Cost and Estimated Cost
- Standard Costing and Budgetary Control
- Advantages of Standard Costing
- Limitations of Standard Costing
- Preliminaries to the Establishment of Standard Cost
- Efficiency Ratio and Activity Ratios
- Analysis of Variances
- Kinds of Variances
- Direct Material Variances
- Direct Labour Variances
- Overhead Variances
- Sales Variances
- Presentation of Standard Cost Statement
- Control of Variances
- Disposition of Variances
- Miscellaneous Illustrations
- *Objective Questions*
- *Assignments*

STANDARD COSTING AND STANDARD COST

Standard costing is a system which seeks to control the cost of each unit or batch through determination beforehand what should be the cost and then its comparison with actual cost. The standard cost is what the cost of an operation or service ought to be under given conditions and subject to given conventions of costing.

Standard costing is defined as 'the preparation and use of standard costs, their comparison with actual cost and the analysis of variances to their causes and points of incidence'.

Wheldon defines standard costing as 'a method of ascertaining the cost whereby statistics are prepared to show (*a*) standard cost (*b*) the actual cost and (*c*) the difference between these costs which is termed the variance'.

According to *WW Bigg* 'Standard costing discloses the cost deviations from standard cost and classifies these as to their causes, so that management is immediately informed of the spheres of operations in which remedial action is necessary'.

Thus, standard costing is preparation and uses of standard costs. Standard cost is a pre-determined cost which is calculated from the managements standard of efficient operation and the relevant necessary expenditure. According to *Blocker* and *Weltmer*, Standard cost of a product is 'pre-determined costs, based upon engineering specifications and representing highly efficient production for quantity standards and forecasts of future market trends for the price, standards with fixed amount expressed in rupees for materials, labour and overheads for an estimated quantity of production'. Another author *Gillespi* defines 'standard cost as usually employed are pre-determined operation costs computed to reflect specified quantities, prices and level of operations'.

Standards may be fixed on an idealistic basis assuming everyone will perform at utmost efficiency. Since this may be rather unrealistic and therefore standards may be fixed on the basis of past average performance. But this will serve no purpose unless past performance was excellent or upto the level. As a general rule standards should be attainable with some effort – these should not be such as to be unattainable or such as to be attained without any effort.

Thus, standard costs are fixed for each product or job. Last experience and experiments are the basis to proceed upon. Standard cost is pre-determined for each element namely material, labour and overhead. These represent attainable targets and help to frame budgets, measure performance and obtain product costs. As the work is done and actual costs are obtained, these are compared with standard cost to find out variances. These variances are analysed further with a view to control the cost and to discover better ways of achieving standards or to revise standards to accomplish the objective.

It may be noted from the aforesaid discussion that the *standard costing involves following process :*

(*i*) Establishment of standard cost
(*ii*) Ascertainment of actual cost
(*iii*) Comparison of the above two and measurement of variances.
(*iv*) Analysis of variances.
(*v*) Reporting to responsibility centres to take appropriate and necessary remedial actions.

DEVELOPMENT OF STANDARD COSTING

Historical cost or actual cost alone gives no indication as to whether the cost is an economic cost. Basically, historical cost is merely a record of what has happened. Actual cost may be inflated due to inefficiencies and wastages of materials and time. But to stand in the competition, cost must be rational and economic, or in other words controlled cost. Due to shortcomings of historical costing, standard costing came to be developed as a systematic method of comparing actual cost with the predetermined standard cost. It is a technique of locating inefficiencies and shortcomings at the source by setting up standards as a basis of evaluating actual performance.

STANDARD COST AND ESTIMATED COST

In standard cost system the *Standard Costs* recorded in accounts are based upon standard rate that are very carefully developed and set as scientifically as possible while in an *estimated cost system*, the estimated cost are not standards based upon a predetermination of what the production should be but are only expression of opinion based mainly upon past experience. There are some significant *differences* between the two:

(*i*) Estimated cost is basically reasonable approximations of what a cost *will be*, whereas standard cost is a specification of what a cost *should be.*

(*ii*) Usually estimated cost are based on average of past actual costs which have been adjusted for anticipated changes in future, whereas standard costs are fixed after scientific analysis of the relevant factors deciding costs.

(*iii*) Estimated costs are used as a guide line for price fixation and these are not concerned with cost control whereas the cost control is the main purpose of standard costing. Thus, standard costs serve as an effective tool for cost control.

(*iv*) The estimated costs are used as figures or statistical data for future costs whereas standard costs are used as a regular system from which variances are calculated (between standard cost and actual cost) and causes of variances are analysed in detail.

STANDARD COSTING AND BUDGETARY CONTROL

Budgeting is for the entire activity. Budgetary control means laying down in monetary and quantitative terms what exactly has to be done and how exactly it has to be done over a coming period and then to ensure that actual results do not diverge from the planned course more than necessary.

Standard costing is a system which seeks to control the cost of each unit or batch through determination before hand of what should be the cost and then its comparison with actual cost. Thus, standard cost is pre-determined or budgeted cost of a unit of a product or job.

In both systems there are some common basic principles :

(i) In both systems the performance target or standard is predetermined.

(*ii*) The actual performance is ascertained and both have appraisal of the actual performance.

(*iii*) In both systems there is comparison of actual performance and costs against budget or standard. There is computation and analysis of variances between the actual cost and budgeted or standard cost.

(*iv*) Both need revision of standard or budget whenever necessary in the light of attainment.

Specific Differences between Standard Costing and Budgetary Control

1. Budgetary control deals with the operation of a department or the business as a whole in the terms of revenue and expenditure. Standard costing is used in manufacturing or producing of a product or in rendering a service. Hence, budgetary control is more extensive because it is concerned with entire organisation while standard costing is related to product and its cost and therefore more intensive.
2. Budgetary control seeks to keep in focus the total amount involved and total activity to be carried on. Standard costing provides control to be exercised in the cost of production.
3. Budgets prepared under budgetary control system are for specific periods and are based on totals of amounts while in standard costing, the standard costs are worked out generally per unit of production or service.
4. Basically a budget under budgetary control is a projection of financial accounts while standard cost is merely a projection of cost accounts.
5. Budgetary control is generally applicable to all business establishments, while standard costing can be usefully applied in manufacturing concerns producing standard products and services.
6. Budgetary control is an effective tool in the control of all types of expense while standard costing is a very effective tool in the matter of control of elements of costs like direct costs (direct material, direct labour, *etc*.,) and overheads.
7. Budgetary control is an effective tool to plan and exercise control over capital expenditure, finance and cash forecast, *etc*., where standard costing can offer no help.
8. Budgets provide ceiling or limits of expenses beyond which the actual expenditure should not normally go up otherwise the planned profit will be reduced. On the other hand, standard costs are usually minimum targets which are to be achieved by the actual performance. Thus, the former puts more emphasis on revenue and expenditure not crossing the budget, while the standard costing lays importance to costs approaching the standard cost.
9. Budgets are prepared for all the activities and functions of an establishment such as purchasing, production, research and development, capital and financing, selling and distribution, *etc*., whereas standard costing relates only to production and its manufacturing cost.
10. Variance analysis is more intensive and searching in case of standard costing in comparison to budgetary system. In standard costing, if even standards are achieved, further analysis is carried on to achieve further efficiency. If expenditure exceed the budget it simply shows that situation is unsatisfactory but if actual cost of production exceeds standard cost, the variances are analysed in detail to search out possible improvements.

Considering the basic principles and approach, standard costing and budgetary control are somewhat inter-related, but basically these two are independent. A system of budgetary control may be efficiently and effectively operated even if

there is no standard costing system in use in a concern. Standard costing may also be operated without budgetary control, but introduction of standard costing will be more facilitated if budgetary system is in operation. Budgetary control will provide basic frame work required in the fixation of realistic standards. If both techniques are adopted simultaneously, there will be very effective cost control machinery. Thus, budgetary control and standard costing are essentially complimentary to each other. Both provide cost control and improve efficiency.

ADVANTAGES OF STANDARD COSTING

1. ***Exact degree of efficiency in various operations can be ascertained through comparison of actual and standard cost.*** The variances between acutal and standard costs reveal the weaknesses and inefficiencies. This enables management to remove causes of inefficiency.
2. ***Management by exception is possible,*** since it is possible to separate the efficient from inefficient operations. Variance analysis helps management to concentrate on those areas where corrective measures are to be taken in time. They do not go to the masses of details. They are attracted towards faults which should not be overlooked.
3. ***Efficiency*** is consolidated and if necessary, the standards are revised after identifying exact causes of deviations of actual costs from standard costs.
4. ***There can be effective delegation of authority*** since the people concerned are told what they have to achieve and by what they will be judged. Control itself becomes effective.
5. ***The effect of idle capacity or fluctuations in output or sales is also, highlighted.*** Variances due to idle capacity and fluctuations in sales are ascertained in the standard costing system which provide very useful information to the management.
6. ***The whole firm is imbued with a dynamic forward looking mentality.*** Standard costing provides in attainable costing targets. The entire management is guided by a progressive outlook.
7. ***Standard costing is of immense benefit for cost audit*** since if variances are satisfactorily explained, the accuracy of costing can be safety assumed.
8. ***The cost of accounting itself is reduced*** since all rates are fixed and do not have to be calculated again and again. Also, automatically the effect of efficiency or inefficiency is revealed.
9. ***Standard costing can be used in formulating production and price policies in advance***. Standard costs are the best basis for establishing policies in as much as such standards which usually eliminate the effect of fluctuating volume and again avoid any cost-increase due to waste or inefficiency.
10. ***Standard costs provide basis of incentive schemes to workers and supervisors.*** The system determines standard labour costs of a product and with help of these, incentive schemes are formulated.
11. ***Standard costing provides faster reporting of operating data.*** It is important due to the fact that the value of any information declines as it relates to a period farther and farther in the past.

12. ***Standard costing provides a common denominator for comparison*** between one period to another.
13. Standard costing, due to the stress of the standard cost and variance analysis, ***makes the whole organisation cost conscious;*** foremen and workers are encouraged to realise the importance of efficient operations.
14. ***Standard costing provides a stable product cost per unit.*** The actual cost of a product may vary from period to period due to many reasons. It cannot be used as a basis of fixation of selling price of a product since selling price should not be frequently adjusted to suit the change in the actual cost. It is, therefore desired that selling price be based on a fixed cost structure relating to normal standard of efficiency. The standard costing provides such a desired structure. The actual cost is normally expected to be at close as possible to the standard cost. Therefore, selling price based on standard cost will be more reliable and representative and will remain fixed for a long time. Moreover, on the assumption that variances could be eliminated, the standard cost provide a sound and consistent basis for price-determination, especially on competitive markets.
15. ***Standard costing helps to pinpoint the responsibility*** of variation in the cost and thereby it facilitates prompt communication to individuals concerned. The system also identifies the specific reason therefore so that prompt remedial action could be taken.
16. ***Standard costing simplifies the cost control procedure*** as the figures for control purposes are easily and directly obtained. Thus, there is saving in the accounting computation. Moreover, the standard cost rates of materials, labour and overheads are available which make accounting calculation more easier.
17. ***Standard costing helps in business planning, budgeting and marginal costing***. Standard costs are pre-determined costs and are therefore very useful in planning and budgeting. Standard costing can be very easily and suitably used for budgetary planning. These help in estimating the effect in cost-price-volume relationship.
18. ***Standard costs are used for inventory valuation.*** Once the standards have been set, it is the standard costs, not the 'actual' or 'historical' costs, which are entered in the accounts for the purpose of valuing material-stock, work-in-progress and finished goods consequently the cost of goods sold in the trading account because the standard cost and the gross profit is *'at standard'*.

LIMITATIONS OF STANDARD COSTING

Standard costing may not prove a success in certain organisation due to difficulty in fixing up reliable and workable standards. If standards are not correctly established, the cost control and variance analysis will not be effective. Conclusions drawn on such variances will be doubtful and it will be detrimental to the system and it will be worse than having no standard at all.

Thus, the basic limitation is that fixation of standard cost is somewhat difficult in practice. Moreover, the standards fixed may become rigid in course of time or even in short period. Standards cannot be revised at every frequent change in the manufacturing condition.

Some worth mentioning points of limitations of standard costing are narrated below.

1. *It is expensive technique* because it requires technically skilled staff. Small concerns may not find standards easy to establish due to their limited resources. But, it must be noted that once the standards are established, the advantages achieved will be far more than cost involved in the beginning.
2. Business conditions are rapidly changing and therefore standard costs once fixed may not be reliable even for a short period. *Standards are to be revised frequently* so as to make these comparable with actuals. But the revision will create the problem of inventory adjustment.
3. *In small concerns*, where production is not carefully scheduled, *standard costing may not be suitable*. The system is also not very useful in industries dealing with non-standardised products. For example, it cannot be successfully used in repair jobs which are carried on according to customers' requirement. In those contracts and jobs also, standard costing is not suitable, where the work is carried on for more than one accounting year.

PRELIMINARIES TO THE ESTABLISHMENT OF STANDARD COST

Standards may be fixed on an idealistic basis assuming everyone will perform at utmost efficiency. This is rather unrealistic. Or, standards may be fixed on the basis of past average performance. This will serve no purpose, unless past performance was excellent. As a general rule, standards should be attainable with some effort—they should not be such as to be unattainable or such as to be attained without any effort. In the former case, they will not interest anybody and, in the latter case, they are meaningless.

Standard Costs are fixed for each product or job in detail. Past experiences and experiments are the basis to proceed upon. For instance, in case labour, time and motion study will determine how much time is to be allowed. In the same way it should be found out by experiments how many units of raw materials will suffice to make a unit of finished product. The experiments will also disclose whether any change in operations or in the materials to be ordered is called for. To take a simple example, if stationary is ordered all pre-punched, much clerical labour will be saved at the time of filing.

As far as possible standards should also be fixed for indirect expenses in quantitative terms—petrol consumed per 100 km, and lubricating oil per hour of machine working are instances. Having fixed the standard in terms of quantity, they should be converted into money at the prices expected to prevail.

While setting up a standard costing system in a concern, the following *preliminary steps* should be carefully considered on the basis of technical and operational aspects of the concern, manufacturing process and organisation *etc*.

(*i*) Cost centres should be set up.
(*ii*) Classification and coding of accounts should be done.
(*iii*) Type of standard cost should be decided.
(*iv*) Setting of standard costs should be carried out.

(i) Establishment of Cost Centres

Cost centre has been defined as *'a location, person or item of equipment (i.e., department or operator or machine etc.) or group of these for which cost may be ascertained and used for the purpose of cost control'*. The concern or the organisation should be divided into cost centres so that responsibilities may be fixed and line of authority may be defined. An officer acting as incharge of a cost centre should be conversant with his responsibility and the cost to be controlled by him.

(ii) Classification of Accounts

Accounts are classified to meet the needed purpose of collection and analysis. The classification may be on the basis of functions, revenue items or assets and liability items *etc*. Codes and symbols may be assigned to each account to facilitate speedy collection and analysis of accounts. Direct materials, indirect materials, direct wages, indirect wages and other expenses *etc*., should be given different codes or symbols.

(iii) Types of Standard Cost

There are various types of standards in use. Out of these, the suitable standard should be selected for effective cost control. The selected standard should be measuring rod to compare all actual figures. Following are main types of standards.

(*a*) Current standard based upon Ideal Standard or Expected Standard
(*b*) Basic Standard
(*c*) Normal Standard
(*d*) Historical Standard

(a) Current Standard

Current standards show what should be the performance under current conditions. Current conditions are conditions during the period the concern will be using standards. These standard are for use over a short period of time and therefore, these are subject to be adjusted according to changes in the conditions. Thus, current standards require periodical revision.

Normally current standards are based upon *Ideal Standard or Expected Standard. Ideal Standard* is that which can be attained under ideal conditions like most favourable prices of materials and labour, maximum utilisation of resources and capacity and maximum production and sales. *Expected Standard* is that which is expected to be achieved during a future specified budget period. Expected Standards are set up by taking into consideration the circumstances prevailing within a particular industry. These standards are supposed to be more realistic and helpful to identify inefficiencies at all levels.

(b) Basic Standards

Basic standards are those which remain constant or unaltered over a long period. These are set on long-term basis by taking a base year, just like index numbers are calculated. Basic standards are more suitable to small manufactures having a limited range of products and long-term production. But these are quite unsuitable for cost control and cost ascertainment.

(c) Normal Standard

Normal standards are average standards. These are suitable for a long period covering one trade cycle. These standards do not require revision or adjustment when used in a long-term planning and decision making. Normal standards are theoretically sound but cannot be used in forecast with reasonable degree of accuracy.

(d) Historical Standard

Historical standards are the average standards set on the basic of average cost incurred during several past years. These are not of much use in future in setting up standard. These may be of some use to those who are starting the setting up of a standard cost system.

(iv) Setting up of Standards

In a big establishment, generally a *Standard Cost Committee* is set-up which is entrusted the work of setting up standard costs. This committee normally consists of Production Manager, Purchases Manager, Sales Manager and Cost Accountant, *etc*. Out of these executives, the function of the Cost Accountant is of great importance because he alone can provide all necessary data relating to cost and he has to coordinate the activities of the standard cost and cost committee.

Standard cost is divided into three main heads: 1. Direct Materials, 2. Direct Labour. 3. Direct and Indirect Overhead Expenditure. Standards for each of these elements of cost are set.

1. **Direct Material Cost Standard.** This standard consists of two basic elements. Standard material quantity or usage and standard material rate or price.
   (*a*) ***Material Quantity or Usage Standard.*** The standard quantities of direct materials, which are required to manufacture a product, are normally decided or fixed by Production Manager and engineers. For this purpose material specification, standard ratio of their mix (when more than one direct materials are needed), product design and quality should be kept in consideration. Moreover, normal wastage or scrap should also be kept in a view while deciding quantity or usage of direct material.
   (*b*) ***Material Price Standard.*** For determining material standard consumed, the cost accountant will have to decide standard price in consultation with the Purchase Manager. The standard price may be based on past average prices of raw material or on current prices or on expected future prices. It is desirable that prevailing current prices should be adjusted to suit future price-variations. While determining expected prices following points should be taken into consideration.
      (*i*) Prices of opening stock in hand,
      (*ii*) Prices for which contracts have been undertaken to obtain material,
      (*iii*) Expected price-changes,
      (*iv*) Price-rebate and discounts which can be availed.
2. **Direct Labour Cost Standards.** There are two elements of standard direct labour—(*a*) standard labour time, and (*b*) standard labour rate.
   (a) ***Standard Labour Time.*** Standard labour time is to be set for each grade of labours and also for each operation involved in the production. It is set

with the help and advice of the work-study engineers. With the technique of time and motion study, the standard time for performance of labour is fixed. Due allowance should be made for fatigue, tool setting and other normal delays.

(b) ***Standard Labour Rate.*** Rate of wages to be paid to workers should be very properly decided. Wage paid to efficient and skilled workers having technical knowledge may be higher than those for unskilled and non-technical workers. There may be workers under a contract, then rate approved by the contract may usually become the standard.

The standard labour hours multiplied by standard labour rate becomes standard labour cost.

3. **Overhead Costs Standard.** Overheads may be classified into Indirect Material, Indirect Labour, Fixed Overheads and other Variable Overheads. Indirect material cost is determined per machine or production hour. Indirect labour cost is determined per machine or production hour or percentage of direct labour. Fixed expenses are total amount for the period of budgeted production hours. Variable overhead cost is determined on the basis of cost per unit of output or cost per production hour Output.

The total fixed overhead cost remains fixed and remain unchanged by changes in the volume of production. For this purpose, it is necessary to ascertain budgeted fixed overheads for the period and the budgeted units or standard hours for the period.

Standard cost for variable overheads, once calculated, remains the same per unit or per hour irrespective of volume of production because standard for variable cost tends to vary directly with the volume of production. While calculating its standard unit cost, due consideration should be given to past records and future trend of prices.

It is to be noted that standards fixed should be comprehensive and realistic. They should be related to the specific period and to the stipulated working conditions. The standard need not be 'ideal' but should be easily attainable. The attainable standard is a normal standard fixed on the basis of average efficiency of men, machine and material. It provides reasonable allowances for wastage of material and idle time. On the other hand, an ideal standard is based on minimum prices of material and maximum efficiency of men and machinery. It may be said that an ideal standard is most favourable but can rarely be achieved in practice.

It is necessary that the standard cost should be related to a common measurement unit. This common unit is normally a time unit and is called standard hour. It is the quantity of production units which can be completed in one hour. After fixing standards hour for each product, the standard for the different items of cost of production are related to standard hour. Thus, standard hour may be defined as '*a hypothetical hour representing the amount of work which should be performed on an hour under standard conditions*'.

On the basis of standard hour, we can calculate 'Efficiency Ratio' and 'Activity Ratio' of the organisation.

EFFICIENCY RATIO AND ACTIVITY RATIOS

There are a number of ratios which are used for reporting to the management related to the effective use of material, labour and other resources of an undertaking. Some of these are given below:

Efficiency Ratio

It is the 'standard hours equivalent to the work produced expressed as a percentage of the actual hours spent in producing that work'.

$$Efficiency\ Ratio = \frac{\text{Standard hours for actual production}}{\text{Actual hours for budgeted production}} \times 100$$

Activity Ratio

It is the number of standard hours equivalent to the work produced, expressed in a percentage of the budgeted standard hours.

$$Activity\ Ratio = \frac{\text{Standard hours for actual production}}{\text{Standard hours for budgeted production}} \times 100$$

The Activity Ratio measures the effectiveness of sales campaign in achieving the budgeted production while the efficiency ratio measures the production efficiency.

Capacity Usage Ratio

It is the relationship between the budgeted number of working hours and the maximum possible number of working hours in a budget period.

$$Capacity\ Usage\ Ratio = \frac{\text{Budgeted hours}}{\text{Maximum possible hours in budgeted period}} \times 100$$

Capacity Utilisation Ratio

It is the relationship between actual hours in a budget period and the budgeted working hours in the period.

$$Capacity\ Utilisation\ Ratio = \frac{\text{Actual hours}}{\text{Budgeted hours}} \times 100$$

Calender Ratio

It is the relationship between the number of working days in a period and the number of working days in the relative budget period.

$$Calender\ Ratio = \frac{\text{Available working days}}{\text{Budgeted working days}} \times 100$$

Illustration 1:

Calculate different ratios used in standard costing regarding efficiency, activity and capacity from the following figures for a four-week period. In this period there was a special one-day holiday due to national event

Standard working : 8 hours per day, 5 days per week
Maximum capacity : 50 employees
Actual working : 40 employees
Actual hour expected to be worked per 4 weeks: 6,400 hours
Standard hours expected to be earned per 4 weeks : 8,000 hours
Actual hours worked in the four week period: 6,000 hours
Standard hours earned in the four-week period: 7,000 hours

Solution:

1. Efficiency Ratio $= \frac{\text{Standard hours for actual production}}{\text{Actual hours for budgeted production}} \times 100$

$= \frac{7,000 \times 100}{6,000} = 117\%$

2. Activity Ratio $= \frac{\text{Standard hours for actual production}}{\text{Standard hours for budgeted production}} \times 100$

$= \frac{7,000 \times 100}{6,400} = 109\%$

3. Capacity Usage Ratio $\frac{\text{Budgeted hours}}{\text{Maximum possible hours in budgeted perio}} \times 100$

$= \frac{6,400 \times 100}{8,000} = 80\%$

4. Capacity Utilisation Ratio $= \frac{\text{Actual hours}}{\text{Budgeted hours}} \times 100$

$= \frac{6,000}{6,400} \times 100 = 94\%$

5. Calender Ratio $= \frac{\text{Available working hours}}{\text{Budgeted working hours}} \times 100$

$= \frac{[(5 \times 4) - 1])}{5 \times 4} \times 100 = \frac{19 \times 100}{20} = 95\%$

ANALYSIS OF VARIANCES

Cost Variance is the difference between a standard cost and the comparable actual cost incurred during a given period.

Variance Analysis is the analysis of the cost variances into its component parts and the explanation of the variances.

The cost variances are normally calculated in respect of three main elements of cost *viz.* material, labour and overhead. These are based on comparison of actuals and standard cost.

Care to be taken while Comparing Actuals and Standard Costs

Standard should be frequently reviewed and changed because working and market conditions are always changing. Standard costs which are carefully determined and regularly reviewed will give a valid basis for comparison with actual performance but some points must be kept in mind while making a judgement. These are :

(*a*) Conditions might have changed, thus rendering the standard costs unrealistic, for instance the quality of available materials may be low.

(*b*) Standards fixed upon on too idealistic a basis will remain unattainable.

(*c*) The service rendered by service departments may not be up to the mark so that, for example, time is lost due to a machine working slow.

(*d*) In certain activities, fixation of standard is either not possible or not desirable. Goods requiring artistic work of high quality cannot be and should not be subject to quantitative standards. In certain cases, work cannot be properly measured. Standards in these cases will be useless.

KINDS OF VARIANCES

The deviation of the actual cost from the standard cost is known as 'variance'. There are a number of causes which lead to a difference between the actual and standard costs. All the causes are weighed and the amount connected with each is ascertained and described in a way to indicate the cause leading to the variance. For instance, the variance caused by a change in prices of materials will be described as *'Materials Price Variance*'. A variance which increases profit is called favourable or just "Cr" or (*F*); the variance which reduces profit is unfavourable and is described as "Dr." or (*A*), *i.e.*, adverse. Variance are of various kinds. Chiefly, however, they may be grouped under two broad categories. These are:

(*i*) Variance indicating efficiency or inefficiency, for example, saving in materials consumed or wastage of time, and

(*ii*) Variances that result from a change in prices, say, wage rates or prices at which materials have been purchased.

Broadly, variances which show efficiency or inefficiency will be calculated as:

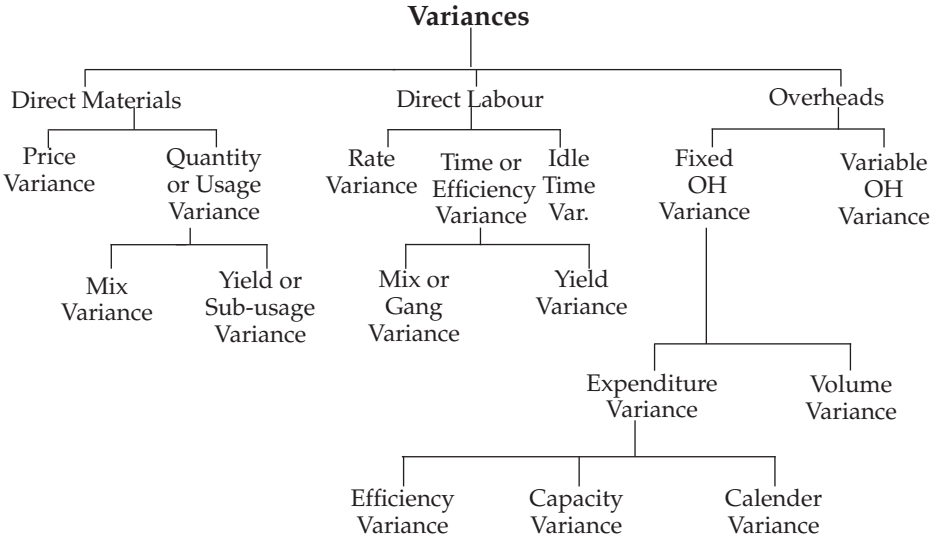
Standard rate × Difference between standard and actual quantities (*e.g.*, materials consumed or hours spent).

Variances which show up the effect of price changes are calculated as:

Actual quantity × Difference between standard price and actual price (*e.g.*, wage rates).

Variance analysis is a part of process of control and involves calculation of variances and interpretation of results so as to localise the various factors that are responsible for the variance. Variances analysis leads to ascertain the magnitude of each of the variances and causes thereof so that corrective measures may be taken.

The variances may be *broadly classified under heads* displayed in following chart.



DIRECT MATERIAL VARIANCES

Direct Materials Cost Variance (DMCV)

It is the difference between the standard cost of standard quantity of material for actual output and actual cost of material consumed. It is 'difference between standard cost of material specified and the actual cost of material used'.

Standard Cost of Direct Material for Actual Output

= Standard Price Per Unit× Standard Quantity for Actual Output

Actual Cost of Direct Material = Actual Price per Unit × Actual Quantity Consumed

Standard Quantity means the Quantity of material which ought to have been consumed according to standard usage rate for producing the actual output. Thus

Direct Material Cost Variance (DMCV) = Standard cost for actual output – Actual cost

or (Standard Price × Standard Quantity for actual output)

– (Actual Price × Actual Quantity)

or $(SP \times SQ) - (AP \times AQ)$ *i.e.*, $SC - AC$

When the actual cost is more than standard cost, there will be adverse or unfavourable variance and *vice-versa.*

Illustration 2:

Product *A* requires 10 kgs of material at the rate of ₹ 4 per kg. The actual consumption of material for the manufacturing of Product *A* came to 12 kgs of material at the rate of ₹ 4.50 per kg. Calculate material cost variance.

Solution:

Material Cost Variance = Standard Cost for Actual Output – Actual Cost

$= (SP \times SQ) - (AP \times AQ)$

$= (4 \times 10) - (4.50 \times 12)$

= 40 – 54 = ₹ 14 (Unfavourable or Adverse)

Illustration 3:

The standard material and standard cost per kg of material required for the production of one unit of product *A* is : Material 5 kg @ ₹ 5 per kg.

The actual production and related data are :

400 units of product *A*, Material used 2,200 kgs @ ₹ 4.80 per kg.

Calculate Material Cost Variance.

Solution:

SQ for actual output = 400 units × 5 kg = 2,000 kg

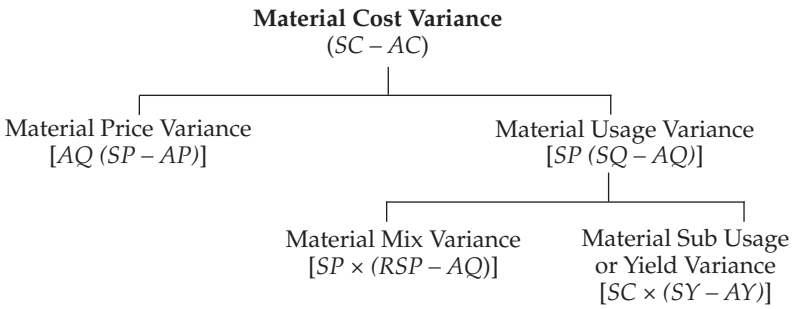
Material Cost Variance = Standard Cost for Actual Output – Actual Cost.

$= (SP \times SQ$ for actual output$) - (AP \times AQ)$

$= (5 \times 2{,}000) - (4.80 \times 2{,}200)$

= 10,000 – 10,560 = **₹ 560 (Adverse)**

Material Cost Variance is further analysed as to Material Price Variance and Material Usage Variance because the cost variance normally arises due to change in price or change in quantity or both.



(a) Direct Material Price Variance

It is that portion of material cost variance which is due to the difference between the standard price specified and actual price paid.

Direct Material Price Variance = Actual Quantity × (Standard Price – Actual Price)

$$DMPV = AQ \times (SP - AP)$$

If actual price is more than standard price, there will be adverse or unfavourable variance and when actual price is less than standard price, the variance will be favourable.

Illustration 4:

Calculate Material Price Variance from the data given in the Illustration No. 3.

Solution:

Material Price Variance = AQ ($SP - AP$)
= 2,200 (5 – 4.80) = 440 (Favourable)

(b) Direct Material Usage or Quantity Variance

It indicates the deviation caused from the standard due to difference in quantities used. It is that 'portion of material cost variance which is due to the difference between the standard quantity specified and the actual quantity used'. It is calculated by multiplying the standard price with the difference between the actual and standard quantities.

Direct Material Usage Variance = Standard Price
× (Standard Quantity for actual output
– Actual Quantity)

$$DMUV = SP \times (SQ \text{ for actual output} - AQ)$$

It is to be noted that if standard output differs from actual output, the standard quantity in the above calculation will be standard quantity for actual output as it is used in the Direct Material Cost Variance.

If Actual Quantity is less than Standard Quantity there will be favourable variance and *vice versa*.

Check. These two variances when added will be equal to Material Cost Variance

Direct Material Price Variance + Direct Material Usage Variance
= Direct Material Cost Variance

Illustration 5:

The standard cost of material for manufacturing a unit of a particular product *PEE* is estimated as follows : 16 kg of raw material @ ₹ 1 per kg.

On completion of the unit, it was found that 20 kg, of raw material costing ₹ 1.50 per kg has been consumed. Compute material variances.

Solution:

Direct Material Price Variance (*DMPV*) = Actual Qty. × (Std. rate – Actual rate)
= 20 × (1 – 1.50) = ₹ 10 (*Adverse*)

Direct Material Usage Variance (*DMUV*) = Std. rate × (Std. qty. for actual output – Actual qty.)
= 1 × (16 – 20) = 4 (*Adverse*)

Direct Material Cost Variance (*DMCV*) = Std. cost for Actual output – Actual cost
= (16 × 1) – (20 × 1.50)
= 16 – 30 = ₹ 14 (*Adverse*)

Thus, *DMCV* = *DMPV* + *DMUV*
= 10 (*Adverse*) + 4 (*Adverse*) = 14 (*Adverse*)

Illustration 6:

From the following particulars compute (*a*) Material cost variance, (*b*) Material price variance, and (*c*) Material usage variance:

Quantity of materials purchased	3,000 units
Value of materials purchased	₹ 9,000
Standard quantity of materials required per ton of output	30 units
Standard rate of material	₹ 2.50 per unit
Opening stock of materials	Nil
Closing stock of materials	500 units
Output during the period	80 ton

Solution:

Materials consumed = 3,000 – 500 = 2,500 units

Actual rate of material = ₹ 9,000/3,000 = ₹ 3 per unit

Standard quantity for actual output = 30 × 80 = 2,400 units

Material Cost Variance (*MCV*) = Standard cost – Actual cost

$$= \left(\begin{matrix}\text{Standard}\\ \text{Price}\end{matrix} \times \begin{matrix}\text{Standard}\\ \text{Quantity}\end{matrix}\right) - \left(\begin{matrix}\text{Actual}\\ \text{Price}\end{matrix} \times \begin{matrix}\text{Actual}\\ \text{Quantity}\end{matrix}\right)$$

= (₹ 2.50 × 2,400) – (₹ 3 × 2,500) = ₹ 1,500 (*A*) (Adverse)

Material Price Variance (*MPV*) = Actual quantity × (Standard price – Actual price)
= 2,500 × (₹ 2.50 – ₹ 3) = ₹ 1,250 Adverse

Material Usage Variance (*MUV*) = Standard price × (Standard quantity – Actual quantity
= ₹ 2.50 (2,400 – 2,500) = **₹ 250 (Adverse)**

Thus, *MCV* = *MPV* + *MUV*
1500 (*A*) = 1250 (*A*) + 250 (*A*)

Illustration 7:

Standard set for material consumption was 100 kg @ ₹ 2.25 per kg

In a cost period : Opening stock was 100 kg @ 2.25 per kg
Purchases made 500 kg @ ₹ 2.15 per kg
Consumption 110 kg

Calculate :

(*a*) Usage variance:

(*b*) Price variance : (*i*) When variance is calculated at point of purchase; (*ii*) when variance is calculated at point of issue on FIFO basis; (*iii*) when variance is calculated at point of issue on LIFO basis;

(*c*) What is the effect on closing stock valuation when materials are charged out to cost on basis (*ii*) and (*iii*) above?

Solution:

(*a*) Usage variance = Std. price × (Std. qty. – Actual qty.)
= 2.25 × (100 – 110) = ₹ 22.50 (A)

(*b*) Price variance = Actual qty. × (Std. price – Actual price)

(*i*) Price variance at the point of purchase
= 500 × (2.25 – 2.15) = ₹ 50 (*F*)

(*ii*) Price variance at the point of issue under FIFO Method
= 100 × (2.25 – 2.25) + 10 × (2.25 – 2.15)
= 0 + 10 × (0.10) = ₹ 1 (*F*)

(*iii*) Price variance at the point of issue under LIFO Method
= 110 × (2.25 – 2.15) = ₹ 11 (*F*)

(*c*) Effect on closing stock valuation when materials are charged on FIFO bases: Closing stock: 490 units @ 2.15 = ₹ 1,053.50 while if valued at standard cost: 490 @ 2.25 ₹ = 1102.50. Thus, it will be valued ₹ 49 less than the standard price.

If LIFO is used for issues, the closing stock will be 100 units @ 2.25 per unit + 390 @ 2.15 per unit. Thus, it will be valued at ₹ 39 less than the standard price.

Illustration 8:

Following details relating to product *X* during the month of April, 2022 are available.

Standard cost per unit of *X* :

Materials	: 50 kg @ ₹ 40/kg
Actual production	: 100 units
Actual material cost	: ₹ 42/kg
Material price variance	: ₹ 9,800 (Adverse)
Material usage variance	: ₹ 4,000 (Favourable)

Calculate the actual quantity of material used during the month of April, 2022.

Solution :

Material price variance = *AQ* (Std. price per kg – Actual price per kg)
= (–) 9,800 = *AQ* (40 – 42)
= (–) 9,800 = *AQ* (– 2)

$$\therefore \quad AQ = \frac{9,800}{2} = 4,900$$

Actual quantity of material used during the month of April = 4,900 kg.

(i) Material Mix Variance

When more than one type of materials are used for production, the usage variance may be subdivided into (*x*) Material Mix Variance and (*y*) Material Yield Variance or Material Revised Usage Variance (or Sub Usage Variance).

Material Mix Variable is defined as that portion of the Direct Material Usage Variance which is due to difference between the standard and actual composition of a mixture of material.

One of the reasons of material usage variance is the change in the composition of the material mixture when more than one type of materials are used. Normally such a situation arises in the chemical, textile, rubber and similar other industries where different raw materials are used in a definite proportion. When there is change in the standard proportion or mix, this variance is separately analysed. It may be due to shortage of a particular material. If there is increase in the proportion of a costly material in the mix, it will result in an unfavourable variance and *vice versa*.

Direct Material Mix Variance = Standard Price × (Revised Standard Quantity – Actual Quantity)

$$DMMV = SP\ (RSQ - AQ)$$

It may be noted that this variance is calculated separately for each material used in a mix. Moreover Revised Standard Quantity will be calculated where there is *variation in the total of composition of standard material quantity* and the composition of actual material quantity, in other words when there is variation in total of input quantities in the standard mix and actual mix.

Revised Standard Quantity or *RSQ*

$$= \frac{\text{Total Weight or Quantity of Actual Mix}}{\text{Total Weight or Quantity of Standard Mix}} \times \text{Standard Quantity of the Material.}$$

Illustration 9:

Calculate the Materials Mix Variance from the following :

Material	*Standard*	*Actual*
A	90 Units at ₹ 12	100 Units at ₹ 12
B	60 Units at ₹ 15	50 Units at ₹ 16
	150	150

Solution:

Materials	*Standard*			*Actual*		
	Quantity	*Rate*	*Amount (₹)*	*Quantity*	*Rate*	*Amount (₹)*
A	90	12	1,080	100	12	1,200
B	60	15	900	50	16	800
	150		1,980	150		2,000

Direct Material Mix Variance = Standard Price or Rate $\left(\begin{matrix}\text{Revised Std.}\\ \text{Quantity}\end{matrix}\right) - \left(\begin{matrix}\text{Actual}\\ \text{Quantity}\end{matrix}\right)$

But in this problem total standard mix and actual mix are same *i.e.*, 150 units, hence Revised Standard Quantity and Standard Quantity will be same.

A	= ₹ 12 × (90 – 100)
	= ₹ 12 × 10 = ₹ 120 (Adverse)
B	= ₹ 15 × (60 – 50)
	= ₹ 15 × 10 = ₹ 150 (Favourable)
Total	= ₹ 30 (Favourable)

Illustration 10:

The standard material cost to produce a tonne of chemical *X* is:

300 kg of material *A* @ ₹ 10 per kg
400 kg of material *B* @ ₹ 5 per kg
500 kg of material *C* @ ₹ 6 per kg.

During a period, 100 tonnes of mixture X were produced from the usage of:

35 tonnes of material *A* at a cost of ₹ 9,000 per tonne
42 tonnes of material *B* at a cost of ₹ 6,000 per tonne
53 tonnes of material *C* at a cost of ₹ 7,000 per tonne.

Calculate material price, usage and mix variances.

Solution:

Materials	*Standard*			*Actual*		
	Quantity	*Rate*	*Amount (₹)*	*Quantity*	*Rate*	*Amount (₹)*
A	30,000	10	3,00,000	35,000	9	3,15,000
B	40,000	5	2,00,000	42,000	6	2,52,000
C	50,000	6	3,00,000	53,000	7	3,71,000
	1,20,000		8,00,000	1,30,000		9,38,000

Direct Material Cost Variance (*DMCV*) = Std. cost for actual output – Actual cost
= ₹ 8,00,000 – ₹ 9,38,000
= ₹ 1,38,000 (Adverse)

Direct Material Price Variance (*DMPV*) = Actual quantity × (Std. Rate – Actual Rate)

A	= 35,000 × (10 – 9)	=	₹ 35,000 (*F*)
B	= 42,000 × (5 – 6)	=	42,000 (*A*)
C	= 53,000 × (6 – 7)	=	53,000 (*A*)
	Total		₹ 60,000 (*A*)

Direct Material Usage Variance (*DMUV*) = Std. Rate × (Std. Qty. for actual output – Actual Qty.)

A	= 10 × (30,000 – 35,000)	=	₹ 50,000 (*A*)
B	= 5 × (40,000 – 42,000)	=	₹ 10,000 (*A*)
C	= 6 × (50,000 – 53,000)	=	₹ 18,000 (*A*)
	Total		₹ 78,000 (*A*)

Direct Material Mix Variance (*DMMV*) = Std. Rate × (Revised Std. Qty. – Actual Qty.)

A = 10 × (32,500 – 35,000)
= 10 × 2,500 = ₹ 25,000 (*A*)

B $= 5 \times \left(\frac{1,30,000}{3} - 42,000 \right)$

$= 5 \times \frac{4,000}{3}$ = ₹6,667 (*F*)

C	$= 6 \times \left(\frac{1,62,500}{3} - 53,000 \right)$		
	$= 6 \times \frac{3,500}{3}$	=	₹ 7,000 (*F*)
	Total		11,333 (*A*)

Working Note:

1. Revised Standard Quantity $= \frac{\text{Total actual weight of mix.}}{\text{Total standard weight of mix.}} \times \text{Standard Quantity}$

$A = \frac{1,30,000}{1,20,000} \times 30,000 = 32,500$ Kg.

$B = \frac{1,30,000}{1,20,000} \times 40,000 = \frac{1,30,000}{3}$ Kg.

$C = \frac{1,30,000}{1,20,000} \times 50,000 = \frac{1,62,500}{3}$ Kg.

(ii) Direct Material Revised Usage Variance (*DMRUV*) or Sub Usage Variance (*DMSUV*)

If there is difference between standard quantity for actual output (as used in Usage Variance) and Revised Standard Quantity (as used in Mix Variance), their variance will be known as Revised Usage Variance. This variance arises when standard output and actual output shows no difference, (where there is difference between standard output and actual output, then there will be material yield variance and there will be no need of calculating Revised Usage Variance. Yield Variance has been explained ahead.

It is clear that if there is no difference between standard quantity (as used in Usage Variance) and Revised Standard Quantity (as used in Mix. Variance) there will be no Revised Usage Variance. Then Usage Variance will be equal to Mix Variance.

Revised Usage Variance = Standard Price × (Standard Quantity for Actual Output – Revised Standard Quantity)

or

$= SP \times (SQ - RSQ)$

Revised Usage Variance will be calculated for each item of material used in the mix separately.

Thus, total Mix variance and total Revised Usage Variance will be equal to the Total Usage Variance. (*DMMV + DMRUV = DMUV*).

Illustration 11:

From the following information compute material (*a*) Mix variance (*b*) Price variance (*c*) Usage Variance (*d*) Sub-usage Variance, and (*e*) Cost Variance.

Materials	*Standard*			*Actual*		
	Quantity	*Rate*	*Amount (₹)*	*Quantity*	*Rate*	*Amount (₹)*
A	10	2	20	5	3	15
B	20	3	60	10	6	60
C	20	6	120	15	5	75
Total	50	4	200	30	5	150

Solution:

(*a*) Material Cost Variance = Standard Cost – Actual Cost
= 200 – 150 = ₹ 50 (Favourable)

(*b*) Material Price Variance = Actual Quantity × (Standard Price – Actual Price)
or = *AQ* × *(SP – AP)*

			₹	
Material	*A*	5 × (2 – 3)	5	(Adverse)
	B	10 × (3 – 6)	30	(Adverse)
	C	15 × (6 – 5)	15	(Favourable)
			20	(Adverse)

(*c*) Material Usage Variance = St. Price × (St. Quantity for Actual Output – Actual Quantity)

i.e.,		*(SP* × *(SQ – AQ)*		₹	
Material	*A*	2 × (10 – 5)	=	10	(Favourable)
	B	3 × (20 – 10)	=	30	(Favourable)
	C	6 × (20 – 15)	=	30	(Favourable)
		Total		70	(Favourable)

(*d*) *Material Mix Variance*
For the calculation of Material Mix Variance, Revised Standard Quantity (*RSQ*) will have to be calculated

$$RSQ = \frac{\text{Actual Mix} \times \text{Standard Quantity}}{\text{Standard Mix}}$$

$$\text{Material } A = \frac{30}{50} \times 10 = 6 \text{ kg}$$

$$\text{Material } B = \frac{30}{50} \times 20 = 12 \text{ kg}$$

$$\text{Material } C = \frac{30}{50} \times 20 = 12 \text{ kg}$$

Mix Variance = St. Price × *(RSQ – AQ)*

Material	*A*	2 × (6 – 5)	₹ 2	(Favourable)
Material	*B*	3 × (12 – 10)	6	(Favourable)
Material	*C*	6 × (11 – 15)	18	(Adverse)
		Total	10	(Adverse)

(*e*) Material Sub-usage Variance = St. Price (Standard Quantity – Revised Standard Quantity)

or		*SP* × *(SQ – RSQ)*	₹	
Material	*A*	2 × (10 – 6)	₹ 8	(Favourable)
	B	3 × (20 – 12)	24	(Favourable)
	C	6 × (20 – 12)	48	(Favourable)
		Total	80	(Favourable)

Verification

Material Usage Variance = Mix Variance + Sub-usage Variance
70 (*F*) = 10 (*A*) + 80 (*F*)
Material Cost Variance = Material Price Variable + Material Usage Variance
50 (*F*) = 20 (*A*) + 70 (*F*)

(*iii*) Direct Material Yield Variance

As said earlier there may be either Revised Usage Variance (when there is no change in standard and actual output) or yield variance (when there is difference in standard output and actual output).

Direct Material yield variance is defined as 'that portion of material Usage Variance which is due to difference between the standard yield (output) specified and actual yield (output) obtained'. It may be noted that yield variance is based on output while all other variances are based on input.

Direct Material Yield Variance = Standard Cost Per Unit × (Standard Yield or output for actual input – Actual Yield or output)

$$(DMYV) = SC \times (SY - AY)$$

Standard yield is the production which should result in by the input of actual quantity of materials.

$$\text{Standard Yield (SY)} = \frac{\text{Standard Production} \times \text{Total Actual Quantity of Input}}{\text{Total Standard Output Quantity}}$$

$$\text{Standard Cost per Unit} = \frac{\text{Total cost of Standard Mix of Material}}{\text{Net Standard Output Quantity}}$$

If standard yield, or production is more than actual yield or production the variance will be unfavourable or adverse and *vice-versa* (Thus in this variance negative figure of variance will be favourable).

It may be noted that *where several types of raw materials are used, Revised Usage Variance* and *Yield Variance imply the same thing.* Revised usage variance is based on input where there is no difference in standard output and actual output, while yield variance is based on output where there is difference between standard output for actual input and actual output. It may be again repeated that total of Mix Variance and Revised Usage Variance or Yield Variance (as the case may be) will be equal to Material Usage Variance.

Illustration 12:

The standard cost of a certain chemical mixture is:

35% Material *A* at 25 per kg
65% Material *B* at ₹ 36 per kg

A standard loss of 5% is expected in production.

During a period there is used:

125 kg of Material *A* at ₹ 27 per kg and
275 kg of Material *B* at ₹ 34 per kg.

The actual output was 365 kgs.

Calculate:

(*a*) Material Cost Variance
(*b*) Material Price Variance
(*c*) Material Mix Variance
(*d*) Material Yield Variance

Solution:

Materials	*Standard*			*Actual*		
	Kg.	*Rate*	*Amount* ₹	*Kg.*	*Rate*	*Amount* ₹
A	140	25	3,500	125	27	3,375

B	260	36	9,360	275	34	9,350
	400		12,860	400		12,725
Standard Loss 5%	20					
Standard output	380					

Standard output : 400 – 20 = 380 kg.
Actual output (given) = 365 kg.
Standard Cost per kg = Total Standard Cost/Standard Output
= 12,860/380 = ₹ 33.84

Calculation of Variances :

(*a*) *DMCV* = Standard Cost for Actual Output – Actual Cost
= 365 × 33.84 – 12,725
= 12,352 – 12,725 = ₹ 373 (Adverse)

(*b*) *DMPV* = Actual Quantity × (Standard Rate – Actual Rate)
A =125 × (25 – 27) = 250 (*A*)
B = 275 × (36 – 34) = 550 (*F*)
₹ 300 (Favourable)

(*c*) *DMMV* = Standard Rate – (Revised Standard Quantity – Actual Quantity)

Note. Since Standard Mix and Actual Mix are the same, the Revised Standard Quantity and Standard quantity will also be the same.

Material *A* = 25 × (140 – 125) = 375 (*F*)
Material *B* = 36 × (260 – 275) = 540 (*A*)
165 (Adverse)

(*d*) *DMYV* = Standard Cost per kg × (Standard Output of Actual Mix – Actual Output)
= 33.84 × (380 – 365) = 508 (Adverse)

Verification:

DMCV = *DMPV*+ *DMMV*+ *DMYV*
₹ 373 (*A*) = 300 (*F*) + 165 (*A*) + 508 (*A*)

Illustration 13:

The standard material cost for 100 kg. of Chemical *D* is made up of:
Chemical *A* – 30 kgs @ ₹ 4.00 per kg
Chemical *B* – 40 kgs @ ₹ 5.00 per kg
Chemical *C* – 80 kgs @ ₹ 6.00 per kg

In a batch, 500 kg of Chemical *D* were produced from a mix of :
Chemical *A* – 140 kgs at a cost of ₹ 588
Chemical *B* – 220 kgs at a cost of ₹ 1,056
Chemical *C* – 440 kgs at a cost of ₹ 2,860

How do the yield, mix and the price factors contribute to the variance in the actual cost per 100 kgs. of chemical *D* over the standard cost?

Solution:

Chemicals	*Standard for 100 kg of Chemical D*			*Actual for 100 kg of Chemical D*		
	Quantity Kg.	*Rate Per Kg.*	*Amount (₹)*	*Quantity Kg.*	*Rate Per Kg.*	*Amount (₹)*
A	30	4	120	28	4.2	117.6
B	40	5	200	44	4.8	211.2

C	80	6	480	88	6.5	572.0
	150		₹ 800	160		₹ 900.8
Output	100			100		

Actual quantity has been taken for 100 kg of Chemical *D* as required.

Material price variance = Actual quantity × (Standard price – Actual price)

Chemical	*A*	=	28 × (4 – 4.20)	=	₹ 5.60 (*A*)
	B	=	44 × (5 – 4.80)	=	8.80 (*F*)
	C	=	88 × (6 – 6.50)	=	44.00 (*A*)
					40.80 (*A*)

Material Usage Variance = Standard price × (Standard quantity – Actual quantity)

Chemical	*A*	=	₹ 4 × (30 – 28)	=	₹ 8 (*F*)
Chemical	*B*	=	5 × (40 – 44)	=	20 (*A*)
Chemical	*C*	=	6 × (80 – 88)	=	48 (*A*)
					60 (*A*)

Revised Standard Qty. $= \frac{\text{Total weight of actual mix}}{\text{Total weight of std. mix}} \times$ Standard qty.

Chemical *A* $= \frac{160}{150} \times 30 = 32$ kg

Chemical *B* $= \frac{160}{150} \times 40 = \frac{640}{15}$ or $42\frac{2}{3}$

Chemical *C* $= \frac{160}{150} \times 80 = \frac{1,280}{15}$ kg. or $85\frac{1}{3}$

Material Mix Variance: St. Rate × (*RSQ* – *AQ*)

Chemical *A*	= ₹ 4 × (32 – 28)	= ₹ 16 (*F*)
Chemical *B*	$= 5 \times \left(42\frac{2}{3} - 44\right)$	= 6.67 (*A*)
Chemical *C*	$= 6 \times \left(85\frac{1}{3} - 88\right)$	= 16 (*A*)
Total Mix Variance		6.67 (*A*)

Yield Variance = Standard Cost per unit × (Standard Output for Actual Mix – Actual Output)

Standard Cost per kg of chemical *D*:

= Standard Cost/Standard Output
= ₹ 800/100 = ₹ 8

Standard Output for actual mix $= \frac{100}{150} \times 160 = 106\ \frac{2}{3}$ kg.

Yield Variance = ₹ 8 $\left(106\frac{2}{3} - 100\right)$ = ₹ 53.33 (*A*)

Illustration 14:

D.V. Ltd. manufactures *BXE* by mixing three raw materials. For every batch of 100 kgs. of *BXE*, 125 kgs. of raw materials are used. In February, 60 batches were prepared to produce an output of 5,600 kg. of *BXE*. The standard and actual particulars for February are as under:

Raw Materials	*Standard*		*Actual*		
	Mix %	*Price per kg.* ₹	*Mix %*	*Price per kg.* ₹	*Quantity of Raw Material Purchased (kg.)*
A	50	20	60	21	5,000
B	30	10	20	8	2,000
C	20	5	20	6	1,200

Calculate:

(*i*) Material Cost Variance (*ii*) Material Price Variance

(*iii*) Material Mix Variance (*iv*) Material Yield Variance

Solution:

Raw Material	*Standard*			*Actual*		
	Kg.	*Rate*	*Amount* (₹)	*Kg.*	*Rate*	*Amount* (₹)
A	3,750	20	75,000	4,500	21	94,500
B	2,250	10	22,500	1,500	8	12,000
C	1,500	5	7,500	1,500	6	9,000
	7,500		1,05,000	7,500		1,15,500
Output	6,000			5,600		

Direct Material Cost Variance (*DMCV*)

= Standard Cost for Actual Output – Actual Cost

$$= \frac{1,05,000}{6,000} \times 5,600 - 1,15,500$$

= 98,000 – 1,15,500 = 17,500 (*A*)

Direct Material Price Variance (*DMPV*)

= Actual qty. × (*SR* – *AR*)

A = 4,500 × (20 – 21) = 4,500 (*A*)

B = 1,500 × (10 – 8) = 3,000 (*F*)

C = 1,500 × (5 – 6) = 1,500 (*A*)

3,000 (*A*)

Direct Material Usage Variance (*DMUV*)

= Standard Rate × (Std. qty. for actual output – Actual qty.)

A $= 20 \times \left(\frac{3,750}{6,000} \times 5,600 - 4,500\right)$

= 20 × (3,500 – 4,500) = 20,000 (*A*)

B $= 10 \times \left(\frac{2,250}{6,000} \times 5,600 - 1,500\right)$

= 10 × (2,100 – 1,500) = 6,000 (*F*)

C $= 5 \times \left(\frac{1,500}{6,000} \times 5,600 - 1,500\right)$

= 5 × (1,400 – 1,500) = 500 (*A*)

₹ 14,500 (*A*)

Direct Material Mix Variance (*DMMV*) = Standard Rate × (Revised Std. Qty. – Actual Qty.)

A	= 20 × (3,750 – 4,500)	=	15,000 (*A*)
B	= 10 × (2,250 – 1,500)	=	7,500 (*F*)
C	= 5 × (1,500 – 1,500)	=	—
			7,500 (*A*)

Note. Since the Standard Mix and Actual Mix are the same, the Standard Quantity and Revised Standard Quantity will also be the same.

Direct Material Yield Variance (*DMYV*)

= Std. cost per unit × (Std. output for actual mix – Actual output)

$$\frac{1,05,000}{6,000} \times (6,000 - 5,600) = 17.5 \times 400 \quad = \quad ₹\ 7,000\ (A)$$

The Direct Material Yield Variance is equal to Direct Material Revised Usage Variance calculated as follows :

DMRUV = *SR* × (Standard Qty. for Actual Output – Revised Std. Qty.)

A	= 20 × (3,500 – 3,750)	=	5,000 (*A*)
B	= 10 × (2,100 – 2,250)	=	1,500 (*A*)
C	= 5 × (1,400 – 1,500)	=	500 (*A*)
			₹ 7,000 (*A*)

Illustration 15:

Common brass is an alloy consisting of 70% copper and 30% zinc. In melting and processing it is expected that a 4% loss of metal will occur. Standard prices are ₹40 per kg for copper and ₹ 15 per kg for zinc. Using suitable figures for the purpose of illustration, show clearly how you would record (*a*) Material Price Variance, (*b*) Material Usage Variance, (*c*) Material Mix Variance and (*d*) Material Yield Variance.

Solution:

It is assumed that following figures will be for standard and actual material based on the information given:

Materials	*Standard*		*Actual*	
	Quantity kg	*Rate* ₹	*Quantity kg*	*Rate* ₹
Copper	700	40.00	600	50.00
Zinc	300	15.00	600	10.00
	1,000		1,200	
Less Standard Loss 4 %	40	*Less* loss	144	
Output	960		1,056	

Material Cost Variance (*MCV*) = Standard Cost for Actual Output – Actual Cost

= (Standard Rate × Standard Quantity of Actual output)

– (Actual Rate × Actual Quantity)

Here, Standard Quantity for Actual Output = Actual output × Standard Quantity / Standard Output

For Copper	= 1,056 × 700/960 = 770 kg		
For Zinc	= 1,056 × 300/960 = 330 kg		
MCV For Copper	= (40 × 770) – (50 × 600) = 30,800 – 30,000	=	800 (*F*)
MCV For Zinc	= (15 × 330) – (10 × 600) = 4,950 – 6,000	=	1,050 (*A*)
	Total		250 (*A*)

Material Price Variance (*MPV*) = Actual Quantity × (Standard Rate – Actual Rate)

MPV for Copper	= 600 × (40 – 50)	= 6,000 (*A*)
MPV for Zinc	= 600 × (15 – 10)	= 3,000 (*F*)
	Total	3,000 (*A*)

Material Usage Variance (*MUV*) = Standard Rate × (Standard Quantity for Actual Output –Actual Quantity).

MUV for Copper	= 40 × (770 – 600)	= 6,800 (*F*)
MUV for Zinc	= 15 × (330 – 600)	= 4,050 (*A*)
	Total	2,750 (*F*)

Verification :

Material Cost Variance = Material Price Variance + Material Usage Variance
= 3,000 (*A*) + 2,750 (*F*) = 250 (*A*)

Material Mix Variance (*MMV*) = Standard Rate per unit × (Revised Standard Quantity – Actual Quantity)

$$\text{Here, Revised Standard Quantity} = \frac{\text{Total Weight Actual Mix} \times \text{Standard Quantity}}{\text{Total Weight of Std. Mix.}}$$

RSQ for Copper	= 1,200 × 700/1,000 = 840 kg.	
RSQ for Zinc	= 1,200 × 300/1,000 = 360 kg	
MMV for Copper	= 40 × (840 – 600)	= 9,600 (*F*)
MMV for Zinc	= 15 × (360 – 600)	= 3,600 (*A*)
	Total	6,000 (*F*)

Material Yield Variance (*MYV*) = Standard Cost Per Unit × (Standard yield for actual input – Actual yield)

$$\text{Here, St. Cost per unit} = \frac{(700 \times 40) + (300 \times 15)}{960\,\text{kg.}} = \frac{32,500}{960} = ₹\ 33.85$$

Standard Yield = 1,200 kg. – (4% *i.e.*,) 48 = 1,152 kg.

MYV = 33.85 × (1,152 – 1,056) = ₹ 3,250 (*A*)

Verification :

Material Usage Variance = Material Mix Variance + Material Yield Variance
= 6,000 (*F*) + 3,250 (*A*) = 2,750 (*F*)

Illustration 16:

Vinay Ltd. produces an article by blending two basic raw materials. It operates a standard costing system and the following standards have been set for raw materials:

Material	*Standard Mix*	*Standard Price per kg*
A	40%	₹ 4.00
B	60%	3.00

The standard loss in processing is 15%.

During April, 2022, the company produced 1,700 kg of finished output.

The position of stock and purchases for the month of April, 2022 is under:

Material	*Stock on 1-4-22*	*Stock on 30-4-22*	*Purchased during April, 2022*	
	kg.	*kg.*	*kg.*	*Cost (₹)*
A	35	5	800	3,400
B	40	50	1,200	3,000

Calculate the following variances:
(*i*) Material Price Variance.
(*ii*) Material Usage Variance.
(*iii*) Material Yield Variance.
(*iv*) Material Mix Variance.
(*v*) Total Material Cost Variance. [*C.A. Inter*]

Solution:

Type of Material	*Standard*			*Actual*		
	Quantity Kg.	*Rate* ₹	*Amount (₹)*	*Quantity Kg.*	*Rate* ₹	*Amount (₹)*
A	800	4	3,200	35 795	4 4.25	140.00 3,378.75
B	1,200	3	3,600	40 1,150	3.00 2.50	120.00 2,875.00
Total	2,000		6,800	2,020		6,513.75
Less	300			320		
	1,700			1,700		

Calculation :

1. The standard loss is 15% of the input. Thus, to produce 1,700 kg. of the article, standard quantity of material required is

$$\frac{100}{85} \times 1{,}700 = 2{,}000 \text{ kg}$$

Out of the 2,000 kg. of material used, 40% is of type *A* and 60% is of type *B, i.e.*, 800 kg of *A* and 1,200 kg of *B.*

2. Standard cost per unit $= \frac{\text{Total Standard Cost}}{\text{Total Standard Output}} = \frac{₹\ 6{,}800}{1{,}700} = ₹\ 4$ per kg.

1. Material Price Variance = Actual Quantity × (Standard Rate – Actual Rate)

Material A: Since the actual price and standard price in respect of 35 kg. of raw materials are the same, price variance will be in respect of 795 kg:

= 795 × (4.0 – 4.25) = ₹ 198.75 (Adverse)

Material B: In respect of Material *B* also, price variance will be only in respect of 1,150 kg.

= 1,150 kg. × (3 – 2.50) = ₹ 575 (Favourable)

Total Material Price Variance of *A* and *B*

= 198.75 (*A*) + 575 (*F*) = ₹ 376.25 (Favourable)

2. Material Usage Variance = Std. Rate × (Std. Qty. for actual output – Actual Qty.)

A = 4 × (800 – 830) = ₹ 120 (*A*)

B = 3 × (1,200 – 1,190) = ₹ 30 (*F*)

Total ₹ 90 (Adverse)

3. Material Yield Variance = Std. cost per unit × (St. output for actual mix – Actual output)

$$= 4 \times \left(\frac{1{,}700}{2{,}000} \times 2{,}020 - 1{,}700 \right)$$

= 4 × (1,717 – 1,700) = ₹ 68 (Adverse)

4. Material Mix Variance = Std. Rate per kg × (Revised Std. Qty. – Actual Qty.)

Revised Std. Qty.:	*A*	$= \frac{2,020}{2,000} \times 800$	=	808
	B	$= \frac{2,020}{2,000} \times 1,200$	=	1,212
Variance:	*A*	= 4 × (808 – 830)	=	₹ 88 (*A*)
	B	= 3 × (1,212 – 1,190)	=	₹ 66 (*F*)
		Total		₹ 22 (Adverse)

5. Material Cost Variance = Standard cost for actual output – Actual cost
= 6,800 – 6,513.75 = ₹ 286.25 (Favourable)

Verification:

Material Cost Variance = Material Price Variance + Material Usage Variance
= 376.25 (*F*) + ₹ 90 (*A*) = ₹ 286.25 (Favourable)

Material Usage Variance = Material Mix Variance + Material Yield Variance
= 22 (*A*) + 68 (*A*) = ₹ 90 (Adverse)

Illustration 17:

Mall Tiles Limited makes plastic tiles of standard size of 6" × 6" × 1/8". From the following information, you are required to calculate for direct materials:

(*i*) the cost variance in total
(*ii*) the cost variance sub-divided into: (*a*) Price, (*b*) Usage
(*iii*) the usage variance analysed to show: (*a*) mixture, (*b*) yield.

A standard mix of the compound required to produce an output of 20,000 square feet of tiles 1/8" thick is as follows:

Direct Materials			*Quantity*	*Price per kg*
A	...	...	600 kg	₹ 0.90
B	...	...	400	0.65
C	...	...	500	0.40

During the month of December, 8 mixes were processed and actual materials consumed were:

Direct Materials			*Quantity*	*Price per kg*
A	...	...	5,000 kg	₹ 0.85
B	...	...	2,900	0.60
C	...	...	4,400	0.45

Actual production for December was 6,20,000 tiles. [*C.A. Inter*]

Solution:

Material	*Standard (for 6,20,000 tiles)*			*Actual (for 6,20,000 tiles)*		
	Qty. (Kg)	*Rate per kg (₹)*	*Amount (₹)*	*Qty. (Kg).*	*Rate per kg (₹)*	*Amount (₹)*
A	4,650	0.90	4,185	5,000	0.85	4,250
B	3,100	0.65	2,015	2,900	0.60	1,740
C	3,875	0.40	1,550	4,400	0.45	1,980
	11,625		7,750	12,300		7,970

(*i*) Material Cost Variance (*DMCV*) = Standard Cost – Actual Cost
= ₹ 7,750 – ₹ 7,970 = ₹ 220 (*A*)

(*ii*) (*a*) Material Price Variance (*DMPV*) = Actual Quantity × (Standard Rate – Actual Rate)

A	= 5,000 × (0.90 – 0.85)	= ₹ 250 (*F*)
B	= 2,900 × (0.65 – 0.60)	= 145 (*F*)
C	= 4,400 × (0.40 – 0.45)	= 220 (*A*)
		175 (*F*)

(*b*) Material Usage Variance (*DMUV*) = Standard Price × (Standard Qty. – Actual Qty.)

A	= 0.90 × (4,650 – 5,000)	= ₹ 315 (*A*)
B	= 0.65 × (3,100 – 2,900)	= 130 (*F*)
C	= 0.40 × (3,875 – 4,400)	= 210 (*A*)
		395 (*A*)

(*iii*) (*a*) Material Mix Variance (*DMMV*) = Standard Rate × (Revised Standard Quantity – Actual Quantity)

A	= 0.90 × (4,920 – 5,000)	= ₹ 72 (*A*)
B	= 0.65 × (3,280 – 2,900)	= 247 (*F*)
C	= 0.40 × (4,100 – 4,400)	= 120 (*A*)
		55 (*F*)

Revised Standard Quantity (*RSQ*)

$$= \frac{\text{Actual Mix}}{\text{Standard Mix}} \times \text{Standard Quantity}$$

$$A = \frac{12,300}{11,625} \times 4,650 = 4,920$$

$$B = \frac{12,300}{11,625} \times 3,100 = 3,280$$

$$C = \frac{12,300}{11,625} \times 3,875 = 4,100$$

(*b*) Material Yield Variance (*DMYV*)

= Std. Cost per Unit × (Std. Output for Actual Mix – Actual Output)

= 0.125 × (6,56,000 – 6,20,000) = ₹ 450 (Adverse)

Calculations

(*i*) Std. Cost per Unit of Tile $= \frac{\text{Total Std. Cost}}{\text{No. of Tiles}} = \frac{7,750}{6,20,000} = ₹\ 0.125$

(*ii*) Std. Output for Actual Mix $= \frac{6,20,000}{11,625} \times 12,300 = 6,56,000$ tiles

(*iii*) Output of tiles:
One Mix produces 20,000 square feet of tiles. Each tile requires 36 square inches of 1/8" thickness

$\therefore$ Total output of one mix $= \frac{20,000 \times 144}{36} = 80,000$ tiles

(*iv*) Standard quantity for actual output:

Material *A* $= \frac{600 \times 6,20,000}{80,000} = 4,650$ kg.

Material *B* $= \frac{400 \times 6,20,000}{80,000} = 3,100$ kg.

Material *C* $= \frac{500 \times 6,20,000}{80,000} = 3,875$ kg.

Illustration 18:

One kilogram of Product *K* requires two chemicals *A* and *B*. The following were the details of product *K* for the month of June :

(*a*) Standard mix Chemical *A* 50% and Chemical *B* 50%.
(*b*) Standard price per kilogram of Chemical *A* ₹ 12, Chemical *B* ₹ 15.
(*c*) Actual input of Chemical *B* 70 kilograms.
(*d*) Actual price per kilogram of Chemical *A* ₹ 15.
(*e*) Standard normal loss 10% of total input.
(*f*) Materials cost variance total ₹ 50 adverse.
(*g*) Materials yield variance total ₹ 135 adverse.

You are required to calculate:

1. Materials mix variance total.
2. Materials usage variance total.
3. Materials price variance
4. Actual input of Chemical *A*.
5. Actual loss of actual Input
6. Actual price per kilogram of Chemical *B*.

[*CA Inter*]

Solution:

Calculations:

(*i*) Since actual output has not been given, it has been presumed to be 90 kg.

(*ii*) The standard input for actual output :

$$\text{Total Mix} = 90 \times 100/90 = 100 \text{ kg.}$$

The standard input of material *A* and *B* will be 50 kg. each because their input proportion is 50% each.

(*iii*) Material Cost Variance total is ₹ 650 (*A*).

Therefore, the actual cost of material is ₹ 2,000 [*i.e.*, (50 × 12 + 50 × 15) + 650)] and standard cost is ₹ 1,350.

(*iv*) Material yield variance is 135 (*A*). The standard output for actual mix is presumed to be *x* in following calculations.

Material Yield Variance = Std. cost per unit × (Std. output for actual mix – Actual output)

$$135\ (A) = \frac{1,350}{90}(x - 90)$$

or $$135\ (A) = 15 \times (x - 90)$$

or $$135\ (A) = 15x - 1,350 \text{ or } x = 99$$

The standard output for actual mix is 99 kg. Therefore, the actual input should be:

$$99 \times 100/90 = 110 \text{ kg.}$$

(*v*) Total actual mix is 110 kg. out of which 70 kg. is that of material *B*. Thus, input of material *A* 40 kg.

(*vi*) The total actual cost of material *A* is ₹ 600 (*i.e.*, 40 × 15). The total actual cost of material *B* will be total actual cost – Cost of *A i.e.*, ₹ 1,400 (*i.e.*, 2,000 – 600). The rate per kg. of material *B* ₹ 20 per kg. *i.e.*, 1400 ÷ 70 = 20.

Cost-Table of *A* and *B*

Chemical	*Standard*			*Actual*		
	Qty. (kg)	*Rate (₹)*	*Amount (₹)*	*Qty. (kg)*	*Rate (₹)*	*Amount (₹)*
A	50	12	600	40	15	600
B	50	15	750	70	20	1,400
	100		1,350	110		2,000

Standard output for actual mix. 99 kg.

Actual output for actual mix. 90 kg.

1. **Material Mix Variance Total** = Standard Rate × (Revised Std. Qty. – Actual Qty.)

A $= 12 \times \left(\frac{50}{100} \times 110 - 40\right) = 12 \times (55 - 40) = 180\ (F)$

B $= 15 \times \left(\frac{50}{100} \times 110 - 70\right) = 15 \times (55 - 70) = 225\ (A)$

Total ₹ 180 (*A*)

2. **Material Usage Variance** = Std. Rate × (Std. Qty. for Actual Output – Actual Qty.)

A	= 12 × (50 – 40)	= 120 (*F*)
B	= 15 × (50 – 70)	= 300 (*A*)
	Total	₹ 180 (*A*)

3. **Material Price Variance** = Actual Qty. × (Std. Rate – Actual Rate)

A	= 40 × (12 – 15)	= 120 (*A*)
B	= 70 × (15 – 20)	= 350 (*A*)
	Total	₹ 470 (*A*)

4. Actual Loss of Actual Input :

Actual Input	110
Actual Output	90
Loss	20

5. Actual Input of Chemical *A*: 40 kg
6. Actual price per kg. of Chemical *B*: ₹ 20.

Causes of Direct Material Variances

Direct material cost variances arise due to variations in the material prices and usage or quantity of material.

Material Price Variance. It arises normally due to following possible causes. The related responsible person is also mentioned along with.

Possible Causes of Material Price Variance		*Person Responsible*
(i)	Inefficient buying	Purchasing Management
(ii)	Change in the market price.	Uncontrollable
(iii)	Rush order to meet shortage of supply or emergency purchase	Purchase Manager
(iv)	Purchase in bulk quantity or in uneconomic quantity.	Purchase Manager
(v)	Failure to avail advantage of off-season price or failure to purchase when price was low	Purchase Manager
(vi)	Failure to avail trade discount	Purchase Manager
(vii)	Payment to avail cash discount	Accounts Officer
(viii)	Payment of excess or less freight	Purchase Manager
(ix)	Non-availability of standard quality	Uncontrollable
(x)	Change in the material purchase, upkeep and store keeping cost	Purchase Manager and Store Keeper
(xi)	Change in the taxes and duties	Uncontrollable
(xii)	Use of substitute materials at different prices	Production Manager
(xiii)	Change in the quality and specification of material purchased	Production Manager

It may be noted that the above list is not comprehensive but suggestive. There may be other similar reasons of material price variance.

For material price variances mainly the Purchase Department and its manager is responsible. But certain causes may be uncontrollable and for which the Purchase Manager will not be held responsible. Moreover, where purchases have been intentionally made in uneconomic quantities due to lack of working capital, the General Manager and the Administration will be responsible.

Price variances provide useful information for taking remedial actions, such as increase in production prices if variance is uncontrollable or adoption of cost reduction method and improvement in the efficiency of the Purchase Department.

Material Usage Variance. It arises normally due to following possible causes. The person responsible is also mentioned.

	Possible Causes of Material usage Variance	*Person Responsible*
(i)	Poor quality of direct material	Purchase Manager
(ii)	Variation in usage of material due to inefficient or uneconomic use	Production Manager or Foreman
(iii)	Inefficient workmanship	Production Manager or Foreman
(iv)	Defective Machinery	Production Manager or Foreman
(v)	Use of substitute materials	Production Manager or Foreman
(vi)	Defective machines, tools and equipment	Production Manager or Foreman
(vii)	Less or more yield	Production Manager or Foreman
(viii)	Accounting error	Accounting Officer
(ix)	Change in the composition of mixture	Production Manager

For Material Usage Variances, the production department, its manager and foreman should be held responsible.

Usage variance may be divided into mix variance and yield variance. Mix variance may arise due to change in the composition of material mix, which may be due to the non-availability of specified material for the mix and the use of substitute material. Increase in the proportion of expensive material in the mix will show unfavourable variance. If cheaper substitutes are used, it may result in favourable mix variance.

DIRECT LABOUR VARIANCES

1. Direct Labour Cost Variance

Like material cost variance, direct labour cost variance is the difference between the standard direct labour cost for actual output and actual cost of labour paid. It is defined as the difference between direct wages specified for the activity achieved and the actual direct wages paid.

Direct Labour Cost Variance = Standard Labour Cost for Actual Output – Actual Labour Cost

Calculation:

Standard Labour Cost for Actual Output = Standard Time for Actual Output × Standard Rate Actual Cost = Actual Time × Actual Rate

$$\text{Standard Time for Actual Output} = \frac{\text{Standard Time}}{\text{Standard Output}} \times \text{Actual Output}$$

When the Actual Labour Cost is more than standard cost, there will be adverse variance and *vice-versa.*

Direct labour cost variance may be further analysed as Direct Labour Rate Variance and Direct Labour Time or Efficiency Variance because the Labour Cost Variance normally arises due to change in labour rate or change in time or both.

(a) Direct Labour Rate Variance (Wage Rate Variance)

It is the difference between the standard labour rate specified and the actual labour rate paid'. In other words, 'it is that portion of direct labour (wages) variance which is due to the difference between standard rate of pay specified and actual rate paid.

Direct Labour Rate Variance = Actual Time × (Standard Wage Rate – Actual Wage Rate),

or $= AT \times (SR - AR)$

It may be seen that Wage Rate Variance is comparable with Material Price Variance and it is calculated in a similar manner.

If actual wage rate is more than standard wage rate, there will be adverse variance and when actual wage rate is less than standard wage rate, the variance will be favourable.

Illustration 19:

The standard time and rate for unit component *A* are given below:

Standard hours 15; Standard rate ₹ 4 per hour

The actual data and related information are as under –

Actual Production 1,000 units; Actual hours 15,300 hours, Actual Rate ₹ 3.90 per hour.

Calculate Labour Rate Variance

Solution:

Labour Rate Variance = Actual hours × (Standard Wage Rate – Actual Wage Rate)

= 15,300 × (4 – 3.9) = ₹ 1,530 (Favourable)

(b) Direct Labour Efficiency Variance or Labour Time Variance

It is 'that portion of labour cost variance which is due to the difference between labour hours specified for the activity achieved and the actual labour hour expended. This variance can be compared with Direct Material Usage Variance and is calculated likewise.

Labour Efficiency Variance or time variance is the result of taking more or less time than the standard time specified for the performance of a work.

Direct Labour Efficiency or Time Variance = Standard Wage Rate × (Standard Hours for Actual Output – Actual hours)

or $= SR \times (SH - AH)$

It is to be noted that if standard output differ from actual output, the standard hours in the above calculation will be standard hours for actual output as it is used in the Direct Labour Cost Variance.

If actual hours are less than standard hours there will be favourable variance and *vice-versa*.

It may be verified that:

Direct Labour Rate Variance + Direct Labour Efficiency or Time Variance = Direct Labour Cost Variance.

Illustration 20:
From the data of previous illustration, calculate labour efficiency variance.

Solution:
Labour Efficiency Variance = Standard Wage Rate × (Standard hours – Actual hours)
= 4 × (15,000 – 15,300)
= 1,200 (Adverse)

Illustration 21:
The standard and actual figures of a firm are as under:

Standard time for the job	1,000 hours
Standard rate per hour	₹ 0.50
Actual time taken	900 hours
Actual wages paid	₹ 360

Compute Labour Variances

Solution:

		₹
(a)	Std. labour cost (1,000 hours × ₹ 0.50)	500
(b)	Actual wages paid	360
(c)	Actual rate per hour: ₹ 360/900 hours =	₹ 0.40

Variances

(*i*) Labour Rate Variance = Actual time (Std. rate – Actual rate)
= 900 hours (₹ 0.50 – ₹ 0.40) = ₹ 90 (*F*)

(*ii*) Labour Efficiency Variance = Std. rate per hr. (Std. time – Actual time)
= ₹ 0.50 (1,000 hrs. – 900 hrs.) = ₹ 50 (*F*)

(*iii*) Total Labour Cost Variance = Std. labour cost – Actual labour cost
= ₹ 140 (*F*)

Illustration 22:
From the following data calculate (*i*) Labour Cost Variance (*ii*) Labour Efficiency Variance, and (*iii*) Labour Rate Variance.

Workmen	*Standard*			*Actual (for 6,20,000 tiles)*		
	Hours	*Rate per hour*	*Total (₹)*	*Hours*	*Rate per hour*	*Total (₹)*
Workman *A*	20 hrs.	3.00	60.00	30 hrs.	3.00	90.00
Workman *B*	25 hrs.	4.00	100.00	15 hrs.	4.50	67.50
			160.00			157.50

Solution:

(*i*) Labour Cost Variance = Standard Labour Cost – Actual Labour Cost
= 160 – 157.50 = ₹ 2.50 (Favourable)

(*ii*) Labour Efficiency Variance = Standard Wage Rate × (Standard hours – Actual hours)
A = 3 × (20 – 30) = 30 (Adverse)
B = 4 × (25 – 15) = 40 (Favourable)
Total 10 (Favourable)

(*iii*) Labour Rate Variance = Actual Time × (Standard Wage Rate – Actual Wage Rate)
A = 30 × (3 – 3) = Nil
B = 15 × (4 – 4.50) = 7.50 (Adverse)
Total 7.50 (Adverse)

Verification

Labour Cost Variance = Labour Efficiency Variance + Labour Rate Variance
= 10 (*F*) + 7.50 (*A*) = 2.50 (F)

Illustration 23:

From the data given below, calculate labour variance for the two departments:

	Deptt. A	*Deptt. B*
Actual Gross Wages (direct)	₹ 2,000	₹ 1,800
Standard Hours	8,000	6,000
Standard Rate per Hour	30 paise	35 paise
Actual Hours Worked	8,200	5,800

[*CMA, Inter*]

Solution:

	Deptt. A	*Deptt. B*
Labour Cost Variance	= (Standard Cost for Actual Output – Actual Cost)	
	(8,000 × 0.30) – ₹ 2,000	(6,000 × 0.35) – ₹ 1,800
	= ₹ 2,400 – ₹ 2,000	= ₹ 2,100 – ₹ 1,800
	= ₹ 400 (Favourable)	= ₹ 300 (Favourable)
Labour Rate Variance	= Actual Time × (Std. Rate – Actual Rate)	
	or Std. Wages for Actual Time – Actual Wages	
	8,200 × 0.30 – ₹ 2,000	5,800 × 0.35 – ₹ 1,800
	= ₹ 2,460 – ₹ 2,000	= ₹ 2,030 – ₹ 1,800
	= ₹ 460 (Favourable)	= ₹ 230 (Favourable)
Labour Efficiency Variance	= Std. Rate × (Std. Time for Actual Output – Actual Time)	
	0.30 × (8,000 – 8,200)	0.35 × (6,000 – 5,800)
	= ₹ 60 (Adverse)	= 2,100 – 2,030 = ₹ 70 (Fav.)

Verification:

Labour Cost Variance	= Labour Rate Variance + Labour Efficiency Variance	
	₹ 460 (*F*) + ₹ 60 (*A*)	₹ 230 (*F*) + ₹ 70 (*F*)
	= ₹ 400 (*F*)	= ₹ 300 (*F*)

Illustration 24:

Standard hours for manufacturing two products *M* and *N* are 15 hours per unit and 20 hours per unit respectively. Both products require identical kind of labour and the standard wage rate per hours is ₹ 5. In the year 2022, 10,000 units of *M* and 15,000 units of *N* were manufactured. The total of labour hours actually worked were 4,50,500 and the actual wage bill came to ₹ 23,00,000. This included 12,000 hours paid for @ ₹ 7 per hour and 9,400 hours paid for @ ₹ 7.50 per hour, the balance having been paid at ₹ 5 per hour. You are required to compute the labour variances.

[*CMA, Inter*]

Solution:

Labour Cost Variance	= Standard Cost of Actual Output – Actual Cost	
Standard Cost		
For Product *M*	= 10,000 × 15 × 5	= 7,50,000
For Product *N*	= 15,000 × 20 × 5	= 15,00,000
Total Standard Cost		₹ 22,50,000
Total Actual Cost	= ₹ 23,00,000	

Labour Cost Variance	= ₹ 22,50,000 – ₹ 23,00,000	
	= ₹ 50,000 (Adverse)	
Labour Rate Variance	= Actual Hours × (Std. Rate – Actual Rate)	
	12,000 × (₹ 5 – ₹ 7)	= ₹ 24,000 (*A*)
	9,400 × (₹ 5 – ₹ 7.50)	= ₹ 23,500 (*A*)
	4,29,100 × (₹ 5 – ₹ 5)	= —
	Total	₹ 47,500 (*A*)
Labour Efficiency Variance	= Std. Rate × (Std. Time – Actual Time)	
	= ₹ 5 × (4,50,000 – 4,50,500)	= ₹ 2,500 (Adverse)

Note: Standard Time = (₹ 10,000 × 15) + (₹ 15,000 × 20) = 4,50,000

Verification: Labour Cost Variance = Labour Rate Variance + Labour Efficiency Variance

= ₹ 47,500 (*A*) + ₹ 2,500 (*A*) = ₹ 50,000 (Adverse)

Classification of Total Efficiency Variance:

This variance may be further analysed as below:

1. When abnormal idle time occurs, total efficiency variance will have two sub-variances
   (*a*) Idle Time Variance
   (*b*) Revised Efficiency Variance or Labour Yield Variance
2. When there is composition of different types of workers or gang and where the composition of standard gang and actual gang differs and abnormal idle has been paid for, the efficiency variance may have three sub-variances.
   (*a*) Idle Time Variance
   (*b*) Mix Variance or Gang Composition Variance
   (*c*) Revised Efficiency Variance or Labour Yield Variance

(a) Idle Time Variance

It is a sub-variance of Wage Efficiency or Time Variance. The Standard cost of actual hours of any employee may remain idle due to abnormal circumstances like strikes, lock outs, power failure *etc*. Standard cost of such idle time is called Idle Time Variance. This variance is always adverse or unfavourable. It requires investigation to discover the cause of abnormal Idle hours. This variance is a part of Efficiency Variance.

Idle Time Variance = Idle Hours × Standard Rate Per Hour

Note: If there are idle hours, actual hours used in mix variance and yield variance will be reduced by idle hours. Revised standard hours will also be calculated on adjusted actual hours. Standard yield for actual hours will also be on adjusted actual hours. But in the calculation of Efficiency and Rate variance, total actual hours will be taken.

If there is idle variance but no mix and yield variance, actual hours in efficiency variance will be reduced by idle hours.

(b) Direct Labour Mix Variance or Gang Composition Variance

Some time when more than one grades of workers are required in a specified proportion, their composition is called gang. The composition of actual gang of labour may differ from composition of standard gang due to shortage of a particular grade of workers or some other reason. Labour mix variance is calculated to show how much of the total efficiency variance is due to the change in the composition of labour force. This variance is like material mix variance. It is separately calculated for each grade of worker.

Direct Labour Mix Variance is defined as 'that part of the wages variance which is due to the difference between standard labour grades specified and the actual labour grades utilised'.

Direct Labour Mix Variance or Gang Composition Variance

= Standard Wage Rate × (Revised Standard labour hours – Actual labour hours)

or = SR × (RSH – AH)

Revised standard labour hours will be calculated where there is variation in the total composition of standard labour hours and in the composition of actual labour hours, *i.e.*, when there is variation in total of input hours in the standard mix or actual mix.

Revised Standard Hours (*RSH*) of each grade

$$= \frac{\text{Total hours of Actual mix or gang}}{\text{Total hours of Standard mix or gang}} \times \text{Standard hours of the grade}$$

Note: It is calculated for each grade of worker separately.

(c) Revised Efficiency Variance

This variance is on the pattern of Revised Direct Material Usage Variance.

If there is difference between standard time for actual output (as used in Labour Efficiency or Time Variance) and Revised Standard Time (as used in Labour Mix Variance), the variance is known as Revised Efficiency Variance. Moreover the variance arises when standard output and actual output shows no difference (where there is difference) when there is difference between standard output and actual output, then there will be Labour Yield Variance and no Revised Efficiency Variance.

Revised Efficiency Variance = (Standard Labour Hours for Actual Output – Revised Standard Hours) × Standard Labour Rate

or $= (SH - RSH) \times SR$

Revised Efficiency Variance will be calculated for each grade of workers separately.

(d) Direct Labour Yield Variance

Just like Material Yield Variance, Direct Labour Yield Variance can also be ascertained. It is calculated when there is difference between standard output and actual output. But if there is no such difference, then Revised Efficiency Variance is calculated as explained earlier.

Direct Labour Yield Variance may be defined as 'that portion of Labour Efficiency Variance which is due to the difference between the standard yield (output) specified and actual yield (output) obtained'.

It may be noted that yield variance is based on output while all other variance are based on input.

Direct Labour Yield Variance = Standard labour cost per unit of output × (Standard yield or output for actual mix or gang hours – Actual output)

Standard yield is the output which should result on input of actual hours mix

$$\text{Standard labour cost per unit of output} = \frac{\text{Total labour cost of standard mix}}{\text{Net standard output}}$$

If standard yield or output is more than actual yield or output, the variance will be unfavourable or adverse and *vice-versa*. (Thus in this variance negative figure of variance will be favourable).

Illustration 25:

The details regarding the composition and the weekly wage rates of labour force engaged on a job scheduled to be completed in 30 weeks are as follows :

Workers	*Standard*		*Actual*	
	No. of Labourers	*Weekly Wage Rate per Labourer* ₹	*No. of Labourers*	*Weekly Wage Rate per Labourer* ₹
Skilled	75	60	70	70
Semi-skilled	45	40	30	50
Unskilled	60	30	80	20

The work is actually completed in 32 weeks. Calculate the various labour variances.

Solution:

Labour Cost Variance = (Standard Cost of Labour = Actual Cost of Labour)

Standard Cost of Labour = Standard No. of Workers × Standard Weekly Wage Rate × Standard No of Weeks

		₹
Skilled	= 75 × 60 × 30	= 1,35,000
Semi-skilled	= 45 × 40 × 30	= 54,000
Unskilled	= 60 × 30 × 30	= 54,000
	Standard Cost of Labour	= ₹ 2,43,000

Actual Cost of Labour = Actual No. of Workers × Actual Weekly Wage Rate × Actual No. of Weeks

			₹
Skilled	= 70 × 70 × 32	=	1,56,800
Semi-skilled	= 30 × 50 × 32	=	48,000
Unskilled	= 80 × 20 × 32	=	51,200
	Actual Cost of Labour	=	2,56,000
	Total Labour Cost of Variance	=	2,43,000 – 2,56,000
		=	₹ 13,000 (*A*)

Labour Rate Variance = Actual weeks × (Standard wage Rate – Actual Wage Rate)

Skilled	= (70 × 32) × (60 – 70)	=	22,400 (*A*)
Semi-skilled	= (30 × 32) × (40 – 50)	=	9,600 (*F*)
Unskilled	= (80 × 32) × (30 – 20)	=	25,600 (*A*)
	Total		₹ 6,400 (*A*)

Labour Efficiency Variance = Standard Wage Rate × (Standard weeks – Actual weeks)

Skilled	= 60 × [(75 × 30) – (70 × 32)]	=	600 (*F*)
Semi-skilled	= 40 × [(45 × 30) – (30 × 32)]	=	15,600 (*F*)
Unskilled	= 30 × [(60 × 30) – (80 × 32)]	=	22,800 (*A*)
	Total		₹ 6,600 (*A*)

Verification

Labour Cost Variance = Labour Rate Variance + Labour Efficiency Variance
= 6,400 (*A*) + 6,600 (*A*) = 13,000 (*A*)

Labour Mix Variance

Calculation of

$$\text{Revised Standard Time} = \frac{\text{Actual Mix of Time} \times \text{Std. Time}}{\text{Standard Mix of Time}}$$

Skilled	= 5,760 × 2,250/5,400	=	2,400
Semi-skilled	= 5,760 × 1,350/5,400	=	1,440
Unskilled	= 5,760 × 1,800/5,400	=	1,920
Calculation of Actual Hours	= No. of Labourers × Actual Week		
Skilled	= 70 × 32	=	2,240
Semi-skilled	= 30 × 32	=	960
Unskilled	= 80 × 32	=	2,560
			5,760
Labour Mix Variance	= Standard Wage Rate × (Revised Standard Time – Actual Time)		
Skilled	= 60 × (2,400 – 2,240)	=	₹ 9,600 (*F*)
Semi-skilled	= 40 × (1,440 – 960)	=	19,200 (*F*)
Unskilled	= 30 × (1,920 – 2,560)	=	19,200 (*A*)
	Total		₹ 9,600 (*F*)
Revised Efficiency Variance	= Standard Wage Rate × (Standard Time – Revised Standard Time)		
Skilled	= 60 × (2,250 – 2,400)	=	9,000
Semi-skilled	= 40 × (1,350 – 1,440)	=	3,600
Unskilled	= 30 × (1,800 – 1,920)	=	3,600
		=	₹ 16,200 (*A*)

Illustration 26:

A gang of workers usually consists of 10 men, 5 women and 5 boys in a factory. They are paid at standard hourly rates of ₹ 1.25, ₹ 0.80 and ₹ 0.70 respectively. In a normal week of 40 hours the gang is expected to produce 1,000 units of output.

In certain week, the gang consisted of 13 men, 4 women and 3 boys. Actual wages were paid at the rates of ₹ 1.20, ₹ 0.85 and ₹ 0.65 respectively. Two hours were lost due to abnormal idle time and 960 units of output were produced.

Calculate various labour variances. [*CA Inter*]

Solution:

Workers	*Standard*			*Actual*		
	Hours (Workers × Week)	*Rate (₹)*	*Amount (₹)*	*Hours (Workers × Week)*	*Rate (₹)*	*Amount (₹)*
Men	400	1.25	500	520	1.20	624
Women	200	0.80	160	160	0.85	136
Boys	200	0.70	140	120	0.65	78
	800		800	800		838

Direct Labour Cost Variance (*DLCV*) = Standard Cost for Actual Output – Actual Cost

Standard Cost for Actual Output = Standard Cost per Unit × Actual Output

$$= \frac{₹800}{1000 \text{ units}} \times 960 \text{ units} = ₹ 768$$

DLCV = 768 – 838 = ₹ 70 (*A*)

Direct Labour Rate Variance (*DLRV*) = Actual Hours × (Standard Wage Rate – Actual Wage Rate)

Men	= 520 × (1.25 – 1.20)	=	₹ 26 (*F*)
Women	= 160 × (0.80 – 0.85)	=	8 (*A*)
Boys	= 120 × (0.70 – 0.65)	=	6 (*F*)
Total			₹ 24 (*F*)

Direct Labour Efficiency Variance (*DLEV*) = Standard Wage Rate × (Standard Time for Actual Output – Actual Time paid for]

[Here Standard Time for Actual Output $= \text{Stansard Hours} \times \frac{\text{Actual Output}}{\text{Standard Output}}$

Men	$= 400 \times \frac{960}{1{,}000} = 384$ hours	
Women	$= 200 \times \frac{960}{1{,}000} = 192$ hours	
Boys	$= 200 \times \frac{960}{1{,}000} = 192$ hours]	

DLEV for Men	= 1.25 × (384 – 520)	=	₹ 170 (*A*)
Women	= 0.80 × (192 – 160)	=	25.60 (*F*)
Boys	= 0.70 × (192 – 120)	=	50.40 (*F*)
Total			94.00 (*A*)

Idle Time Variance (*ITV*) = Idle hours × Standard Wage Rate

= (Workers × hours) × Standard Wage Rate

Men	= (13 × 2) × 1.25	=	₹ 32.50 (*A*)
Women	= (4 × 2) × 0.80	=	6.40 (*A*)
Boys	= (3 × 2) × 0.70	=	4.20 (*A*)
Total		=	43.10 (*A*)

Direct Labour Mix Variance = Standard Wage Rate × (Revised Standard Time – Actual Time taken)

[Here Revised Standard Time $= \frac{\text{Total Actual Time}}{\text{Total Standard Time}} \times \text{Standard Time}$]

Total Actual Time will be 800 – 40 Idle hours = 760

Men	= 760 × 400/800 = 380		
Women	= 760 × 200/800 = 190		
Boys	= 760 × 200/800 = 190		
DLMV for Men	= 1.25 × (380 – 494)	=	142.50 (*A*)
Women	= 0.80 × (190 – 152)	=	30.40 (*F*)
Boys	= 0.70 × (190 – 114)	=	53.20 (*F*)
	Total		58.90 (*A*)

Direct Labour Yield Variance (*DLYV*) = Standard Cost per unit × (Standard Output for Actual Time – Actual output)
= ₹ 0.80 × (950 – 960) = ₹ 8 (*F*)

[Here standard output for actual time will be $\frac{1,000 \text{ units}}{800}$ × Actual hours 760 = 950 units]

Verification

Labour Cost Variance = Labour Rate Variance + Labour Efficiency Variance
= 24 (*F*) + 94 (*A*)
= 70 (*A*)

Labour Efficiency Variance = Direct Labour Mix Variance + Idle Time Variance + Direct Labour Yield Variance
= ₹ 58.90 (*A*) + 43.10 (*A*) + 8 (*F*)
= 94 (*A*)

Illustration 27:

The standard labour component and the actual labour component engaged in a week for a job are as under :

Particulars	*Skilled Workers*	*Semi-skilled Workers*	*Unskilled Workers*
(*a*) Standard Number of Workers in the Gang	32	12	6
(*b*) Standard Wage Rate per Hours (₹)	3	2	1
(*c*) Actual Number of workers employed in the Gang during the week	28	18	4
(*d*) Actual Wage Rate per Hour (₹)	4	3	2

During the 40-hour working week, the gang produced 1,800 standard labour hours of work. Calculate the different labour variances. *[CA - Inter]*

Solution:

Category of Workers	*Standard*			*Actual*		
	Hours	*Rate*	*Amount (₹)*	*Hours*	*Rate*	*Amount (₹)*
Skilled	1,280	3	3,840	1,120	4	4,480
Semi-skilled	480	2	960	720	3	2,160
Unskilled	240	1	240	160	2	320
	2,000		5,040	2,000		6,960

Direct Labour Cost Variance (*DLCV*) = Standard Cost for Actual Output – Actual Cost
= ₹ 4,536 – ₹ 6,960
= ₹ 2,424 (Adverse)

Direct Labour Rate Variance (*DLRV*) = Actual Time × (Standard Rate – Actual Rate)

Skilled	= 1,120 × (3 – 4)	= ₹ 1,120 (*A*)
Semi-skilled	= ₹ 720 × (2 – 3)	= ₹ 720 (*A*)
Unskilled	= ₹ 160 × (1 – 2)	= ₹ 160 (*A*)
Total		= ₹ 2,000 (*A*)

Direct Labour Efficiency Variance (*DLEV*) = Std. Rate × (Std. Time for Actual Output – Actual Time)

Skilled	= 3 × (1,152 – 1,120)	= ₹ 96 (*F*)
Semi-skilled	= 2 × (432 – 720)	= ₹ 576 (*A*)

Unskilled	= 1 × (216 – 160)	= ₹ 56 (*F*)
Total		= ₹ 424 (*A*)

Direct Labour Mix Variance (*DLMV*) = Standard Rate × (Revised Standard Time – Actual Time

Skilled	= 3 × (1,280 – 1,120)	= ₹ 480 (*F*)
Semi-skilled	= 2 × (480 – 720)	= ₹ 480 (*A*)
Unskilled	= 1 × (240 – 160)	= ₹ 80 (*F*)
Total		= ₹ 80 (*F*)

Direct Labour Yield Variance (*DLYV*) = Std. Cost per hour of work × (Std. Output for Actual Mix – Actual Output)

= 2.52 × (2,000 – 1,800) = ₹ 504 (Adverse)

Verification:

DLCV	= *DLRV* + *DLEV*	
	= 2,000 (*A*) + 424 (*A*)	= ₹ 2,424 (Adverse)
DLEV	= *DLMV* + *DLYV*	
	= ₹ 80 (*F*) + ₹ 504 (*A*)	= ₹ 424 (Adverse)

Calculations:

1. Standard Cost for Actual Output $= \frac{5,040}{2,000} \times 1,800$ = ₹ 4,536
2. Standard Time for Actual Output:

Skilled	$= \frac{1,800}{2,000} \times 1,280$	= 1,152 hrs.
Semi-skilled	$= \frac{1,800}{2,000} \times 480$	= 432 hrs.
Unskilled	$= \frac{1,800}{2,000} \times 240$	= 216 hrs.

3. Revised Standard Time $= \frac{\text{Actual Mix}}{\text{Standard Mix}} \times \text{Standard Time}$
4. Since, Standard Mix and Actual Mix are the same, the Standard Time will also be the Revised Standard Time.
5. Standard Cost per hour of standard work

$$= \frac{\text{Total Standard Cost}}{\text{Total Standard Hours of Work}}$$

$$= \frac{5,040}{2,000} = ₹ 2.52$$

Revision Wage Variance

Sometimes wage rate has to be revised, subsequent to the setting up of the standards, on account of agreement with workers or trade unions or revision of wage rates by the government. If rates are revised and its effects are to be considered, a Wages Revision Variance is calculated.

Direct Labour Revision Variance (DLRV) at original standard rate products at revised standard rate = Standard labour of actual production – Standard labour cost of actual

DLRV is usually adverse or unfavourable as revised standard wage rate is ordinarily higher than original standard rate.

Illustration 28:

From the following data calculate the Direct Labour Revision Variances:

Category	*Original Standard*			*Revised Standard*			*Actual*		
	Hrs.	*Rate*	*Amt.*	*Hrs.*	*Rate*	*Amt.*	*Hrs.*	*Rate*	*Amt.*
Skilled	60	3	180	40	3	120	50	4	200
Semi-skilled	40	2	80	60	2	120	50	2	100
Total	100		260	100		240	100		300

Standard Output 100 units : Actual Output 80 units

Solution:

Direct Labour Revision Variance (*DLRV*) = Original Std. cost for Actual Output
– Revised Std. cost for Actual Output
= (80 × 2.60) – (80 × 2.40)
= 208 – 192 = ₹ 16 (Favourable)

After calculating the Revision Variance, other variances will be calculated as if the "Revised Standard" is the real standard.

Causes of Labour Variances

There are basically two labour variances : *Labour Rate Variance and Labour Efficiency Variance. Labour Rate Variance* may arise due to following reasons:

Possible Causes of Labour Rate Variance	*Person Responsible*
1. Employment of wrong grade of workers	Personnel Manager and Foreman
2. Excessive overtime for urgent completion	Production Manager and Sales Manager
3. Permanent revision in labour rate and special increments or allowances	Uncontrollable
4. Amount paid to make up minimum wages	Uncontrollable
5. Special rates for experimental production	Uncontrollable
6. Composition of labour gang different from standard	Production Manager and Foreman

The above list is suggestive only.

Labour Efficiency Variance or Time Variance may arise due to following possible causes:

Possible Causes of Labour Efficiency or Time Variance	*Person Responsible*
1. Inefficient workmen	Personnel Manager and Foreman
2. Break-even of machinery	Maintenance Engineer
3. Inefficient supervision	Foreman
4. Poor quantity of material	Purchase Manager
5. Hours lost in waiting *etc.*	Maintenance Engineer
6. Bad working condition	General Manager
7. Change in designing and quality of product	Maintenance Engineer

OVERHEAD VARIANCES

Overhead Variance is the difference between the standard overhead specified and the actual overhead incurred.

Overhead variance is segregated into:

(*i*) Variable Overhead Variances (*VOV*)

(*ii*) Fixed Overhead Variances (*FOV*)

Variable Overhead Variance

Variable overhead variance represents the difference between standard variable overhead (specified for actual units produced) and the actual variable overhead incurred.

Variable Overhead Cost Variance = Standard Variable Overhead on Actual Production – Actual Variable Overhead

or

(Actual time or Standard hours for actual production × Standard Variable Overhead Rate) – (Actual Variable Overhead)

Here, Standard Variable Overhead Rate per unit or per hour;

$$= \frac{\text{Budgeted Overhead}}{\text{Budgeted Output or Hours}}$$

Note: Budgeted overhead are overheads for budgeted time or budgeted output. On the other hand standard overheads are overhead for actual time or for budgeted output in actual time.

The calculation of variable overhead variance is fairly simple as the standard is specified as a rate per unit. By multiplying standard rate by actual units produced, the standard variable overhead is obtained. This is compared with the actual variable overhead to find out variable overhead variance.

Illustration 29:

The following information is available from the books of a manufacturing company regarding variable overheads. Calculate variable overhead cost variance.

Budgeted Production for the year	5,000 units
Actual Production	4,600 units
Budgeted Variable Overheads	₹ 1,00,000
Actual Variable Overheads	₹ 93,000

Solution:

Variable Overhead Rate per unit $= \frac{\text{Budgeted Overhead}}{\text{Budgeted Production}}$

$= \frac{1,00,000}{5,000} = ₹ 20.$

Standard Variable Overhead = Actual Production × Overhead Rate on Actual Production

or

Recovered Variable Overhead = 4,600 × 20 = ₹ 92,000

Variable Overhead Cost Variance = [Standard Variable Overhead on Actual Production – Actual Variable Overhead]

or = Recovered Variable Overheads – Actual Variable Overheads

= 92,000 – 93,000 = ₹ 1,000 (unfavourable)

Sub-division of Variable Overhead

Normally there is only one variable overhead variance because variable overheads vary according to output and not according to time. However, some cost accountants

argue that certain variable overheads may vary on the basis of time also and therefore there may be two sub-divisions of variable overhead variance:

(*i*) ***Variable Overhead Expenditure or Budget Variance***
= Standard Variable Overheads for Actual Time – Actual Variable Overheads
[Here, standard variable overheads for Actual Time = Standard Variable Overhead Rate per hour × Actual Hours. It may also be called Budgeted Variable Overhead for Actual hours]

(*ii*) ***Variable Overhead Efficiency Variance***
= Standard Variable Overheads on Actual Production – Standard Variable Overheads for Actual Time

Calculations

1. Standard or Budgeted Variable Overhead for Actual Time
= Standard Overhead Rate per Hour × Actual hours
2. Standard Variable Overhead on Actual Production
= Standard Variable Overhead per unit × Actual Output

Illustration 30:

From following data, calculate (*i*) Variable Overhead Variance, (*ii*) Variable Overhead Expenditure or Budget Variance and (*iii*) Variable Overhead Efficiency Variance:

1. Standard hours per unit 3; Variable Overhead rate per hour ₹ 2
2. Actual Variable Overhead Incurred ₹ 1,08,000
3. Actual output : 20,000 units
4. Actual hours worked : 56,000 hours

Solution:

Calculations :

1. Standard or Budgeted Variable Overhead on Actual Time
= Standard Overhead Rate × Actual hours
= 2 × 56,000 = ₹ 1,12,000
2. Standard Variable Overhead for Actual output = Standard Variable Overhead rate per unit × Actual Output
= (3 × 2) × 20,000 = ₹ 1,20,000

(*i*) *Variable Overhead Variance* = Standard Variable Overhead – Actual Variable Overhead
= 1,20,000 – 1,08,000 = ₹ 12,000 (*F*)

(*ii*) *Variable Overhead Expenditure or Budget Variance*
= Budgeted or St. Variable Overhead for Actual Time – Actual Variable Overhead
= 1,12,000 – 1,08,000 = ₹ 4,000 (*F*)

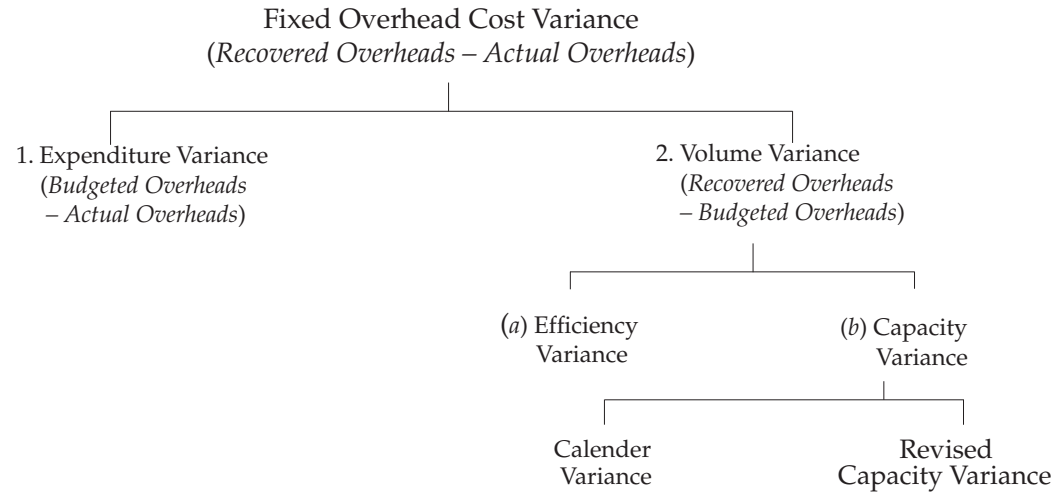
(*iii*) *Variable Overhead Efficiency Variance*
= Standard Variable Overhead on Actual Production – Standard Variable Overhead for Actual Time
= 1,20,000 – 1,12,000 = ₹ 8,000 (*F*)

Verification:

Variable Overhead Variance = Variable Overhead Expenditure Variance + Variable Overhead Efficiency Variance
= 4,000 (*F*) + 8,000 (*F*) = ₹ 12,000 (*F*)

Fixed Overhead Variances

Fixed overhead variance depends upon two factors, which are (*i*) fixed expenses incurred and (*ii*) volume of production obtained. The volume of production depends upon (*a*) capacity at the factory worked (*b*) number of days factory works and (*c*) efficiency at which factory worked. Thus, while analysing the fixed overhead variance the variance due to each of above factors is independently worked out.



These variances may be briefly defined as below:

1. Fixed Overhead Cost Variance	It is difference between standard fixed Overheads on actual output and actual Fixed Overhead incurred *i.e., Recovered fixed Overhead – Actual fixed Overheads.* It is total of Fixed Overhead Expenditure Variance and Fixed Overhead Volume Variance.
2. Fixed Overhead Expenditure Variance	It is difference between standard expenses specified and the actual expenses incurred *i.e., Budgeted Overheads – Actual Overheads.*
3. Fixed Overhead Volume Variance	It is a portion of Overhead variance which is due to the difference between recovered overhead budgeted level of output *i.e., Recovered Overheads – Budgeted Overheads.*
Volume variance may be divided into following three variance *(a), (b)* **and** *(c)*	
(*a*) Fixed Overhead Efficiency Variance	It is that portion of Overhead Volume Variance which is due to the difference between the budgeted efficiency of production and actual efficiency attained *i.e., Recovered Fixed Overheads – Standard Fixed overheads.*
(*b*) Fixed Overhead Capacity Variance	It is variance which is related to the over and under utilisation of plant and equipment *i.e., Standard Fixed Overheads. – Budgeted Fixed Overheads.*

(c) Fixed Overhead Calender Variance	It is that portion of fixed overhead variance which is due to the difference between the number of working days in the period to which budget is applied *i.e., Possible Fixed Overheads – Budgeted Fixed Overheads.*

Two Variance or Three Variance Methods

Overhead Cost Variance normally arises due to change in expenditure (which is called Overhead Expenditure Variance) and/or change in the volume (which is known as Overhead Volume Variance). If only these two variances are analysed, the method is known is two variance method.

There is three variance method where overhead volume variance is further analysed. Change in volume may be due to change in capacity (Capacity variance), and change in the level of efficiency (Efficiency variance). Thus, in three method there will be three variances (*i*) Overhead Expenditure Variance, (*ii*) Overhead Capacity Variance, and (*iii*) Overhead Efficiency Variance.

Basic Terms or Calculations

Before calculating Overhead Variances, following terms should be understood.

$$\textbf{Standard Overhead Rate per unit or per hour or Budgeted Overhead Rate per unit} = \frac{\textbf{Budgeted Overheads}}{\textbf{Budgeted Output Units or Budgeted Hours}} \textbf{ or per hour.}$$

1. Recovered or Absorbed Overheads [*i.e.*, Standard Overheads for actual output or actual hours]	= Standard Overheads Rate per unit × Actual Output or Standard Overhead Rate per hour × Standard hours for actual output.
2. Budgeted Overheads [for budgeted hours or budgeted output]	= Standard Overhead rate per unit × Budgeted output units or Standard Overhead rate per hour × budgeted hours [Note Budgeted Output or Hours are equal to Standard Output or Hours]
3. Standard Overheads [For actual time or budgeted output for Actual Time]	= Standard Overhead Rate Per Unit × Standard Output for Actual time or Standard Overhead Rate per hour × Actual hours
4. Actual Overheads	= Actual Overhead Rate per unit × Actual Output or Actual Rate per hours × Actual hours
5. Standard hours for Actual Output	$= \frac{\text{Budgeted Hours}}{\text{Budgeted Output}} \times \text{Actual Output}$
6. Standard Output for Actual Time	$= \frac{\text{Budgeted Output}}{\text{Budgeted Hours}} \times \text{Actual Hours}$

Fixed Overhead Cost Variance (*FOCV*)

FOCV is the difference between standard overhead recovered or absorbed for actual output and the actual fixed overhead.

$$FOCV = \left(\begin{matrix}\textit{Recovered or Absorbed}\\ \textit{Fixed Overhead}\end{matrix}\right) - \left(\begin{matrix}\textit{Actual Fixed}\\ \textit{Overhead}\end{matrix}\right)$$

or

$$= (\textit{Actual Output}) \times (\textit{Standard Overhead Rate}) - (\textit{Actual Overhead Rate} \times \textit{Actual Output})$$

FOCV may be analysed into following variances:

(*a*) Fixed Overhead Expenditure Variance (*FOEV*)

FOEV is the difference between actual expenditure and budgeted expenditure.

$$FOEV = \textit{Budgeted Overhead} - \textit{Actual Overhead}$$

or

$$= (\textit{Standard Overhead Rate} \times \textit{Budgeted Output}) - (\textit{Actual Overhead Rate} \times \textit{Actual Output})$$

(*b*) Fixed Overhead Volume Variance (*FOVV*)

FOVV is the difference between fixed overhead recovered on actual output and fixed overhead on budgeted output. It is the result of difference in volume of production multiplied by the standard rate.

$$FOVV = \textit{Recovered Fixed Overhead} - \textit{Budgeted Fixed Overhead}$$

or

$$= (\textit{Standard Overhead Rate} \times \textit{Actual Output}) - (\textit{Standard Overhead Rate} \times \textit{Budgeted Output})$$

Segregation of Fixed Overhead Volume Variance

Fixed Overhead Volume Variance (*FOVV*) can further be analysed as Fixed Overhead Efficiency Variance and Fixed Overhead Capacity Variance.

(*a*) Fixed Overhead Efficiency Variance (*FOEFV*)

It is that portion of volume variance which arises due to difference between budgeted efficiency of production and the actual efficiency attained.

$$FOEFV = \textit{Recovered Fixed Overheads} - \textit{Standard Fixed Overhead}$$

or

$$= (\textit{Standard Overhead Rate} \times \textit{Actual Output}) - (\textit{Standard Overhead Rate} \times \textit{Standard Output for Actual Time})$$

(*b*) Fixed Overhead Capacity Variance (*FOCPV*)

It is that portion of volume variance which arises due to budgeted capacity specified and the actual capacity attained. It reveals whether the plants are over or under utilised. This variance may arise due to break-down in machinery, idle time, failure of power, *etc*.

$$FOCPV = \textit{Standard Fixed Overheads} - \textit{Budgeted Fixed Overheads}$$

or

$$= (\textit{Standard Overhead Rate} \times \textit{Standard Output for Actual Time}) - (\textit{Standard Overhead Rate} \times \textit{Budgeted Output})$$

Illustration 31:

From the following data, calculate Fixed Overhead Expenditure Variance (*FOEXPV*) and Volume Variance (*FOVV*):

Fixed Overhead Budget for the Month	₹ 1,00,000
Budgeted Production for the Month	50,000 units
Actual Production for the Month	54,000
Actual Fixed Overhead Incurred	₹ 1,20,000

Solution:

Fixed Overhead Exp. Variance (*FOEXPV*) = Budgeted Overheads – Actual Overhead
= ₹ 1,00,000 – ₹ 1,20,000 = ₹ 20,000 (*A*)

Fixed Overhead Volume Variance (*FOVV*) = Recovered Overheads – Fixed Overhead

[Recovered Overheads $= \frac{\text{Budgeted Overheads}}{\text{Budgeted Output}} \times \text{Actual Output}$

$= \frac{1,00,000}{50,000} \times ₹\ 54,000 = ₹\ 1,08,000$

= ₹ 1,08,000 – ₹ 1,00,000 = ₹ 8,000 (*F*)

Overhead Cost Variance (*OCV*) = Recovered Overheads – Actual Overheads
= ₹ 1,08,000 – ₹ 1,20,000 = ₹ 12,000 (*A*)

Verification :

Overhead Cost Variance = Expenditure Variance + Volume Variance
= ₹ 20,000 (*A*) + ₹ 8,000 (*F*) = ₹ 12,000 (*A*)

Illustration 32:

From the following information compute Fixed Overhead Cost, Expenditure and Volume Variances.

Normal capacity is 5,000 hours. Budgeted Fixed Overhead Rate is ₹ 10 per standard hour. Actual level of capacity utilised is 4,400 standard hours. Actual Fixed Overheads ₹ 52,000.

Solution:

Fixed Overhead Cost Variance (*FOCV*) = Recovered Fixed Overheads
– Actual Fixed Overheads
= 44,000 – 52,000 = 8,000 (Adverse)

Fixed Overhead Exp. Variance (*FOEXPV*) = Budgeted Fixed Overheads
– Actual Fixed Overheads
= 50,000 – 52,000 = ₹ 2,000 (Adverse)

Fixed Overhead Volume Variance (*FOVV*) = Recovered Fixed Overheads
– Budgeted Fixed Overheads
= 44,000 – 50,000 = ₹ 6,000 (Adverse)

Illustration 33:

From the following prepare variance analysis of a particular department for a month :

Variable Overhead Items	*Actual (₹)*	*Fixed Overhead Items*	*Actual (₹)*
Materials handling	8,325	Supervision	1,700
Idle time	850	Depreciation—Plant	2,000
Re-work	825	Depreciation—Equipment	5,000
Overtime premium	250	Rates	1,150
Supplies	4,000	Insurance	350
Total	14,250	Total	10,200

Normal capacity 10,000 standard hours, budgeted rate ₹ 1.70 per standard hour for variable overhead and ₹ 1 per standard hour for fixed overhead. Actual level: 8,000 standard hours.

[CMA Inter]

Solution:

Variable Overhead Cost Variance (*VOCV*) = Recovered Variable Overheads – Actual Variable Overheads
= 8,000 × 1.70 – 14,250
= 13,600 – 14,250 = 650 (Adverse)

Fixed Overhead Cost Variance (*FOCV*) = Recovered Fixed Overheads – Actual Fixed Overheads
= 8,000 × 1 – 10,200 = ₹ 2,200 (Adverse)

Fixed Overhead Expenditure Variance (*FOEV*) = Budgeted Fixed Overheads – Actual Fixed Overheads
= 10,000 × 1– 10,200 = ₹ 200 (Adverse)

Fixed Overhead Volume Variance (*FOVV*) = Recovered Fixed Overheads – Budgeted Fixed Overheads
= 8,000 – 10,000 = ₹ 2,000 (Adverse)

Fixed Overhead Capacity Variance may be further analysed into (*a*) Fixed Overhead Calender Variance and (*b*) Fixed Overhead Revised Capacity Variance and (*c*) Fixed Overhead Yield Variance.

(a) Fixed Overhead Calender Variance (FOCALV)

FOCALV is that portion of capacity variance which arises due to difference between the number of working days anticipated in the budget period and the actual working days in the budget period. The number of working days in the budget are arrived at by dividing the number of annual days by twelve. But the actual days of a month may be more or less than the standard days and with the result there may be calender variance.

FOCALV = Possible Fixed Overheads – Budgeted Fixed Overheads

or

= (Standard Overhead Rate per hour × Possible Hours) – (Standard Rate per hour × Budgeted Hours

[Here, Possible Hours = Standard working hours per day × Actual number of working days]

(b) Fixed Overhead Revised Capacity Variance (FORCAPV)

FORCAPV will be the remaining part of capacity variance as reduced by calender variance.

FORCAPV = Standard Fixed Overhead – Possible Fixed Overheads

(c) Fixed Overhead Yield Variance (FOYV)

Just like material or labour yield variance, overhead yield variance may be calculated. This variance shows the gain or loss incurred by way of overhead cost incidence on account of loss or wastage in production.

FOYV = Recovered Fixed Overhead – Expected Fixed Overheads

[Here; Expected Fixed Overhead = Standard Overhead Rate per Unit × Expected Output]

Note: Expected output means output on actual input after allowing standard loss.

Illustration 34:

In a factory the standard units of production of the year were fixed at 1,20,000 units and overhead expenditures were estimated to be:

Fixed	₹ 12,000	Variable	₹ 6,000
Semi-variable	₹ 1,800		

Actual production during the month of April of the year was 8,000 units. Each month has 20 working days.

During the month in question there was one statutory holiday. The actual overheads amounted to:

Fixed	₹ 1,190	Variable	₹ 480
Semi-variable	₹ 192		

Semi-variable charges are considered to include 60 per cent expenses of fixed nature and 40 per cent of variable character.

Find out the Overhead Expenditure, Volume and Calender Variances.

[C.A. Inter]

Solution:

Overhead Cost Variance (OCV) = Recovered Overheads – Actual Overheads
= ₹ 1,320 – 1,862 ₹ 542.00 (Adverse)

(*a*) *Expenditure Variance.*

Variable Overheads Exp. Variance = Standard Variable Overhead Absorbed – Actual Variable Overheads
= ₹ 448 – 556.80 108.80 (Adverse)

Fixed Overheads Exp. Variance = Budgeted Fixed Overhead – Actual Fixed Overheads
= ₹ 1,090 – 1,305.20 215.20 (Adverse)

Total Overhead Expenditure Variance 324.00 (Adverse)

(*b*) *Overhead Volume Variance :*

Fixed Overheads Volume Variance = Recovered Overheads – Budgeted Overheads
= ₹ 872 – 1,090 218.00 (Adverse)
Total 324.00 + 218.00 542.00 (Adverse)

(*c*) *Calender Variance:* (included in the volume variance)

Fixed overheads to be absorbed per day

$$= \frac{₹\ 13{,}080}{240} = ₹\ 54.50$$

Loss due to one day (54.50 × 1) ₹ 54.50 (Adverse)

Calculations:

1. (*A*) *Standard Rate of Overhead Absorption Per Unit:*

Fixed Overheads: $= \frac{\text{Budgeted Fixed Overheads}}{\text{Budgeted Output}}$

$= \frac{12{,}000}{1{,}20{,}000}$ ₹ 0.100

Fixed Overheads element in semi-variable overheads

i.e., 60% of ₹ 1,800 $= \frac{6{,}720}{1{,}20{,}000}$ 0.009

Standard Rate of Absorption of Fixed Overheads per unit	₹ 0.109
Fixed Overheads recovered on 8,000 units, @ ₹ 0.109	₹ 872
(*B*) *Budgeted Variable Overheads*	₹ 6,000
Add: Variable element in Semi-variable Overheads 40% of ₹ 1,800	720
Total Budgeted Variable Overheads	6,720

$$\text{Standard Variable Cost per unit} = \frac{6,720}{1,20,000} = ₹\ 0.056$$

Variable Overheads for 8,000 units @ ₹ 0.056 = ₹ 448

2. Budgeted Annual Fixed Overheads are ₹ 12,000 + 60% of ₹ 1,800 — 13,080

$$\text{Budgeted Monthly Fixed Overheads are} = \frac{13,080}{12} = ₹\ 1,090$$

3. Actual Fixed Overheads are ₹ 1,190 + 60% of ₹ 192 — ₹ 1,305.20
4. Actual Variable Overheads are ₹ 480 + 40% ₹ 192 — ₹ 556.80

Illustration 35:

A Cost Accountant of a company was given the following information regarding the overheads for the month of February,

(*a*) Overheads cost variance: ₹ 1,400 adverse.
(*b*) Overheads volume variance: ₹ 1,000 adverse.
(*c*) Budgeted hours for February: 1,200 hours.
(*d*) Budgeted overheads for February: ₹ 6,000.
(*e*) Actual rate of recovery of overheads: ₹ 8 per hour.

You are required to assist him in computing the following for the month of February,

1. Overhead expenditure variance.
2. Actual overhead incurred
3. Actual hours for actual production
4. Overheads capacity variance.
5. Overheads efficiency variance.
6. Standard hours for actual production.

[*CA Inter*]

Solution:

Variances:

1. Overheads Expenditure Variance (*OEXPV*)
   = Overheads Cost Variance – Overheads Volume Variance
   = ₹ 1,400 (*A*) – ₹ 1,000 (*A*) = ₹ 400 (*A*)
2. Actual Overheads incurred
   = Budgeted Overheads – Overhead Expenditure Variance
   = *i.e.*, 6,000 – (– 400) = 6,400
3. Actual hours for actual production
   $$= \frac{\text{Actual Overheads Incurred}}{\text{Actual Rate of Recovery of Overheads per hour}}$$
   = 6,400/8 = 800 hours
4. Overheads Capacity Variance
   = Standard Overhead Rate × (Actual Hours – Budgeted Hours)
   = 5 × (800 Hours – 1,200 Hours) = 2,000 (*A*)

   $$\left[\text{Standard Overhead Rate} = \frac{\text{Budgeted Overheads}}{\text{Budgeted Hours}} = \frac{₹\ 6,000}{1,200} = 5 \text{ per hour}\right]$$
5. Overhead Efficiency Variance
   = Overheads Volume Variance – Overhead Capacity Variance
   = 1,000 (*A*) – ₹ 2,000 (*A*) = ₹ 1,000 (*F*) [*i.e.*, – 1,000 – (– 2,000)]
6. Standard Hours for Actual Production
   Volume Variance
   = Standard Overhead Rate × Std. hours for actual production – Budgeted hours)

Budgeted hours are presumed to be x.

or	1,000 (A)	= 5 (x – 1,200)
or	(–)1,000	= 5x – 6,000
or	– 5x	= – 5,000
or	x	= 1,000 hours.

Causes of Overhead Variances

Some of possible causes of overhead variances are given below:

Variance	*Possible Causes*	*Person Responsible*
1. Overhead Expenditure Variance	(*i*) Rise in wages	Uncontrollable
	(*ii*) Rise in price level	Uncontrollable
	(*iii*) Lack of effective control	Departmental Manager
	(*iv*) Change in methods of production	Production Manager
	(*v*) Change in the policy of manufacturing	Top Management
2. Overhead Efficiency Variance	(*i*) Inefficient workmen	Foremen
	(*ii*) Break-down of machinery	Production Manager
	(*iii*) Inefficient supervisor	Foremen
	(*iv*) Loss of time	Production Manager
	(*v*) Lack of proper planning	Planning Engineer
	(*vi*) Poor efficiency of machinery	Maintenance Engineer
	(*vii*) Old and obsolete machinery	Uncontrollable
3. Overhead Capacity Variance	(*i*) Lack of orders	Sales Manager
	(*ii*) Lock-outs and strikes	Uncontrollable
	(*iii*) Seasonal cuts in production	Uncontrollable
4. Overhead Calender Variance	(*i*) Differences between budgeted days and actual days	Uncontrollable

SALES VARIANCES

The Actual Profit and Standard Profit should also be analysed. Since profit is the difference between sales and cost, the analysis of cost variances would be incomplete if sales variances are not analysed.

Sales variances are the variances which are due to (*i*) difference between standard sale-quantity and actual sale-quantity, and/or (*ii*) difference between standard selling price or profit per unit and actual selling price or profit per unit.

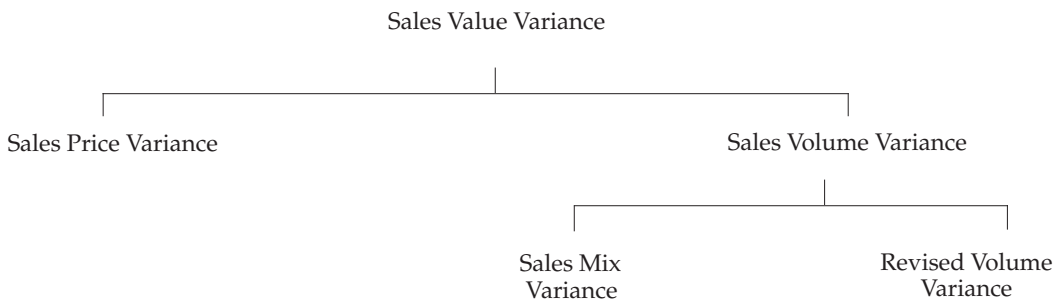
There are two methods of computing sales variances.

1. *Sales Turnover or Value Method*
2. *Profit or Sales Margin Method*

In the sales value method, the variances are calculated on the basis of sales value. In the second method, sales variances are computed with reference to profit per unit.

Sales Variances with Reference to Turnover or Sales Value

Sales value variance is the difference between standard value of sales and the actual value of sales effected during the period. Since change in the sales value may be due to change in selling price/quantity and sales mix, *etc*., this variance may be analysed as below:



Before calculating various sales variances, the following terms should be understood.

Budgeted Sales = Standard or Budgeted Quantity of Sales × Standard Selling Price
Actual Sales = Actual Quantity of Sales × Actual Selling Price
Standard Sales = Actual Quantity of Sales × Standard Selling Price

Sales Value Variance ***= Budgeted Sales – Actual Sales***
or ***= (Standard Selling Price × Standard Quantity) – (Actual Selling Price × Actual Quantity)***

If Actual Sales are more than Budgeted Sales, the variance will be favourable and *vice-versa*. Sales Value Variance may be further analysed as (*i*) Sales Price Variance and (*ii*) Sales Volume Variance.

It may be noted that these variances are calculated just like material variances.

Sales Price Variance

It is that portion of sales value variance which is due to difference between the standard selling price specified and actual selling price charged.

Sales Price Variance ***= Standard Sales – Actual Sales***
or ***= Actual Quantity Sold × (Standard Selling Price – Actual Selling Price)***

If the actual prices of sales attained are more than standard prices, there will be favourable variance and *vice-versa.*

Sales Volume Variance

It is the difference between the budgeted sales and the standard sales.

Sales Volume Variance ***= Budgeted Sales – Standard Sales***
or ***= Standard Selling Price × (Budgeted or Standard Quantity – Actual Quantity)***

If the actual sales at standard price *i.e.*, standard sales are more than budgeted sales, there is favourable variance and *vice-versa.*

Illustration 36:

The budgeted and actual sales of a concern manufacturing and marketing a single product are furnished below:

Budgeted Sales	10,000 units at ₹ 4 per unit
Actual Sales	5,000 units at ₹ 3.5 per unit
	8,000 units at ₹ 4 per unit

Calculate: (*a*) Sales Price Variance (*b*) Sales Volume Variance, and (*c*) Sales Value Variance. [*C.A., Inter*]

Solution:

(*a*) *Sales Price Variance* = *AQ (SP – AP)*
= 5,000 (4 – 3.5) = 2,500

(*b*) *Sales Volume Variance* = Budgeted Sales – Standard Sales or St. S.P. (*SQ – AQ*)
= ₹ 40,000 – ₹ 52,000
= ₹ 12,000 (Favourable)

(*c*) *Sales Value Variance* = Budgeted Sales – Actual Sales
= ₹ 40,000 – ₹ 49,500
= ₹ 9,500 (Favourable)

Verification

Sales Value Variance = Sales Price Variance + Sales Volume Variance
= 2,500 (*A*) + 12,000 (*F*) = 9,500 (*F*)

Segregation of Sales Volume Variance

Sales volume variance may be further sub-divided into (*a*) Sales Mix Variance, and (*b*) Sales Quantity Variance.

(*a*) **Sales Mix Variance.** It is that portion of sales value variance which is due to the difference between the standard and actual mix of the quantities of each product or product group of which the sales are composed of. It is calculated just like material mix variance. As it is in the material mix variance, the Revised Standard Quantity (or Revised Standard Sales) is calculated:

The standard is revised by two methods: (*i*) based on quantity, and (*ii*) based on value.

Based on Quantity. If products are homogeneous (of same kind) the revised standard quantities will be calculated as these are calculated in Material Mix Variance.

$$\text{Revised Standard Quantity} = \frac{\text{Total Quantity of Actual Mix} \times \text{Standard Quantity}}{\text{Total Quantity of Standard Mix}}$$

Sales Mix Variance* = *Standard Selling Price* × *(Revised Standard Quantity – Actual Quantity)

If actual quantity is more than the Revised Standard Quantity, there will be favourable variance and *vice-versa.*

Based on Value. If the products are not homogenous (not of same kind), the actual sales at standard price (*i.e.*, standard sales) are revised in budgeted ratio of sales in order to calculate Revised Standard Sales.

$$\text{Budgeted Ratio of Sales} = \frac{\text{Budgeted Sales of a Product}}{\text{Total Budgeted Sales}}$$

Revised Standard Sales = Budgeted Ratio of Sales × Standard Sales

***Sales Mix Variance* = Revised Standard Sales – Standard Sales**

The mix variance, if standard sales are more than the revised standard sales, will be favourable.

Usually the second method (based on sales value) is considered more reasonable.

(*b*) **Revised Quantity or Volume Variance.** When there is difference between Revised standard Sales and Budgeted Sales, it is called Revised Volume Variance. When Revised Standard Sales are more than Budgeted Sales, it is favourable variance and *vice-versa.*

Revised Sales Volume Variance = Budgeted Sales – Revised Standard Sales

or ***= Standard Selling Price × (Budgeted Quantity – Revised Standard Quantity)***

It may be noted that total of Sales Mix Variance and Revised Volume Variance is equal to Sales Volume Variance.

Illustration 37:

PVC Plastics Limited operates a budgetary control and standard costing system. From the following data calculate:

(*i*) Sales Variance

(*ii*) Sales Volume Variance

(*iii*) Sales Price Variance

Product	*Std. cost of sales per unit*	*Std. selling price per unit*	*Budget*		*Actual*	
			Units to be sold	*Sales values*	*Units sold*	*Sales values*
A	₹ 10.00	₹ 12.00	100	₹ 1,200	100	₹ 1,100
B	9.40	12.00	50	600	50	600
C	7.50	9.00	100	900	200	1,700
D	4.00	6.00	75	450	50	300
Total	–	–	325	3,150	400	3,700

[*C.A.*]

Solution:

Sales (Value) Variance = Budgeted Sales – Actual Sales

or = Actual Qty. × (Std. Price – Actual Price)

A	= 100 × (12 – 11)	=	₹ 100 (Adverse)
B	= 50 × (12 – 12)	=	Nil
C	= 200 × (9 – 8.50)	=	₹ 100 (Adverse)
D	= 50 × (6 – 6)	=	Nil
		Total	₹ 200 (Adverse)

Sales Volume Variance = Budgeted Sales – Standard Sales

or = Std. Price × (Budgeted Qty. – Actual Qty.)

A	= 12 × (100 – 100)	=	Nil
B	= 12 × (50 – 50)	=	Nil
C	= 9 × (100 – 200)	=	900 (Favourable)
D	= 6 × (75 – 50)	=	150 (Adverse)
		Total	₹ 750 (Favourable)

Verification:

Sales Value Variance = Sales Price Variance + Sales Volume Variance

= ₹ 200 (*A*) + ₹ 750 (*F*) = ₹ 550 (Favourable)

Sales Margin Variance or Sales Variance with Reference to Profit

While calculating Sales Margin Variance, following terms should be clearly understood.

Budgeted Profit	= Budgeted or Standard Quantity of Sales × Standard Profit per unit
Actual Profit	= Actual Quantity of Sales × Actual Profit per unit
Standard Profit	= Actual Quantity of Sales × Standard Profit per unit
Revised Standard Profit	= Revised Standard Sales × Standard Profit per unit
Standard Rate of Profit	= Standard Profit per Unit ÷ Standard Selling Price per unit

Sales Margin Value Variance or ***Total Sales Margin Variance***
– It is difference between Budgeted Profit and Actual Profit
Sales Value Variance = Budgeted Profit – Actual Profits

Sales Margin Value Variance may be analysed as (*i*) Sales Margin Price Variance, and (*ii*) Sales Margin Volume Variance.

(*a*) **Sales Margin Price Variance:** It is the difference between Standard Profit and Actual Profit. This variance is calculated just like Material Price Variance.

Sales Margin Price Variance = Standard Profit on Actual Quantity – Actual Profit on Actual Quantity

or ***= Actual Quantity Sold × (Standard Profit per Unit – Actual Profit per Unit)***

If Standard Profit is more than Actual Profit, it will be unfavourable variance and *vice-versa.*

(*b*) ***Sales Margin Volume Variance*** – It is the amount by which standard profit differ from Budgeted Profit.

Sales Margin Volume Variance = Budgeted Profit – Standard Profit

or ***= Standard Rate of Profit per unit × (Budgeted or Standard Quantity – Actual Quantity)***

If standard profit is more than budgeted profit it will be favourable variance and *vice versa.*

The sales volume variance may be further analysed as (*i*) Sales Mix Variance, and (*ii*) Sales Quantity Variance.

(*i*) Sales Margin Mix Variance (Based on Profit)

There may be variance in profit due to change in the composition or mix or various products sold. On change in the mix, revised standard profit will be calculated.

Revised Standard Profit = Revised Standard Sales × Standard Rate of Profit

$$\text{Standard Rate of Profit} = \frac{\text{Standard Profit per Unit}}{\text{Standard Price per Unit}}$$

Revised Standard Sales will be calculated on the basis of Budgeted Ratio of Sales

$$\text{Budgeted Ratio of Sales} = \frac{\text{Budgeted Sales of a Product}}{\text{Total Budgeted Sales}}$$

Revised Standard Sales of each product will be Standard Sales × Budgeted Ratio of Sales.

Sales Margin Mix Variance = Revised Standard Profit × Standard Profit

If the standard profit is more than revised standard profit, there will be a favourable variance and *vice-versa.*

(*ii*) Sales Margin Quantity Variance (Based on Profit)

It is that part of volume variance which arises due to difference between budgeted profit and revised standard profit.

Sales Margin Quantity Variance = Budgeted Profit – Revised Standard Profit

If Revised Standard Profit is more than Budgeted Profit, there will be favourable variance and *vice-versa.*

Illustration 38:

From the following budgeted and actual figures, calculate sales variances on sales margin basis and cost of sales variance.

Budgeted	₹
Sales 2,000 units @ ₹ 30 each	60,000
Cost of Sales @ ₹ 24 each	48,000
Profit	12,000
Actual	
Sales 1,900 units @ ₹ 28 each	53,200
Cost of Sales @ ₹ 20 each	38,000
Profit	15,200

[*CMA*]

Solution:

Calculation:

(*i*) Actual Margin or Profit per Unit = Actual Selling Price – Budgeted Cost of Sales per Unit
= ₹ 28 – 24 = ₹ 4

(*ii*) Budgeted Margin or Profit per Unit = Budgeted Selling Price – Budgeted Cost of Sales per Unit
= ₹ 30 – 24 = ₹ 6

1. Total Sales Margin Variance = Budget Profit – Actual Profit
= 12,000 – 15,200 = ₹ 3,200 (*F*)
2. Sales Margin Price Variance = Standard Profit on Actual Quantity – Profit on Actual Quantity
or = Actual Quantity Sold (Standard Profit per Unit – Actual Profit per Unit)
= 1,900 × (6 – 4) = ₹ 3,800 (*A*)
3. Sales Margin Volume Variance = Budgeted Profit – Standard Profit
or = Standard Profit per Unit × (Budgeted Quantity – Actual Quantity)
= 6 × (2,000 – 1,900) = 600 (*A*)
4. Cost of Sales Variance = Actual Quantity (Budgeted Cost of Sales per Unit – Actual Cost of Sales per Unit)
= 1,900 × (₹ 24 – 20) = 7600 (*F*)

Verification:

Total Sales Margin Variance = Sales Margin Price Variance + Sales Margin Quantity Variance + Cost of Sales Variance

₹ 3,200 (*F*) = 3,800 (*A*) + 600 (*A*) + 7,600 (*F*)

Illustration 39:
From the following information, calculate sales margin variances.

Product	*Budgeted Sales*			*Actual Sales*	
	Quantity (Unit)	*Sales Price per Unit* ₹	*Standard Cost per Unit* ₹	*Quantity (Units)*	*Sales Price per Unit* ₹
X	900	20	15	1,200	24
Y	600	15	10	900	12
	1,500			2,100	

Solution:

1. Total Sales Margin Variance = Budgeted Profit or Margin – Actual Profit
= (Standard or Budgeted Quantity × Standard Profit per Unit) – (Actual Quantity × Actual Profit per Unit)
= [(900 × 5) + (600 × 5)] – [(1,200 × 9) + (900 × 2)]
= 7,500 – 12,600 = 5,100 (*F*)

2. Total Sales Margin Price Variance = Standard Profit on Actual Quantity – Profit on Actual Quantity

or = Actual Quantity Sold × (Standard Profit per Unit – Actual Profit per Unit

Product *X*	= 1,200 (₹ 5 – ₹ 9)	= 4,800 (*F*)
Product *Y*	= 900 (₹ 5 – ₹ 2)	= 2,700 (*A*)
		₹ 2,100 (*F*)

(*i*) Total Sales Margin Volume Variance = Budgeted Profit – Standard Profit
or = Standard Profit per Unit × (Budgeted Quantity – Actual Quantity)

Product *X*	= ₹ 5 × (900 – 1,200)	= 1,500 (*F*)
Product *Y*	= ₹ 5 × (600 – 900)	= 1,500 (*F*)
		₹ 3,000 (*F*)

(*ii*) Total Sales Margin Mix Variance = Revised Standard Profit – Standard Profit
or = Standard Profit per Unit × (Standard Proportion of Mix – Actual Mix)

Product *X*	= ₹ 5 (1,260 – 1,200)	= 300 (*A*)
Product *Y*	= ₹ 5 (840 – 900)	= 300 (*F*)
		Nil

(*iii*) Total Sales Margin Quantity Mix = Budgeted Profit – Revised Standard Profit
or = [5 × (900 + 600)] – 5 (1260 + 840)]
= 7,500 – 10,500 = 3,000 (*F*)

Working: Standard Proportion of Mix

X	$900 \times \frac{2,100}{1,500}$	=	1,260 Units
Y	$600 \times \frac{2,100}{1,500}$	=	840 Units

PRESENTATION OF STANDARD COST STATEMENT

Standard cost statement is prepared to show reconciliation between the Standard Profit and the Actual Profit. The statement is a consolidated summary of all variances.

Item	*Standard*	*Variances*		*Actual*
		Favourable	*Adverse*	
Standard Sales Values				
Sales Variances				
Price				
Quantity				
Mix				
Actual Sales Value				
Less: Standard Cost of Sales				
Direct Material				
Direct Labour				
Variable Overhead				
Fixed Overhead				
Standard Net Profit				
Cost Variances:				
(*a*) Material:				
Price				
Mix				
Yield				
(*b*) Labour				
Rate				
Efficiency				
Mix				
(*c*) Variable Overhead				
Expenditure				
(*d*) Fixed Overhead				
Expenditure				
Efficiency				
Calender				
Total Cost Variance				
Actual Net Profit				

CONTROL OF VARIANCES

For control purposes, variances should be attributed to the managers normally responsible. Thus, the responsible manager in the case of a Material Price Variance is the Purchase Manager and in case of Labour Inefficiency is the Production Manager. However, business functions are so much inter-related that the variance attributed to a Manager may not be within his control. Thus, an adverse Material Price Variance may be due to a reduction in the volume of purchase due to fall in output which in turn may have been caused by a recession in demand, excess tunes in the workshop may be due to faulty material; Overhead variances may be due to restrictions on output. But it can be said that ultimately variance is the combined responsibility of the entire management.

It can be understood that all variances are controllable at some level of management. If various adverse variances are the result of recession and reduction in sale, it is responsibility of top management to apply the resources of business to alternative outlets or there may be a programme of contraction.

But some variances are uncontrollable by the management, particularly where external factors such as government-intervention impose price increases on raw

material and other supplies or price reduction on output or increase in administrative costs. Thus, it is desirable that variances which are controllable or uncontrollable should be separately considered. If a variance is not controllable at any level of management then the standard should be revised at the next review period. If it is controllable, then the standard should not be revised merely on the grounds that the actual performance does not meet the correctly assessed standard.

The success of a standard costing system depends on the involvement of the managers. It is the manager who should assess and revise the standards and take what action they can take to eliminate the variances.

DISPOSITION OF VARIANCES

The usual practice is to transfer all variances to the Costing Profit and Loss Account. But a question may arise whether inventory valuations as determined according to standard costs, should be adjusted for variances. It would not be proper to do so for variances which have resulted only from inefficiency or extra efficiency. Price variances can be properly adjusted in the valuation placed on inventory. For instance, if Materials Price Variance is unfavourable, inventory values may be suitably increased so that inventory is valued at cost. One must, however, remember that sometimes efficiency and price variance are interlinked. For instance, Materials Usage Variance may be adverse because of a decision to use inferior material but this may (and should) result in favourable price variance. In such a case, the two variances should first be adjusted against one another and then the net amount adjusted in the value placed on the inventory. This also applies to variances connected with labour. Variances connected with overheads should all be transferred to the Costing Profit and Loss Account but if changes in output leading to over or under recovery of overheads are because of unavoidable causes (say, because of restrictions imposed by Government), such variances should be adjusted in inventory values.

In brief following are the various methods which are generally used.

(*i*) Where the cost of variances is considered as a cost of inefficiency and not as a cost of product, they are to be transferred to Profit and Loss Accounts to maintain the same standard in future.

(*ii*) Where the cost of variances is considered as cost of product they are to be allocated to cost of sales, finished stock and work-in-progress.

(*iii*) Controllable variance can be adjusted against income of that period and uncontrollable variances, such as materials price change, wages rate increases due to national awards, *etc*., are to be allocated over cost of sales and closing inventories of work-in-progress and finished goods.

Accounting Procedure

The accounting procedure regarding treatment of variances is based on following principles.

(*i*) Work-in-Progress A/c should be debited by standard cost.

(*ii*) All Expenses Control A/c should be credited at their actual cost.

(*iii*) Favourable variances under separate accounts should be credited. Adverse variances should be debited. These accounts should be closed by transferring them to Costing P&L A/c.

On the basis of these principles, the accounting entries will be :

			₹
1. **Material Cost Variance**			
[Suppose Mix and Yield Variances are adverse by ₹ 30 and 20. Price variance is favourable ₹ 18. Material Cost Variance is ₹ 32 (*A*). Standard Cost ₹ 340 and Actual Cost ₹ 372]	Work-in-Progress A/c Dr.	340	
	Material Mix Variance A/c Dr.	30	
	Material Yield Variance A/c Dr.	20	
	To Material Price Variance		18
	To Stores Ledger Control A/c		372
2. **Labour Variance**	Work-in-Progress A/c Dr.	1,000	
[Suppose Wages Cost Variance ₹ 500 (*A*), Wage Rate Variance ₹ 100 (*A*), Labour Efficiency Variance ₹ 350 (*A*), Labour Mix Variance ₹ 50 (*A*); Standard Wage ₹ 1,000. Actual Wages ₹ 1,500].	Wage Rate Variance A/c Dr.	100	
	Labour Efficiency Variance A/c	350	
	Labour Mix Variance A/c Dr.	50	
	To Wages Control A/c		1,500
3. **Overhead Variance**	Work-in-Progress A/c Dr.	33,000	
[Standard Overhead ₹ 33,000 Expenditure Variance ₹ 1,000 (*F*), Volume Variance ₹ 2,000 (*F*) Efficiency Variance ₹ 2,400 (*F*) Calender Variance ₹ 2,000 (*A*)	Calender Variance A/c Dr.	2,000	
	To Expenditure Variance A/c		2,000
	To Efficiency Variance A/c		2,400
	To Capacity Variance A/c		1,600
	To Overhead Control A/c		29,000
4. **Closing Entries**	Finished Stock A/c	34,340	
	To Work-in-Progress A/c		34,340
	Material Price Variance A/c Dr.	18	
	Expenditure Variance A/c Dr.	2,000	
	Efficiency Variance A/c Dr.	2,400	
	Capacity Variance A/c Dr.	1,600	
	To Material Mix Variance A/c		30
	To Material Yield Variance A/c		20
	To Wage Rate Variance A/c		100
	To Labour Efficiency Variance A/c		350
	To Labour Mix Variance A/c		50
	To Calender Variance A/c		2,000
	To Costing P&L A/c		3,468

MISCELLANEOUS ILLUSTRATIONS

Illustration 40:

The standard mix of product *A* 2 is as follows:

Kgs.	*Material*	*Price per kg. (₹)*
45	*X*	6.00
25	*Y*	4.50
30	*Z*	9.50

The standard loss in production is 10% of input. There is no scrap value. Actual production for a month was 7.425 kgs. of *A* 2 from 80 mixes. Actual purchases and consumption of material during the month were:

Kgs.	*Material*	*Price per kg. (₹)*
4,200	*X*	6.50
1,700	*Y*	4.25
2,600	*Z*	9.75

You are required to calculate the following variances for presentation to the management
(*i*) Material cost variance
(*ii*) Material price variance
(*iii*) Material mix variance
(*iv*) Material yield variance [*CS Inter*]

Solution:

Standard Cost					*Actual Cost*			
Material		*Kg*	*Price*	*Amount* ₹	*Material*	*Kg*	*Price*	*Amount* ₹
X	80 × 45	= 3,600	6.00	21,600	*X*	4,200	6.50	27,300
Y	80 × 25	= 2,000	4.50	9,000	*Y*	1,700	4.25	7,225
Z	80 × 30	= 2,400	9.50	22,800	*Z*	2,600	9.75	25,350
Input		8,000		53,400	Input	8,500		59,875
Loss 10%		800		—	*Loss*	1,075		—
Output		7,200		53,400	Output	7,425		59,875

Standard Cost per Unit $= \frac{53,400}{7,200} = 7.4167$ per kg

Standard Cost of Actual Production = 7,425 × 7.4167 = 55,069

(*i*) Material Cost Variance (*MCV*) = Standard Cost for Actual Production – Actual Cost
= 55,069 – 59,875 = ₹ 4,806 (*A*)

(*ii*) Material Price Variance (*MPV*) = Actual Quantity (Standard Rate – Actual Rate)

X	= 4,200 (6.00 – 6.50)	= 2,100 (*A*)
Y	= 1,700 (4.50 – 4.25)	= 425 (*F*)
Z	= 2,600 (9.50 – 9.75)	= 650 (*A*)
	Total	₹ 2,325 (*A*)

(*iii*) Material Mix Variance (*MMV*) = Standard Rate (Revised St. Quantity – Actual Quantity)

X	= 6.00 (3,825 – 4,200)	= 2,250 (*A*)
Y	= 4.50 (2,125 – 1,700)	= 1,912.50 (*F*)
Z	= 9.50 (2,550 – 2,600)	= 475 (*A*)
	Total	4,637.50 (*A*)

(*iv*) Material Yield Variance (*MYV*):
For 8,000 Input = 7,200 Yield

For 8,500 Input $= \frac{8,500}{8,000} \times 7,200 = 7,650$ kgs

MYV = Standard Cost per kg (Actual yield – Standard Yield)
= 7.4167 (7,425 – 7,650)
= ₹ 1,668.50 (*A*) (appx.)

Verification

MCV = *MPV* + *MMV* + *MYV*
= 2,325 (*A*) + 812.50 (*A*) + 1,668.50 (*A*) = 4,806 (*A*)

Calculations:

Revised Standard Quantity (*RSQ*)

		Kgs.
$X = 3,600 \times \frac{8,500}{8,000}$	=	3,825

$Y = 2{,}000 \times \frac{8{,}500}{8{,}000}$	=	2,125
$Z = 2{,}400 \times \frac{8{,}500}{8{,}000}$	=	2,550
Total	=	8,500

Illustration 41:

Compute the missing data indicated by the Question Marks from the following.

Particulars	*A*	*B*
Standard Price/Unit	₹ 12	₹ 15
Actual Price/Unit	₹ 15	₹ 20
Standard Input (kgs.)	50	?
Actual Input (kgs.)	?	70
Material Price Variance	?	?
Material Usage Variance	?	₹ 300 Adverse
Material Cost Variance	?	?

Material mix variance for both products together was ₹ 45 adverse. [*CA Inter*]

Solution:

1. Standard Input of Product *B*:

Material Usage Variance	= *SR (SQ – AQ)*
₹ 300 *A*	= 15 (*SQ* – 70)
– 300	= 15 *SQ* – 1,050
$SQ = \frac{1{,}050 - 300}{15}$	= 50 kg. Std. input of *B*

2. Actual Input of Product *A*:

This can be ascertained with the help of material mix variance. Let *A* be the actual input in kgs. for Product *A*.

Material Mix Variance = *AQ* (Std. cost of Std. mix per kg. – Std. cost of actual mix per kg.)

$$-45 = (A + 70 \text{ kg. }) (₹ 13.50) - \frac{12A + 1{,}050}{A + 70}$$

$$-45 = 13.50 (A + 70) - (12 A + 1{,}050)$$

$$-45 = 13.50 A + 945 - 12 A - 1{,}050$$

$$-45 = 1.5 A - 105$$

$$A = \frac{105 - 45}{1.5} = 40 \text{ kgs. (Actual input of Product } A)$$

3. (*a*) Material Price Variance of *A*	= *AQ (SR – AR)*
	= 40 Kg. (12 – 15) = ₹ 120 (*A*)
(*b*) Material Price Variance of *B*	= 70 (15 – 20) = ₹ 350 *(A)*
4. Material Usage Variance of *A*	= *SR (SQ – AQ)*
	= 12 (50 – 40) = ₹ *120 (F)*
5. (*a*) Material Cost Variance of *A*	= *SC – AC*
	= (50 kgs at ₹ 12) – (40 kgs. at ₹ 15)
	= 600 – 600 = Nil

(*b*) Material Cost Variance of *B* = (50 kgs. at ₹ 15) – (70 kgs. at ₹ 20)
= 750 – 1,400 = ₹ 650 (*A*)

Calculations:

1. Std. Cost of Std. mix per kg.:

A 50 kgs. at ₹ 12	= ₹ 600
B 50 kgs. at 15	= ₹ 750
Total 100 kgs.	= ₹ 1,350
₹ 1,350/100	= ₹ 13.50

Standard Cost of Actual Mix of *B*
₹ 15 × 70 kgs. = ₹ 1,050

2. Standard Cost of Actual Mix:

	SC		*AM*	Amount (₹)
A	12	×	*A*	= 12 *A*
B	15	×	70	= 1,050
Total			*A* + 70	12 *A* + 1,050

Standard Cost of Actual Mix $= \frac{12A+1050}{A+70}$

3.

	Standard Cost				*Actual Cost*		
	Kg.	*Price*	*Amount*		*Kg.*	*Price*	*Amount*
			(₹)				(₹)
A	50	12	600	*A*	40	15	600
B	50	15	750	*B*	70	20	1,400
Input	100		1,350	Input	110		2,000

Material Mix Variance = *SR (RSQ – AQ)*

A $= 12\left(\frac{110}{100}\times 50 - 40\right)$
= 12 (55 – 40) = 180 (*F*)

B = 15 (55 – 70) = 225 (*A*)

45 (*A*)

Illustration 42:

The following information has been extracted from the records of a chemical company:

Standard price	:	Raw material *A* – ₹ 2 per kg.
		Raw material *B* – ₹ 10 per kg.
Standard mix	:	*A* : 75% : *B* : 25% (by weight)
Standard yield	:	90%

In a period, the actual costs, usages and output were as follows :

Used	:	2,200 kgs. of *A*, costing ₹ 4,650
		800 kgs. of *B*, costing ₹ 7,850
Output	:	2,850 kgs. of products.

Calculate material cost variances.

Solution:

Calculations

1. Materials used 2,200 + 800 = 3,000 kgs.

	2. Standard Cost (SC)				3. Actual Cost (AC)		
Material	*Kg*		*Rate*	*Amt. (₹)*	*Material*	*Kg.*	*Amt. (₹)*
A	75% of 3,000	= 2,250	2	4,500	*A*	2,200	4,650
B	25% of 3,000	= 750	10	7,500	*B*	800	7,850
Input		3,000		12,000	Input	3,000	12,500
Loss 10%		300	—		*Loss*	150	—
Output		2,700		12,000	Output	2,850	12,500

4. Standard yield rate = $\frac{12,000}{2,700}$ = ₹ 4.444 per unit
5. Standard Cost of Actual Production (*SCAP*) = 2,850 × 4.444 = ₹ 12,667
6. Standard Cost for Standard Mix = ₹ 12,000
7. Actual Rate of Material used :

$A = \frac{4,650}{2,200}$ = ₹ 2.1135 per unit

$B = \frac{7,850}{800}$ = ₹ 9.8125 per unit

8. Standard Cost for Actual Mix

Material	*SC*	*AM*	*Amount (₹)*
A	2	2,200	4,400
B	10	800	8,000
		3,000	12,400

Variances

(*a*) Material Cost Variance (*MCV*) = Standard Cost of Actual Production – Actual Cost
= 12,667 – 12,500 = ₹ 167 (*F*)

(*b*) Material Price Variance (*MPV*) = Actual Quantity (Standard Rate – Actual Rate)

A	= 2,200 (2 – 2.1136)	= 250 (*A*)
B	= 800 (10 – 9.8125)	= 150 (*F*)
	Total	= 100 (*A*)

(*c*) Material Mix Variance (*MMV*) = Std. Rate (*RSQ* – *AQ*)

A	= 2 (2,250 – 2,200)	= 100 (*F*)
B	= 10 (750 – 800)	= 500 (*A*)
	Total	= 400 (*A*)

or = Total Standard Cost for Standard Mix – Total Standard Cost for Actual Mix
= 12,000 – 12,400 = 400 (*A*)

(*d*) Material Yield Variance (*MYV*) = *SYR* (*AY* – *SY*)
= 4.4444 (2,850 – 2,700) = ₹ 667 (*F*)

Verification

MCV = *MPV* + *MMV* + *MYV*
= 100 (*A*) + 400 (*A*) + 667 (*F*) = 167 (*F*)

Illustration 43:

The standard labour complement and the actual labour complement engaged during the month are given below:

	Skilled	*Semi-skilled*	*Unskilled*
(*a*) Standard number of workers in a group	30	10	10
(*b*) Standard wage rate (₹ per hour)	5	3	2
(*c*) Actual number of workers employed during the month in the group	24	15	12
(*d*) Actual wage rate per hour (₹)	6	2.5	2

During the month of 200 working hours, the group produced 9,600 standard hours of work.

Required:

Calculations showing Wage rate variance, Labour efficiency variance, Labour mix variance and Total labour cost variance. [*CMA (Inter)*]

Solution:

Calculations:

1. Standard Labour Hour Rate of the Standard Group

Category	*No. of men*	*Hours per month*	*Total hours*	*Standard Rate* ₹	*Standard Labour Cost* ₹
Skilled	30	200	6,000	5	30,000
Semi-skilled	10	200	2,000	3	6,000
Unskilled	10	200	2,000	2	4,000
			10,000		40,000

Hence, standard rate per hour of the group = 40,000/10,000 = ₹ 4.0

2. Standard Cost for Actual Mix

Category	*No. of men*	*Hours per month*	*Total hours*	*Standard Rate* ₹	*Standard Labour Cost* ₹
Skilled	24	200	4,800	5	24,000
Semi-skilled	15	200	3,000	3	9,000
Unskilled	12	200	2,400	2	4,800
			10,200		37,800

3. Actual Labour Hour Rate of Actual Mix

Category	*No. of men*	*Hours per month*	*Total hours*	*Standard Rate* ₹	*Standard Labour Cost* ₹
Skilled	24	200	4,800	6.00	28,800
Semi-skilled	15	200	3,000	2.50	7,500
Unskilled	12	200	2,400	2.00	4,800
			10,200		41,100

Variances

(*a*) *Wages Rate Variance* = *AHP (SR – AR)*

Skilled	= 4,800 (5 – 6)	= 4,800 (*A*)
Semi-skilled	= 3,000 (3 – 2.50)	= 1,500 (*F*)
Unskilled	= 2,400 (2 – 2.00)	= Nil
	Total	= 3,300 (*A*)

(*b*) *Labour Efficiency Variance* = *SR (SH – AHP)*

Skilled	= 5 (6,000 – 4,800)	= 6,000 (*F*)
Semi-skilled	= 3 (2,000 – 3,000)	= 3,000 (*A*)

Unskilled	= 2 (2,000 – 2,400)	= 800 (*A*)
		= 2,200 (*F*)
(*c*) *Labour Mix Variance*	= Standard Cost for St. Mix – St. Cost of Actual Mix	
	= 40,000 – 37,800	= 220 (*F*)
(*d*) *Total Labour Cost Variance*	= *SC – AC*	
	= 40,000 -41,100	= ₹ 1,100 (*A*)

(*e*) *Labour yield Variance:*

St. yield is not given in the question. Actual output is 9,600 standard hours of work. Hence, labour yield variance could not be worked out.

Illustration 44:

From the particulars given below compute : Material Price Variance, Material Usage Variance, Labour Rate Variance, Idle Time Variance and Labour Efficiency Variance with full working details.

One tonne of material input yields a standard output of 1,00,000 units. The standard price of material is ₹ 20 per kg. Number of employees engaged is 200. The standard wage rate per employee per day is ₹ 6. The standard daily output per employee is 100 units. The actual quantity of material used is 10 tonnes and the actual price paid is ₹ 21 per kg. Actual output obtained is 9,00,000 units. Actual number of days worked is 50 and actual rate of wages paid is ₹ 6.50 per day. Idle time paid for and included in above time is 1/2 day.

Solution:

(*A*) **Material Variances :**

Standard Cost	= 10 tonnes at ₹ 20,000	= ₹ 2,00,000
Actual Cost	= 10 tonnes at ₹ 21,000	= ₹ 2,10,000
Standard Cost for Actual Production	= $\frac{9,00,000}{1,00,000}$ or 9 tonnes at ₹ 20,000	= ₹ 1,80,000
(*i*) Material Price Variance	= *AQ (SR – AR)*	
	= 10 (20,000 – 21,000)	= ₹ 10,000 (*A*)
(*ii*) Material Usage Variance	= *SR (SQ – AQ)*	
	= 20,000 (9 – 10)	= ₹ 20,000 (*A*)
(*iii*) Material Cost Variance	= *SCAP – AC*	
	= 1,80,000 – 2,10,000	= ₹ 30,000 (*A*)

Verification

Standard Cost Variance	= Price Variance + Usage Variance
	= 10,000 (*A*) + 20,000 (*A*) = 30,000 (*A*)

(*B*) **Labour Variances**

No. of employees : 200. Standard daily output per employee =100 units

One day output for 200 employees	= 200 × 100 = 20,000 units	
Days required	= $\frac{9,00,000 \text{ units}}{20,000 \text{ units}}$ = 45 days	
Standard Cost for Actual Output (*SCAP*)	= 45 days × ₹ 6 × 200 employees = ₹ 54,000	
Actual Cost	= 50 days × ₹ 6.50 × 200 employees = ₹ 65,000	
Actual No. of days paid	= 50 days × 200 employees	= 10,000 man days
Idle time	= 200 × 1/2 day	= 100 man days
Actual No. of days worked		= 9,900 man days
Standard Man days required	= $\frac{₹ 12,000}{100 \text{ units}}$ = 9,000 man days	

(*i*) Labour Rate Variance = Actual days paid (*SR* – *AR*)
= 10,000 (6 – 6.50) = ₹ 5,000 (*A*)

(*ii*) Idle Time Variance = *SR* × idle Time
= 6 × 100 man days = ₹ 600 (*A*)

(*iii*) Labour Efficiency Variance = *SR* (Std. man days – Actual man days worked)
= 6 (9,000 – 9,900) = 5,400 (*A*)

(*iv*) Labour Cost Variance = *SCAP* – *AC*
= 54,000 – 65,000 = ₹ 11,000 (*A*)

Verification

Labour Cost Variance = Labour Rate Variance + Idle Time Variance + (Revised) Labour Efficiency Variance
= 5,000 (*A*) + 600 (*A*) + 5,400 (*A*) = 11,000 (*A*)

Illustration 45:

The following information is available from the cost records of Vimal & Co. for the month of August, 2022:

Material purchased 24,000 kg ₹ 1,05,600
Material consumed 22,800 kg
Actual wages paid for 5,940 hours ₹ 29,700
Units produced 2,160 units.

Standard rates and prices are :

Direct material rate is ₹ 4.00 per unit
Direct labour rate is ₹ 4.00 per hour
Standard input is 10 kg. for one unit
Standard requirement is 2.5 hours per unit
Calculate all material and labour variances for the month of August, 2022.

Solution :

(*a*) **Material Variances :**

(*i*) Material Cost Variance
= (Standard Quantity × Standard Price) – (Actual Quantity × Actual Price)
= (2,160 × 4 × 10) – (22,800 × 4.40)
= ₹ 86,400 – ₹ 1,00,320 = 13,920 (Adverse)

(*ii*) Material Price Variance
= Actual Quantity (Standard Price – Actual Price)
= 22,800 Kg (4 – 4.40) = 9,120 (Adverse)

(*iii*) Material Usage Variance
= Standard Price (Standard Quantity – Actual Quantity)
= 4 (21,600 – 22,800) = 4,800 (Adverse)

Note: Unit basis for direct material has been taken as kg. hence, direct material rate is ₹ 4 per kg.

Verification :

MCV = *MPV* + *MUV*
13,920 (Adverse) = 9,120 (Adverse) + 4,800 (Adverse)

(*b*) **Labour Variances :**

(*i*) Labour Cost Variance
= (Standard Hour × Standard Rate) – (Actual Hour × Actual Rate)
= (2,160 × 2.50 × 4) – (29,700)
= 21,600 – 29,700 = 8,100 (Adverse)

(*ii*) Labour Rate Variance
= Actual Hour (Standard Rate – Actual Rate)
= 5,940 (4 – 5) = 5,940 (Adverse)
(*iii*) Labour Efficiency Variance
= Standard Rate (Standard Hour – Actual Hour)
= 4 (5,400 – 5,940) = 2,160 (Adverse)

Verification :

LCV = LRV + LEV
8,100 (Adverse) = 5,940 (Adverse) + 2,160 (Adverse)
Standard Hour = 2,160 Units × 2.50 Hours = 5,400 Hrs.

Illustration 46:

The following information was obtained from the records of a manufacturing unit using Standard Costing System:

Particulars	*Standard* *4,000 units*	*Actual* *3,800 units*
Working Days	20	21
	₹	₹
Fixed Overhead	40,000	39,000
Variable Overhead	12,000	12,000

You are required to calculate the following Overhead Variances:
(*a*) Variable Overhead Variance
(*b*) Fixed Overhead Variance
(*i*) Expenditure Variance (*ii*) Volume Variance
(*iii*) Efficiency Variance (*iv*) Calender Variance
(*c*) Also prepare a Reconciliation Statement for the standard fixed expenses worked out at Standard Fixed Overhead and the Actual Overhead.

Solution :

Calculations:

Standard Rate (*S.R.*) $= \frac{₹\ 12,000}{4,000\ \text{units}}$ = ₹ 3 per Unit

Standard Variable Overhead (*S.V.O.*) = 3,800 × 3 = ₹ 11,400

(*a*) **Variable Overheads Variance** = Standard Variable Overhead – Actual Variable Overhead
= (*SVO – AVO*)

Basic Data = 11,400 – 12,000 = ₹ 600 (*A*)
1. Budgeted Qty. (*B.Q.*) = 4,000 units
2. Actual Qty (*A.Q.*) = 3,800 units
3. Standard Qty (*S.Q.*) $= 4,000 \times \frac{21}{20}$ = 4,200 Units
4. Standard Rate (*S.R.*) $= \frac{₹\ 40,000}{4,000\ \text{units}}$ = ₹ 10 per unit
5. Budgeted Fixed Overhead (*B.F.O.*) = ₹ 40,000
6. Actual Fixed Overhead (*A.F.O)* = ₹ 39,000
7. Standard Fixed Overhead (*S.F.O.*) = 3,800 × 10 = ₹ 38,000
8. Revised Budgeted Qty. (*R.B.Q.*) $= 4,000 \times \frac{21}{20}$ = 4,200 units

(*b*) **Fixed Overhead Variance**	= (*S.F.O. – A.F.O.*)	
	= 38,000 – 39,000	= ₹ 1,000 (*A*)
(*i*) Expenditure Variance	= (*B.F.O. – A.F.O.*)	
	= 40,000 – 39,000	= ₹ 1,000 (*F*)
(*ii*) Volume Variance	= *S.R.* (*B.Q. – A.Q.*)	= 10 (4,000 – 3,800)
	= ₹ 2,000 (A)	
(*iii*) Efficiency Variance	= *S.R.* (*S.Q. – A.Q.*)	= 10 (4,200 – 3,800)
	= ₹ 4,000 (A)	
(*iv*) Calendar Variance	= *S.R.* (*B.Q. – R.B.Q.*)	
	= 10 (4,000 – 4,200)	= 2,000 (*F*)

(*c*) **Reconciliation Statement for Overhead Variances**

	₹
Standard Fixed Expenses worked out at Standard Fixed Overhead rate (3.800 × 10)	38,000
Less: Expenditure Variance	1,000 (*F*)
	37,000
Add: Efficiency Variance	4,000 (*A*)
	41,000
Less: Calender Variance	2,000 (*F*)
Actual Fixed Overheads	39,000

Verification :

Volume Variance = Efficiency Variance + Calendar Variance
= 4,000 (*A*) + 2,000 (*F*) = 2,000 (*A*)

Illustration 47:

The following data have been collected from the cost records of a unit for computing the various fixed overhead variances for a period :

Number of budgeted working days	25
Budgeted man-hours per day	6,000
Out-put (budgeted), per man-hour (in units)	1
Fixed overhead cost as budgeted	₹ 1,50,000
Actual number of working days	27
Actual man-hours per day	6,300
Actual output per man-hour (in units)	0.9
Actual fixed overhead incurred	₹ 1,56,00

Calculate Fixed Overhead Variances :

(*a*) Expenditure Variance, (*b*) Calender Variance,
(*c*) Capacity Variance, (*c*) Efficiency Variance,
(*e*) Volume Variance, (*f*) Fixed Cost Variance,

[CMA (Inter)]

Solution :

Calculations

Budgeted Quantity (*BQ*)	= 25 × 6,000 × 1 = 1,50,000 units
Actual Quantity (*AQ*)	= 27 × 6,300 × 0.9 = 1,53,090 units
Standard Quantity (*SQ*)	= 27 × 6,300 = 1,70,100 × 1 = 1,70,100 units
Budgeted Fixed Overheads (*BFO*)	= ₹ 1,50,000
Actual Fixed Overheads (*AFO*)	= ₹ 1,56,000
Standard Rate	$= \frac{BFO}{BQ} = \frac{1,50,000}{1,50,000\,\text{units}}$ = ₹ 1.00 Per unit

Revised Budgeted Quantity (*RBQ*) = 27 × 6,000 × 1 = 1,62,000 units
St. Fixed Overheads for Actual Product (*SFO*) = 1,53,090 × 1 = ₹ 1,53,090
(should have been incurred for *AQ* produced).

Variances :

(*a*) Expenditure Variance = *BFO – AFO*
= 1,50,000 – 1,56,000 = ₹ 6,000 (*A*)

(*b*) Calender Variance = *SR (RBQ – BQ)*
= 1.00 (1,62,000 – 1,50,000) = ₹ 12,000 (*F*)

(*c*) Capacity Variance = *SR (SQ – RBQ)*
= 1.00 (1,70,100 – 1,62,000) = ₹ 8,100 (*F*)

(*d*) Efficiency Variance = *SR (AQ – SQ)*
= 1.00 (1,53,090 – 1,70,100) = ₹ 17,010 (*A*)

(*e*) Volume Variance = *SR (AQ – BQ)*
= 1.00 (1,53,090 – 1,50,000) = ₹ 3,090 (*F*)

(*f*) Fixed Cost Variance = *SFO – AFO*
= 1,53,090 – 1,56,000 = ₹ 2,910 (*A*)

Verification :

Fixed Overhead Variance = *FO* Exp. Variance + *FO* Volume Variance
= 6,000 (*A*) + 3,090 (*A*)
= 2,910 (*A*)

FO Volume Variance = Efficiency Variance + Cap. *V* + Calender *V.*
= 17,010 (*A*) + 8,100 (*F*) + 12,000 (*F*)
= 3,090 (*F*)

Illustration 48:

The following information is available from the cost records of a Company for the month of February,

	₹
Materials purchased: 20,000 pieces	88,000
Materials consumed: 19,000 pieces	
Actual wages paid for 4,950 hours	24,750
Factory overheads incurred	44,000
Factory overheads budgeted	40,000
Units produced 1,800	

Standard Rates and Prices are
Direct material rate ₹ 4 per piece
Standard input 10 pieces per unit
Direct labour rate ₹ 4 per hour
Standard requirement 2.5 hours per unit
Overhead ₹ 8 per labour hour.
Required (*a*) Show the Standard Cost Card; (*b*) Compute all material, labour and overhead variances for the month of February

Solution:

Calculations

(*a*) *Standard Cost Card*	₹ *per unit*
Direct Materials 10 pieces at ₹ 4 per piece	40
Direct labour 2.5 hours at ₹ 4 per hour	10
Overheads 2.5 hours at ₹ 8 per hour	20
	₹ 70

(*b*) (*i*) **Material Variance**

Standard Cost (*SC*)	= 1,800 units × 10 pieces = 18,000 pieces at ₹ 4.00 per piece = ₹ 72,000	
Actual Rate of Purchase	$= ₹ \frac{88,000}{20,000}$ = ₹ 4.40 per piece	
Actual Cost (*AC*)	= 19,000 pieces consumed at ₹ 4.40 per piece = ₹ 83,600	
1. Material Cost Variance (*MCV*)	= *SC* – *AC* = 72,000 – 83,600	= ₹ 11,600 (*A*)
2. Material Price Variance (*MPV*)	= *AQ (SR – AR)* = 19,000 (4.00 – 4.40)	= ₹ 7,600 (*A*)
3. Material Usage Variance (*MUV*)	= *SR (SQ – AQ)* = 4.00 (18,000 – 19,000)	= 4,000 (*A*)

Verification:

MCV = *MPV* + *MUV*
= 7,600 (*A*) + 4,000 (*A*) = 11,600 (*A*)

(*ii*) **Labour Variances:**

Standard Cost 1,800 × 2.5 *i.e.* 4,500 hours at ₹ 4 per hour = ₹ 18,000
Actual Cost = 4,950 hour amounting to ₹ 24,750 *i.e.*, ₹ 5.00 per hour paid.

1. Labour Cost Variance (*LCV*)	= *SC* – *AC* = 18,000 – 24,750	= ₹ 6,750 (*A*)
2. Labour Rate Variance (*LRV*)	= *AH (SR – AR)* = 4,950 (4.00 – 5.00)	= ₹ 4,950 (*A*)
3. Labour Efficiency Variance (*LEV*)	= *SR (SH – AH)* = 4.00 (4,500 – 4,950)	= ₹ 1,800 (*A*)

Verification:

LCV = *LRV* + *LEV*
= 4,950 (*A*) + 1,800 (*A*)
= 6,750 (*A*)

(*iii*) **Fixed Overhead Variances:** (All overheads are assumed to be fixed)

St. Rate (*SR*)	= ₹ 8.00 per hour;
Actual Hours (*AH*)	= 4,950
Budgeted Fixed Overhead (*BFO*)	= ₹ 40,000
Actual Fixed Overhead (*AFO*)	= ₹ 44,000
Budgeted Hours (*BH*)	$= \frac{BFO}{SR} = ₹ \frac{40,000}{8.00}$ = 5,000 hours
Standard Hours (*SH*)	= 1,800 × 2.5 = 4,500
Standard Fixed Overhead (*SFO*)	= 1,800 × 2.5 = 4,500 hours at ₹ 8 per hour = ₹ 36,000
or 1,800 units at ₹ 20 per unit	= ₹ 36,000.

1. *FOH* Variance	= *SFO* – *AFO* = 36,000 – 44,000	= ₹ 8,000 (*A*)
2. Expenditure Variance	= *BFO* – *AFO* = 40,000 – 44,000	= ₹ 4,000 (*A*)
3. Efficiency Variance	= *SR (SH – AH)* = 8.00 (4,500 – 4,950)	= ₹ 3,600 (*A*)
4. Capacity Variance	= *SR (AH – BH)* = 8.00 (4,950 – 5,000)	= ₹ 400 (*A*)

Verification :

FOH V. = *EXP. V+ Effy. V. + Capacity V*

= 4,000 *A* + 3,600 *A* + 400 *A* = 8,000 (*A*)

Illustration 49:

AB Constructions Limited has entered into a big contract at an agreed price of ₹ 1,50,00,000 subject to an escalation clause for material and labour as spent out on the contract and corresponding actual are as follows :

	Standard		*Actual*	
Material	*Quantity (tonnes)*	*Rate per tonne* ₹	*Quantity (tonnes)*	*Rate per tonne* ₹
A	3,000	1,000	3,400	1,100
B	2,400	800	2,300	700
C	500	4,000	600	3,900
D	100	30,000	90	31,500
Labour	*Hours*	*Hourly Rate* ₹	*Hours*	*Hourly Rate* ₹
*L*1	60,000	15	56,000	18
*L*2	40,000	30	38,000	35

You are required to :

(*i*) Give your analysis of admissible escalation claim and determine the final contract price payable,

(*ii*) Prepare the contract account if all the expenses other than material and labour related to the contract are ₹ 13,45,000.

(*iii*) Calculate the following variances and verify them :

(*a*) Material cost variance

(*b*) Material price variance

(*c*) Material usage variance

(*d*) Labour cost variance

(*e*) Labour rate variance

(*f*) Labour efficiency variance.

[*CA Inter*]

Solution:

(*i*) Statement showing additional claim due to escalation clause Materials

Material	*Std Qty/ Hours* (*a*)	*Std. Rate* (*b*)	*Actual Rate* (*c*)	*Variation in Rate* (₹) (*d*) = (*c* – *b*)	*Escalation claim* (₹) (*e*) = (*a* × *d*)
A	3,000	1,000	1,100	+ 100	+ 3,00,000
B	2,400	800	700	– 100	– 2,40,000
C	500	4,000	3,900	– 100	– 50,000
D	100	30,000	31,500	+ 1500	+1,50,000
					1,60,000
Labour Escalation Claim					
Labour					
*L*1	60,000	15	18	+3	+1,80,000
*L*2	40,000	30	35	+5	+2,00,000
Labour Escalation Claim					3,80,000

Statement Showing Final Contract Price

Particulars		₹
Agreed contract price		1,50,00,000
Add: Agreed escalation claim :	₹	
Material Cost	1,60,000	
Labour Cost	3,80,000	5,40,000
Final Contract Price		1,55,40,000

Dr. **(*ii*) Contract Account** **Cr.**

Date	*Particulars*	*(₹)*	*Date*	*Particulars*	*(₹)*
	To Material:			By Contractee's A/c	1,55,40,000
	A – 3,400 × ₹ 1,000				
	B – 2,300 × ₹ 700				
	C – 600 × ₹ 3,900				
	D – 90 × ₹ 31,500	1,05,25,000			
	To Labour				
	*L*1 – 56,000 × ₹ 18				
	*L*2 – 38,000 × ₹ 35	23,38,000			
	To Other Expenses	13,45,000			
	To Profit and Loss A/c	13,32,000			
		1,55,40,000			1,55,40,000

(*iii*) Material Variances

	SQ × *SP*	₹	*AQ* × *AP*	₹	*AQ* × *SP*	₹
A	3,000 × 1,000	30,00,000	3,400 × 1,100	37,40,000	3,400 × 1,000	34,00,000
B	2,400 × 800	19,20,000	2,300 × 700	16,10,000	2,300 × 800	18,40,000
C	500 × 4,000	20,00,000	600 × 3,900	23,40,000	600 × 4,000	24,00,000
D	100 × 30,000	30,00,000	90 × 31,500	28,35,000	90 × 30,000	27,00,000
	Total	99,20,000		1,05,25,000		1,03,40,000

(*a*) Material Cost Variance (***MCV***) = (*SQ* × *SP*) – (*AQ* × *AP*)
= ₹ 99,20,000 – ₹ 1,05,25,000 = ₹ 6,05,000 (*A*)

(*b*) Material Price Variance (***MPV***) = *AQ* (*SP* – *AP*) or (*AQ* × *SP*) – (*AQ* × *AP*)
= ₹ 1,03,40,000 – ₹ 1,05,25,000 = ₹ 1,85,000 (*A*)

(*c*) Material Usage Variance (***MUV***) = (*SQ* × *SP*) – (*AQ* × *SP*)
= ₹ 99,20,000 – ₹ 1,03,40,000 = ₹ 4,20,000 (*A*)

Verification

= *MCV* = *MPV* + *MUV*
= ₹ 1,85,000 (*A*) + ₹ 4,20,000 (*A*)
= ₹ 6,05,000 (*A*)

Labour Variances

SH × *SR*	₹	*AH* × *AR*	₹	*AH* × *SR*	₹
*L*1 60,000 × 15	9,00,000	56,000 × 18	10,08,000	56,000 × 15	8,40,000
*L*2 40,000 × 30	12,00,000	38,000 × 35	13,30,000	38,000 × 30	11,40,000
Total	21,00,000		23,38,000		19,80,000

(*d*) Labour Cost Variance (*LCV*) = (*SH* × *SR*) – (*AH* × *AR*)
= ₹ 21,00,000 – ₹ 23,38,000 = ₹ 2,38,000 (*A*)

(*e*) Labour Rate Variance (*LRV*) = *(AH × SR) – (AH × AR)*
= ₹ 19,80,000 – ₹ 23,38,000 = ₹ 3,58,000 (*A*)

(*f*) Labour Efficiency Variance (*LEV*) = *(SH × SP) – (AH × SP)*
= ₹ 21,00,000 – ₹ 19,80,000 = ₹ 1,20,000 (*F*)

Verification

LCV = *LRV + LEV*
= ₹ 3,58,000 (*A*) + ₹ 1,20,000 (*F*)
= ₹ 2,38,000 (*A*)

Illustration 50:

Compute the following variances from the data given below:

(*i*) Total sales margin variance; (*ii*) Sales margin volume variance; (*iii*) Sales margin price variance; (*iv*) Sales margin mix variance; (*v*) Sales margin quantity (sub-volume) variance.

Product	*Budgeted Quantity*	*Actual Quantity units*	*Budgeted sale price per unit* ₹	*Actual sale price per unit* ₹	*Standard cost per unit* ₹
X	240	400	50	45	30
Y	160	200	25	20	15

[*C.A. (Inter)*]

Solution:

Calculations

1. Actual Profit *(AP)*

Product	*Actual SP*	*Standard Cost*	*Actual Profit per unit*	*Actual Qty.*	*Actual Profit (AP)*
X	45	– 30	= 15	× 400	= 6,000
Y	20	– 15	= 5	× 200	= 1,000
					7,000

2. Budgeted Profit (*BP*)

Product	*Budgeted SP*	*Standard Cost*	*Budgeted Profit per unit*	*Budgeted Qty.*	*Budgeted Profit (BP)*
X	50	– 30	= 20	× 240	= 4,800
Y	25	– 15	= 10	× 160	= 1,600
				400	6,400

3. Standard Profit (*SP*)

Product	*Actual Qty.*	*SRP*	*Standard Profit*
A	400	20	8,000
B	200	10	2,000
	600		10,000

4. Budgeted profit per unit on actual mix $= \frac{1,000}{600} =$ ₹ 16.667

5. Revised Standard Profit (*RSP*)

Budgeted profit per unit of standard mix $= \frac{6,400}{400} =$ ₹ 16

RSP = Total Actual Quantity × ₹ 16
= 600 × 16 = ₹ 9,600

Variances :

1. Total Sales Margin Variance = $AP - BP$
   = 7,000 – 6,400 = ₹ 600 (*F*)
2. Sales Margin Volume Variance = $SRP\ (AQ - BQ)$
   X = 20 (400 – 240) = ₹ 3,200 (*F*)
   Y = 10 (200 – 160) = ₹ 400 (*F*)
   = ₹ 3,600 (*A*)
   SRP = Standard Rate of Profit *i.e.*, Budgeted Profit per unit.
3. Sales Margin Price Variance = $AQ\ (ARP - SRP)$
   X = 400 (15 – 20) = ₹ 2,000 (*A*)
   Y = 200 (5 – 10) = ₹ 1,000 (*A*)
   = ₹ 3,000 (*A*)
   ARP = Actual Rate of Profit *i.e.*, Actual profit per unit.
4. Sales Margin Mix Variance = $SP - RSP$
   = 10,000 – 9,600 = ₹ 400 (*F*)
5. Sales Margin Quantity (Sub-Volume) Variance = $RSP - BP$
   = 9,600 – 6,400 = ₹ 3,200 (*F*)

Illustration 51:

Following are the details of the product Remix for the month of April 2021:
Standard quantity of material required per unit 5 kg

Actual output	1000 units
Actual cost of materials used	₹ 7,14,000
Material price variance	₹ 51,000 (Fav)

Actual price per Kg of material is found to be less than standard price per Kg of material by ₹ 10.

You are required to calculate:

(*i*) Actual quantity and Actual price of materials used.
(*ii*) Material Usage Variance
(*iii*) Material Cost variance

Solution:

(*i*) Actual Quantity and Actual Price of Material used

Material Price Variance = Actual Quantity (Std. Price – Actual Price) = ₹ 51,000
or, $AQ\ (SP - AP)$ = ₹ 51,000
or, $10\ AQ$ = ₹ 51,000
or, AQ = ₹ 5,100 Kgs.

Actual cost of material used is given *i.e.*,
$AQ \times AP$ = ₹ 7,14,000
or, $5{,}100 \times AP$ = ₹ 7,14,000
$\therefore$ AP = ₹ 140
$\therefore$ Actual price is less by ₹ 10
So, Standard price = ₹ 140 + ₹ 10 = ₹ 150 per kg
Actual Quantity = 5,100 kgs.
Actual Price = ₹ 140/kg

(*ii*) Material Usage Variance

Std. Price (Std. Quantity – Actual Quantity)

or, $SP\ (SQ - AQ)$ = ₹ 150 (1,000 units × 5 kg – 5,100 kg) = ₹ 15,000 (*A*)

(*iii*) Material Cost Variance

= Std. Cost – Actual Cost

= $(SP \times SQ) - (AP \times AQ)$

= ₹ 150 × 5,000 – ₹ 140 × 5,100

= ₹ 7,50,000 – ₹ 7,14,000 = **₹ 36,000 (*F*)**

or Material Price Variance + Material Usage Variance

₹ 51,000 (*F*) – ₹ 15,000 (*A*) **= ₹ 36,000 (*F*)**

Illustration 52:

XYZ Limited produces an article and used a mixture of material *X* and *Y*. The standard quantity and price of material for one unit of output is as under.

Material	*Quantity*	*Price (₹)*
X	2,000 kg	1.00 per kg.
Y	800 kg	1.50 per kg.

During a period, 1500 units were produced. The actual consumption of materials and prices are given below

Material	*Quantity*	*Price (₹)*
X	31,00,000 kg	1.10 per kg.
Y	12,50,000 kg	1.60 per kg.

Calculate:

(*i*) Standard cost for actual output
(*ii*) Material Cost Variance
(*iii*) Material Price Variance
(*iv*) Material Usage Variance

Solution:

Basic Calculations:

Material	*Standard for 1,000 kg.*			*Actual for 1,000 kg.*		
	Quantity Kg.	*Rate* ₹	*Amount (₹)*	*Quantity Kg.*	*Rate* ₹	*Amount (₹)*
X	30,00,000	1	30,00,000	31,00,000	1.10	34,10,000
Y	12,00,000	1.5	18,00,000	12,50,000	1.60	20,00,000
Total	**42,00,000**		**48,00,000**	**43,50,000**		**54,10,000**

Standard quantity for Actual output 1,000 kg.

A $= \frac{2,000}{1} \times 1,500 = 30,00,000$

B $= \frac{800}{1} \times 1,500 = 12\ 00,000$

(*i*) Total standard cost for actual output = ₹ 48,00,000

(*ii*) Material Cost Variance = Std. cost for actual output– Actual cost

MCV = ₹ 48,00,000 – 54,10,000

= ₹ 6,10,000 (*A*)

(*iii*) Material Price Variance = $(SP - AP) \times AQ$

X = (1 – 1.10) × 31,00,000 = ₹ 3,10,000 (*A*)

$Y = (1.5 - 1.6) \times 12,50,000$	= ₹ 1,25,000 (*A*)
MPV	= ₹ 4,35,000 (*A*)
(*iv*) Material Usage Variance	= *(SQ – AQ) × SP*
$X = (30,00,000 - 31\ 00,000) \times 1$	= ₹ 1,00,000 (*A*)
$Y = (12,00,000 - 12,50,000) \times 1.5$	= ₹ 75,000 (*A*)
MUV	= ₹ 1,75,000 (*A*)
Verification	
MCV	= *MPV + MUV*
6,10,000 (*A*	= 4,35,000 (*A*) + 1,75,000 (*A*)

Illustration 53:

Alpha Ltd. is manufacturing Product *N*. This is manufactured by mixing two materials namely Material *P* and Material *Q*. The Standard Cost of Mixture is as under:

Material *P* 150 ltrs. @ ₹ 40 per ltr.
Material *Q* 100 ltrs. @ ₹ 60 per ltr.
Standard loss @ 20% of total input is expected during production.

The cost records for the period exhibit following consumption:

Material *P* 140 ltrs. @ ₹ 42 per ltr.
Material *Q* 110 ltrs. @ ₹ 56 per ltr.
Quantity produced was 195 ltrs.

Calculate:

(*i*) Material Cost Variance
(*ii*) Material Usage Variance
(*iii*) Material Price Variance [*CA Inter May 2018*]

Product – *N* is moving faster than Product – *M*

Solution:

Calculation:

Material	*Standard for 200 Ltrs. Output*			*Actual for 195 Ltrs. Output*		
	Qty. Ltrs.	*Rate (₹)*	*Amount (₹)*	*Qty. Ltrs.*	*Rate (₹)*	*Amount (₹)*
P	150	40	6,000	140	42	5,880
Q	100	60	6,000	110	56	6,160
Total	250		12,000	250		12,040
Less: Loss	50	–	–	55		–
	200		12,000	195		12,040

Standard Cost of actual output $= ₹ 12,000 \times \frac{195}{200} = ₹ 11,700$

Calculation of Variances

(*i*) Material Cost Variance = (Standard Cost of Actual Output – Actual Cost)
= (₹ 11,700 – ₹ 12,040)
= ₹ 340 (*A*)

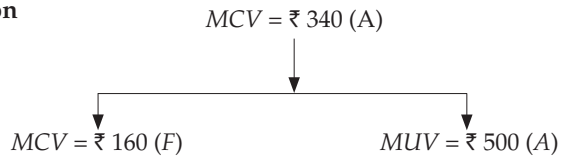
(*ii*) Material Usage Variance = (Standard Quantity for actual output – Actual Quantity) × Std. Price

Material *A* $= \left(150 \times \frac{195}{200} - 140\right) \times 40 = ₹ 250\ (F)$

Material *Q* $= \left(100 \times \frac{195}{200} - 110\right) \times 60 = ₹ 750\ (A)$

Material Usage variance = ₹ 500 (*A*)

Verification



(*iii*) Material Price Variance = *(SP – AP)* × *AQ*
Material *P* = (40 – 42) × 140 = ₹ 280 (*A*)
Material *Q* = (60 – 56) × 110 = ₹ 440 (*F*)
Material Price Variance = ₹ 160 (*F*)

Illustration 54:

The standard cost of chemical mixture is as follows:

60% of Material *A* @ ₹ 50 per kg
40% of Material *B* @ ₹ 60 per kg

A Standard loss of 25% on output is expected in production. The cost records for a period have shown the following usage.

540 kg of Material *A* @ ₹ 60 per kg
260 kg of Material *B* @ ₹ 50 per kg

The quantity processed was 680 kilograms of good product.

From the above given information

Calculate

(*i*) Material Cost Variance
(*ii*) Material Price Variance
(*iii*) Material Usage Variance
(*iv*) Material Mix Variance
(*v*) Material Yield Variance [*CA Inter Nov. 2019*]

Solution:

Basic Calculation:

Material	*Standard for 640 kg. Output*			*Actual for 650 kg. Output*		
	Qty. kg	*Rate (₹)*	*Amt. (₹)*	*Qty. kg*	*Rate (₹)*	*Amt. (₹)*
A	480	50	24,000	540	60	32,400
B	320	60	19,200	260	50	13,000
Total	800		43,200	800		45,400
Less: Loss	160	–	–	200	–	–
	640		43,200	680		45,400

Standard Cost of Actual output = ₹ 43,200 × $\frac{680}{640}$
= 45,900

(*i*) Material Cost Variance = (Std. Cost of Actual Output – Actual Cost)
= (₹ 45,900 – ₹ 45,400)
= ₹ 500 (*F*)

(*ii*) Material Price Variance = *(SP – AP)* × *AQ*
Material *A* = (50 – 60) × 540 = ₹ 5,400 (*A*)
Material *B* = (60 – 50) × 260 = ₹ 2,600 (F)
MPV = ₹ 2,800 (*A*)

(*iii*) Material Usage Variance = (Std. Quantity for Actual Output – Actual Quantity × Std. Price.

Material *A*	$= \left(480 \times \frac{680}{640} - 540\right) \times 50$	= ₹ 1,500 (*A*)
Material *B*	$= \left(320 \times \frac{680}{640} - 260\right) \times 60$	= ₹ 4,800 (*F*)
MUV		= ₹ 3,300 (*F*)

(*iv*) Material Mix Variance = *SP* × *(RAQ – AQ)*

Material *A*	= ₹ 50 × (480 kg. – 540 kg.)	= ₹ 3,000 (*A*)
Material *B*	= ₹ 60 × (320 kg. – 260 kg.)	= ₹ 3,600 (*F*)
Total	= ₹ 3,000 (*A*) + ₹ 3,600 (*F*)	= ₹ 600 (*F*)

(*v*) Material Yield Variance = *(AY – SY)* × 50
or = (*SQ – RSQ*) × *SP*

Material *A*	= (510 – 480) × 50	= ₹ 1,500 (*F*)
Material *B*	= (340 – 320) × 60	= ₹ 1,200 (*F*)
		₹ 2,700 (*F*)

Illustration 55:

K&K Ltd. produces an article by blending two basic raw materials. The following standard have been set up for raw materials:

Material	*Standard Mix*	*Standard Price per kg.*
A	40%	₹ 5.00
B	60%	₹ 4.00

The standard loss in processing is 10%. During March, 2021 the company produced 2,250 kg. of finished output.

The position of stock and purchases for the month of March, 2021 is as under:

Material	*Stock on 1.3.21*	*Stock on 31.3.21*	*Purchases during March 2021*
A	40 kg.	20 kg.	800 kg. for ₹ 4,800
B	50 kg.	15 kg.	1,800 kg. for ₹ 7,500

Calculate the following variances

(*i*) Material price variance
(*ii*) Material usage variance
(*iii*) Material yield variance
(*iv*) Material mix variance
(*v*) Material cost variance

Assume FIFO method for issue of material. The opening stock is to be valued at standard price.

Solution:

Working Notes:

(*a*) Standard input $= \frac{\text{Actual output}}{90\%} = \frac{2{,}250 \text{ kg}}{90\%} = 2{,}500 \text{ kg.}$

Standard input of material – *A*	= 2,500 kg. × 40%	= 1.000 kg.
Standard input of material – *B*	= 2,500 kg. × 60%	= 1,500 kg.

(*b*)	Actual input	= (Opening Stock + Purchases – Closing Stock)	
	Actual input of Material – *A*	= (40 kg. + 800 kg. – 20 kg.)	= 820 kg.
	Actual input of Material – *B*	= (50 kg. + 1,800 kg. – 15 kg.)	= 1,835 kg.
	Total actual input		= 2,655 kg.
(*c*)	Standard Cost		
	Material – *A*	= 1,000 kg. @ ₹ 5.00 per kg.	= ₹ 5,000
	Material – *B*	= 1,500 kg. @ ₹ 4.00 per kg.	= ₹ 6,000
			= ₹ 11,000
(*d*)	Actual Cost		
	Material – *A* 40 kg. @ ₹ 5.00 per kg.	= ₹ 200	
	780 kg. @ ₹ 6.00 per kg.	= ₹ 4,680	= ₹ 4,880
	Material – *B* 50 kg. @ ₹ 4.00 per kg.	= ₹ 200	
	1,785 kg. @ ₹ 4.20 per kg.	= ₹ 7,497	= ₹ 7,697
			= ₹ 12,577
	(*i*) Material Price Variance	= Actual Quantity (Std. Rate – Actual Rate)	
	Material – *A*	= 40 kg. (₹ 5.00 – ₹ 5.00)	= Nil
		= 780 kg. (₹ 5.00 – ₹ 6.00)	= ₹ 780 (*A*)
	Material – *B*	= 50 kg. (₹ 4.00 – ₹ 4.00)	= Nil
		= 1,785 kg. (₹ 4.00 – ₹ 4.20)	= ₹ 357 (*A*)
			= ₹ 1,137 (*A*)
	(*ii*) Material Usage Variance	= Std. Rate (Standard Quantity – Actual Quantity)	
	Material – *A*	= ₹ 5.00 (1,000 kg. – 820 kg.)	= ₹ 900 (*F*)
	Material – *B*	= ₹ 4.00 (1,500 kg. – 1,835 kg.)	= ₹ 1,340 (*A*)
			= ₹ 440 (*A*)
	(*iii*) Material Yield Variance	= Std. Rate (Std. Quantity – Revised Std. Quantity)	
	Material – *A*	= ₹ 5.00 (1,000 kg. – 2,655 × 40%)	
		= ₹ 5.00 (1,000 kg. – 1,062 kg.)	= ₹ 310 (*A*)
	Material – *B*	= ₹ 4.00 (1,500 kg – 2,655 × 60%)	
		= ₹ 4.00 (1,500 kg. – 1,593 kg.)	= ₹ 372 (*A*)
			= ₹ 682 (*A*)
	(*iv*) Material Mix Variance	= Std. Rate (Revised Std. Quantity – Actual Quantity)	
	Material – *A*	= ₹ 5.00 (2,655 × 40% – 820 kg.)	
		= ₹ 5.00 (1,062 kg. – 820 kg.)	= ₹ 1,210 (*F*)
	Material – *B*	= ₹ 4.00 (2,655 × 60% – 1,835 kg.)	
		= ₹ 4.00 (1,593 kg. – 1,835 kg.)	= ₹ 968 (*A*)
			= ₹ 242 (*F*)
	(*v*) Material Cost Variance	= Std. Cost – Actual Cost	
		= 11,000 – 12,577	= ₹ 1,577 (*A*)

Illustration 56:

The Standard labour employment and the actual labour engaged in a 40 hours week for a job are as under.

Category of Workers	*Standard*		*Actual*	
	No. of workers	*Wages Rate per hour* ₹	*No. of workers*	*Wages rate per hour* ₹
Skilled	65	45	50	50
Semi-skilled	20	30	30	35
Unskilled	15	15	20	10

Standard output: 2,000 units

Actual output: 1,800 units, Abnormal idle time 2 hours in the week

Calculate:

(*i*) Labour Cost Variance
(*ii*) Labour Efficiency Variance
(*iii*) Labour Idle Time Variance

Solution:

Basic Calculations:

Worker	*Standard Hours* (*a*)	*Standard Rate per Hour* (*b*)	*Standard Cost for Actual Output* (*c*) = (*a*) × (*b*)	*Actual Hours Paid* (*d*)	*Actual Rate per hour* (*e*)	*Actual Cost* (*f*) = (*d*) × (*e*)	*Idle time* (*f*)	*Actual hours worked* (*g*) = (*d*) – (*f*)
Skilled	2,340 hrs. [(65 workers × 40 hrs.) /2,000 units)] × 1,800 units	₹ 45	₹ 1,05,300	2,000 hrs. (50 Workers × 40 hrs.)	₹ 50	₹ 1,00,000	100 hrs (50 Workers × 2 hrs.)	1,900 hrs. (2,000 hrs. – 100 hrs)
Semi-Skilled	720 hrs. [(20 Workers × 40 hrs.) /2,000 units] × 1,800 units	₹ 30	₹ 21,600	1,200 hrs. (30 Workers × 40 hrs.)	₹ 35	₹ 42,000	60 hrs. (30 workers × 2 hrs.)	1,140 hrs. (1,200 hrs. – 60 hrs.)
Un-skilled	540 hrs. [(15 Workers × 40 hrs.) /2,000 units] × 1,800 units	₹ 15	₹ 8,100	800 hrs. (20 Workers × 40 hrs.)	₹ 10	₹ 8,000	40 hrs. (20 Workers × 2 hrs.)	760 hrs. (800 hrs. – 40 hrs.)
Total	3,600 hrs.		₹ 1,35,000	4,000 hrs.		₹ 1,50,000	200 hrs.	3,800 hrs.

Calculation of Variances:

(*i*) **Labours Cost Variance** **= Standard Cost for Actual Output – Actual Cost**
(*a*) Skilled worker = ₹ 1,05,300 – ₹ 1,00,000
= ₹ 5,300 (*F*)
(*b*) Semi-skilled Worker = ₹ 21,600 – ₹ 42,000
= ₹ 20,400 (*A*)
(*c*) Un-skilled Worker = ₹ 8,100 – ₹ 8,000
= ₹ 100 (*F*)
Total = ₹ 5,300 (*F*) + ₹ 20,400 (*A*) + ₹ 100 (*F*)
= ₹ 15,000 (*A*)

(*ii*) **Labour Efficiency Variance** **= Std. Rate × (Standard hours – Actual hours worked)**
(*a*) Skilled Worker = ₹ 45 × (2,340 hrs. – 1,900 hrs.)
= ₹ 19,800 (*F*)

(*b*) Semi-skilled Worker = ₹ 30 × (720 hrs. – 1,140 hrs.)
= ₹ 12,600 (*A*)
(*c*) Un-skilled Worker = ₹ 15 × (540 hrs. – 760 hrs.)
= ₹ 3,300 (*A*)
Total = ₹ 19,800 (*F*) + ₹ 12,600 (*A*) + ₹ 3,300 (*A*)
= ₹ 3,900 (*F*)

(*iii*) **Labour Idle Time Variance** **= Std. Rate × Idle Time (Hrs.)**
(*a*) Skilled Worker = ₹ 45 × 100 hrs.
= ₹ 4,500 (*A*)
(*b*) Semi-skilled worker = ₹ 30 × 60 hrs.
= ₹ 1,800 (*A*)
(*c*) Un-skilled worker = ₹ 15 × 40 hrs.
= ₹ 600 (*A*)
Total = ₹ 4,500 (*A*) + ₹ 1,800 (*A*) + ₹ 600 (*A*)
= ₹ 6,900 (*A*)

Illustration 57:

PJ Ltd. has furnished the following information

Standard overhead absorption rate per unit	₹ 20
Standard rate per hour	₹ 4
Budgeted production	15,000 units
Actual production	15,560 units
Actual overheads were ₹ 2,95,000 out of which ₹ 62,500 fixed	
Actual hours	74,000

Overheads are based on the following flexible budget

Production (units)	8,000	10,000	14,000
Total Overheads (₹)	1,80,000	2,10,000	2,70,000

You are required to calculate the following overhead variances (on hour's basis) with appropriate workings:

(*i*) Variable overhead efficiency and expenditure variance.
(*ii*) Fixed overheads efficiency and capacity variance.

Solution:

Working Notes:

(*a*) Variable overhead rate per unit = Difference in total overheads at two levels/ Difference in output at two level
= (2,70,000 – 2,10,000)/(14,000 – 10,000)
= 60,000/4,000 = ₹ 15 per unit
(*b*) Fixed overhead = 2,70,000 – (14,000 × 15) = ₹ 60,000
(*c*) Standard Fixed Overhead Rate per Hour = 4 – 3 = 1
(*d*) Standard Hour per Unit = Standard OH rate per unit/standard overhead rate per hour = 20/4 = 5 hours
(*e*) Actual Variable Overheads = 2,95,000 – 62,500 = 2,32,500
(*f*) Actual Variable Overheads per Hour = 2,32,500/74,000 = 3.1419
(*g*) Budgeted hours = 15,000 × 5 = 75,000 hours
(*h*) Standard variable Overhead rate per hour = Variable overheads/budgeted hours
= 15,000 × 15/75,000 = ₹ 3.00 per hour
(*i*) Standard Hours for Actual Production = 15,560 × 5 = 77,800 hours

(*i*) Variable Overhead Efficiency and Expenditure Variances

Variable Overheads Efficiency Variance = Standard rate per hour (Std. Hours – Actual Hours)

= 3 (77,800 – 74,000) = 11,400 (*F*)

Variable Overhead Expenditure Variance = Actual Hours (Std. Rate per Hour – Actual Rate per Hour)

= 74,000 (3 – 3.1419) = 10,500 (*A*)

(*ii*) Fixed Overhead Efficiency and Expenditure Variances

Fixed Overhead Efficiency Variance = Std. Rate per Hour (Std. Hours – Actual Hours

= ₹ 1 (77,800 – 74,000) = 3,800 (*F*)

Fixed Overhead Capacity Variance = Std. Rate per Hour (Actual Hours – Budgeted Hours)

= 1 (74,000 – 75,000)

= 74,000 – 75,000 = 1,000 (*A*)

Note: Standard Fixed overhead rate per hour is calculated with the help of budgeted hours and the Fixed overhead efficiency and expenditure variance is calculated as follows:

Standard fixed overheads rate per hour = Fixed overheads/budgeted hours

= 60,000/75,000 = ₹ 0.80 per hour

(*iii*) Fixed Overhead Efficiency and Capacity Variance

Fixed Overhead Efficiency Variance = Std. Rate per hour (Std. hours – Actual hours)

= ₹ 0.80 (15.560 × 5 – 74,000) = ₹ 3.040 (*F*)

Fixed Overhead Capacity Variance = Std. Rate per hour (Actual hours – Budgeted hours)

=₹ 0.80 (74,000 – 15,000 × 5) = ₹ 800 (*A*)

Illustration 58:

ABC Co. Ltd. provides the following information

	Standard	*Actual*
Production	4,000 Units	3,800 Units
Working hours	20	21
Fixed Overhead	₹ 40,000	₹ 39,000
Variable Overhead	₹ 12,000	₹ 12,000

You are required to calculate following overhead variances

(*a*) Variable Overhead Variance

(*b*) Fixed Overhead Variance

(*i*) Expenditure Variance

(*ii*) Volume Variance

Solution:

(*a*) *Calculation of Variable Overheads Variances*

(*i*) Variable Overhead Cost Variance = (Std. hrs. for Actual prod. × Std. OH rate) – Actual overhead cost

= (19 × 600) × 12,000

= 600 (*A*)

(*ii*) Variable Efficiency Variance = (Std. hrs. for actual prod. – Actual hours) × Actual overhead rate

= (19 – 21) × 600

= 1,200 (*A*)

(*iii*) Variable Overhead Expenditure Variance = (Actual hours × Std. variable overhead rate) – Actual overhead cost

= (21 × 600) – 12,000

= 12,600 – 12,000

= 600 (*A*)

Verification

Variable cost variance = *V.O.* Exp. Variance × *V.O.* Efficiency Variance
= 600 (*F*) – 1,200 (*A*)
= 600 (*A*)

(*b*) *Calculation of Fixed Overhead Variances*

(*i*) Fixed overhead expenditure variance = (Std. hours × Std. rate) – Actual overhead
= (20 × 2,000) – 39,000
= 40,000 – 39,000
= 1,000 (*F*)

(*ii*) Fixed overhead volume variance = (Std. hours for actual output – Std. hours) × Std. fixed overhead rate
= (19 – 20) × 2,000
= 2,000 (*A*)

Illustration 59:

A manufacturing concern has provided following information related to fixed overheads:

	Standard	*Actual*
Output in a month	5,000 units	4,800 units
Working days in a month	25 days	23 days
Fixed overheads	₹ 5,00,000	₹ 4,90,000

Compute:

(*i*) Fixed overhead variance
(*ii*) Fixed overhead expenditure variance
(*iii*) Fixed overhead volume variance
(*iv*) Fixed overhead efficiency variance [*CA Inter 2018*]

Solution:

Standard Fixed Overhead Rate per unit = $\frac{₹\ 5,00,000}{5,000\ \text{units}}$ = ₹ 100

(*i*) *Fixed Overhead Variance* = (Absorbed Fixed Overhead – Actual Fixed Overhead)
= [(4,800 units × ₹ 100) – ₹ 4,90,000]
= ₹ 10,000 (Adverse)

(*ii*) *Fixed Overhead Expenditure Variance* = Budgeted Overhead – Actual Overhead
= ₹ 5,00,000 – ₹ 4,90,000
= ₹ 10,000 (Favourable)

(*iii*) *Fixed Overhead Volume Variance* = Recovered Overhead – Budgeted Overhead
= [(4,800 units × ₹ 100) – ₹ 5,00,000]
= ₹ 20,000 (Adverse)

(*iv*) *Fixed Overhead Efficiency Variance* = Std. Fixed OH – Budgeted Fixed OH for Actual days
= 4,80,000 – [(5,00,000 ÷ 25) × 23]
= 20,000 (*F*)

Illustration 60:

XYZ Ltd. has furnished the following information regarding the overheads for the month of June 2022:

(*i*) Fixed Overhead Cost Variance ₹ 2,800 (Adverse)
(*ii*) Fixed Overhead Volume Variance ₹ 2,000 (Adverse)

(*iii*) Budgeted Hours for June, 2020 — 2,400 hours
(*iv*) Budgeted Overheads for June, 2020 — ₹ 12,000
(*v*) Actual Rate of Recovery of Overheads — ₹ 8 Per Hour

From the above given information calculate:

1. Fixed Overhead Expenditure Variance
2. Actual Overheads Incurred
3. Actual Hours for Actual Production
4. Fixed Overhead Capacity Variance
5. Standard Hours for Actual Production
6. Fixed Overhead Volume Variance

[*CA Inter Nov. 2018*]

Solution:

1. Fixed O/H Expenditure Variance = Fixed O/H Cost Variance (–) Fixed O/H volume variance
= – 2,800 + 2,000
= 800 (*A*)

2 Actual O/H Incurred: = Budgeted O/H – Fixed O/H Expenditure variance
= 12,000 – (800 *A*)
= ₹ 12,800

3 Actual Hours for Actual Production $= \frac{\text{Actual O/H incurred}}{\text{Actual Rate of Recovering of O/H per Hour}}$
$= \frac{12,800}{₹\ 8}$
= 1,600 Hours

4 Fixed O/H Capacity Variance = Budgeted Fixed Overhead for Actual Hours – Budgeted Fixed Overheads
= 5 × 1,600 hrs – ₹ 12,000 = ₹ 4,000 (*A*)

5 Std. Hrs for Actual Production $= \frac{12,800 - 2,800}{5}$
= 2,000 hrs

6 Volume Variance = Std. Rate of O/H Recovery × (Std. Hr. for actual production (–) Budget Hrs).
= 2,000 (*A*) = ₹ 5 × (Std. Hr for Actual Production – 2,400 Hrs)
= 400 (*A*) = Std. Hrs – 2,400 Hrs

Std. Hrs. for Actual Production = 2,000 (*F*)

Illustration 61:

Sudha Industries has a small factory where 52 workers are employed on an average for 25 days a month and they work 8 hours per day. The normal down time is 15%. The firm has introduced standard costing for cost control. Its monthly budget for November, 2021 shows that the budgeted variable and fixed overhead are ₹ 1,06,080 and ₹ 2,21,000 respectively. The firm reports the following details of actual performance for November, 2021, after the end of the month:

Actual hours worked	8,100 hrs.
Actual production expressed in standard hours	8,800 hrs.
Actual Variable Overheads	₹ 1,02,000
Actual Fixed Overheads	₹ 2,00,000

You are required to calculate

(*i*) Variable Overhead Variances
  (*a*) Variable overhead expenditure variance
  (*b*) Variable overhead efficiency variance

(*ii*) Fixed Overhead Variances
  (*a*) Fixed overhead budget variance
  (*b*) Fixed overhead capacity variance
  (*c*) Fixed overhead efficiency variance

(*iii*) Control Ratios
  (*a*) Capacity ratio
  (*b*) Efficiency ratio
  (*c*) Activity ratio

(*CA Inter Jan 2021)*

Solution:

Workings:

Calculation of budgeted hours

Budgeted hours = (52 × 25 × 8) × 85% = 8,840 hours

(*i*) **Variable Overheads Variance**

(*a*) Variable overhead expenditure variance = Std. Overhead for Actual hours – Actual variable Overhead

$$= \left(\frac{₹\ 1,06,080 \times 8,100}{8,840}\right) - ₹\ 1,02,000$$

= 4,800 (*A*)

(*b*) Variable overhead efficiency variance = Std. rate per hour × (Std. hours for actual production – Actual hours)

$$= \frac{₹\ 1,06,080}{8,840} (8,800 \text{ hours} - 8,100 \text{ hours})$$

= 8,400 (*F*)

(*ii*) **Fixed Overheads Variance**

(*a*) Fixed overheads budget variance = Budgeted overhead – Actual overhead
= ₹ 2,21,000 – ₹ 2,00,000
= 21,000 (*F*)

(*b*) Fixed overhead capacity variance = Std rate × (Actual hours – Budgeted hours)

$$= \frac{₹\ 2,21,000}{8,840} \times (8,100 - 8,840)$$

= 18,500 (*A*)

(*c*) Fixed overhead efficiency variance = Std rate × (Std hours for actual production – Actual hours)

$$= \frac{₹\ 2,21,000}{8,840} \times (8,800 - 8,100)$$

= 17,500 (*F*)

(*iii*) **Control Ratios**

(*a*) Capacity Ratio

$$= \frac{\text{Actual hours}}{\text{Budgeted hours}} \times 100$$

$$= \frac{8,800}{8,840} \times 100 = 91.63\%$$

(*b*) Efficiency Ratio

$$= \frac{\text{Standard hours}}{\text{Actual hours}} \times 100$$

$$= \frac{8,800}{8,840} \times 100 = 108.64\%$$

(*c*) Activity Ratio $= \frac{\text{Standard hours}}{\text{Budgeted hours}} \times 100$

$= \frac{8,800}{8,840} \times 100 = 99.55\%$

Illustration 62:

AB Constructions Limited has entered into a big contract at an agreed price of ₹ 1,50,00,000 subject to an escalation clause for material and labour as spent out on the contract and corresponding actuals are as follows:

Material	*Standard*		*Actual*	
	Quantity (tonnes)	*Rate per tonne* ₹	*Quantity (tonnes)*	*Rate per tonne* ₹
A	3,000	1,000	3,400	1,100
B	2,400	800	2,300	700
C	500	4,000	600	3,900
D	100	30,000	90	31,500
Labour	*Hours*	*Hourly Rate* ₹	*Hours*	*Hourly Rate* ₹
L1	60,000	15	56,000	18
L2	40,000	30	38,000	35

You are required to :

(*i*) Give your analysis of admissible escalation claim and determine the final contract price payable,

(*ii*) Prepare the Contract Account if the all expenses other than material and labour related to the contract are ₹ 13,45,000.

(*iii*) Calculate the following variances and verify them :

(*a*) Material Cost Variance

(*b*) Material Price Variance

(*c*) Material Usage Variance

(*d*) Labour Cost Variance

(*e*) Labour Rate Variance

(*f*) Labour Efficiency Variance.

Solution:

(*i*) Statement showing additional claim due to escalation clause.

Material	*Std. Qty/ Hours* (*a*)	*Std. Rate* (*b*)	*Actual Rate* (*c*)	*Variation in Rate* (₹) (*d*) = (*c* − *b*)	*Escalation claim* (₹) (*e*) = (*a* × *d*)
A	3,000	1,000	1,100	+ 100	+ 3,00,000
B	2,400	800	700	− 100	− 2,40,000
C	500	4,000	3,900	− 100	− 50,000
D	100	30,000	31,500	+ 1,500	+ 1,50,000
Material escalation claim					1,60,000
Labour					
L1	60,000	15	18	+ 3	+ 1,80,000
L2	40,000	30	35	+ 5	+ 2,00,000
Labour escalation claim					3,80,000

Statement Showing Final Contract Price

Particulars		₹
Agreed contract price		1,50,00,000
Add: Agreed escalation claim	₹	
Material Cost	1,60,000	
Labour Cost	3,80,000	5,40,000
Final Contract Price		1,55,40,000

Dr. **(*ii*) Contract Account** **Cr.**

Particulars	*(₹)*	*Particulars*	*(₹)*
To Material:		By Contractee's A/c	1,55,40,000
A – 3,400 × ₹ 1,000			
B – 2,300 × ₹ 700			
C – 600 × ₹ 3,900			
D – 90 ×₹ 31,500	1,05,25,000		
To Labour:			
*L*1 – 56,000 × ₹ 18			
*L*2 – 38,000 × ₹ 35	23,38,000		
To Other expenses	13,45,000		
To Profit and Loss A/c	13,32,000		
	1,55,40,000		1,55,40,000

(*iii*) Material Variances Calculations

	SQ × *SP*	₹	*AQ* × *AP*	₹	*AQ* × *SP*	₹
A	3,000 × 1,000	= 30,00,000	3,400 × 1,100	= 37,40,000	3,400 × 1,000	= 34,00,000
B	2,400 × 800	= 19,20,000	2,300 × 700	= 16,10,000	2,300 × 800	= 18,40,000
C	500 × 4,000	= 20,00,000	600 × 3,900	= 23,40,000	600 × 4,000	= 24,00,000
D	100 × 30,000	= 30,00,000	90 × 31,500	= 28,35,000	90 × 30,000	= 27,00,000
	Total	99,20,000		1,05,25,000		1,03,40,000

Material Cost Variance (***MCV***) = *(SQ × SP) – (AQ × AP)*
= ₹ 99,20,000 – ₹ 1,05,25,000 = ₹ 6,05,000 (*A*)

Material Price Variance (***MPV***) = *AQ (SP – AP)* or *(AQ × SP) – (AQ × AP)*
= ₹ 1,03,40,000 – ₹ 1,05,25,000 = ₹ 1,85,000 (*A*)

Material Usage Variance (***MUV***) = *(SQ × SP) – (AQ × SP)*
= ₹ 99,20,000 – ₹ 1,03,40,000 = ₹ 4,20,000 (*A*)

Verification

MCV = *MPV* + *MUV*
= 1,85,000 (*A*) + 4,20,000 (*A*)
= 6,05,000 (*A*)

Labour Variances (Calculations)

SH × *SR*	₹	*AH* × *AR*	₹	*AH* × *SR*	₹
*L*1 60,000 × 15 =	9,00,000	56,000 × 18 =	10,08,000	56,000 × 15 =	8,40,000
*L*2 40,000 × 30 =	12,00,000	38,000 × 35 =	13,30,000	38,000 × 30 =	11,40,000
Total	21,00,000		23,38,000		19,80,000

Labour Cost Variance (*LCV*) = *(SH × SR) – (AH × AR)*
= ₹ 21,00,000 – ₹ 23,38,000 = ₹ 2,38,000 (*A*)

Labour Rate Variance (*LRV*) = *(AH × SR) – (AH × AR)*
= ₹ 19,80,000 – ₹ 23,38,000 = ₹ 3,58,000 (*A*)

Labour Efficiency Variance (*LEV*) = *(SH × SP) – (AH × SP)*
= ₹ 21,00,000 – ₹ 19,80,000 = ₹ 1,20,000 (*F*)

Verification

LCV = *LRV + LEV*
= ₹ 3,58,000 (*A*) + ₹ 1,20,000 (*F*)
= ₹ 2,38,000 (*A*)

Illustration 63:

Alpha Ltd. has furnished the following standard cost data per unit of production :

Material 10 kg @ ₹ 10 per kg.
Labour 6 hours @ ₹ 5.50 per hour.
Variable Overhead 6 hours @ ₹ 10 per hour.
Fixed overhead ₹ 4,50,000 per month (Based on a normal volume of 30,000 labour hours).

The actual cost data for the month of August 2022 are as follows:

Material used 50,000 kg at a cost of ₹ 5,25,000.
Labour paid ₹ 1,55,000 for 31,000 hours worked.
Variable overheads ₹ 2,93,000.
Fixed Overheads ₹ 4,70,000.
Actual production 4,800 units.

Calculate:

(*i*) Material Cost Variance
(*ii*) Labour Cost Variance
(*iii*) Fixed Overhead Cost Variance
(*iv*) Variable Overhead Cost Variance

Solution

Budgeted Production 30,000/6 = 5,000 units
Budgeted Fixed Overhead Rate = 4,50,000/5,000
= ₹ 90 per unit

1. Material Cost Variance = Total Standard Cost for Actual Output – Total Actual Cost
= (4,800 × 10 × 10) – 5,25,000
= 4,80,000 – 5,25,000
= 45,000 (*A*)

2. Labour Cost Variance = Total Standard Cost of labour for Actual Output – Total Actual Cost of labour
= (4,800 × 6.0 × 5.50) – 1,55,000 = 1,58,400 – 1,55,000
= 3,400 (*F*)

3. Fixed OH Cost Variance = Recovered Fixed overhead – Actual Fixed overhead
= (90 × 4,800) – 4,70,000 = 4,32,000 – 47,000
= 38,000 (*A*)

4. Variable OH Cost Variance = Recovered Variable overheads – Actual Variables overheads
= (4,800 × 6 × 10) – 2,93,000
= 2,88,000 – 2,93,000
= 5,000 (*A*)

Illustration 64:

AS Limited produces a product 'Tempex' which is sold in a 10 kg. packet. The standard cost card per packet of 'Tempex' are as follows:

	₹
Direct materials 10 kg @ ₹ 45 per kg	450
Direct labour 8 hours @ ₹ 50 per hour	400
Variable Overhead 8 hours @ ₹ 10 per hour	80
Fixed Overhead	200
	1,130

Budgeted output for the third quarter of a year was 10,000 Kg. Actual output is 9,000 Kg. Actual cost for this quarter are as follows:

	₹
Direct Materials 3,900 Kg @ ₹ 46 per kg.	4,09,400
Direct Labour 7,000 hours @ ₹ 52 per hour	3,64,000
Variable Overhead incurred	72,500
Fixed Overhead incurred	1,92,000

You are required to calculate:

(*i*) Material Usage Variance
(*ii*) Material Price Variance
(*iii*) Material Cost Variance
(*iv*) Labour Efficiency Variance
(*v*) Labour Rate Variance
(*vi*) Labour Cost Variance
(*vii*) Variable Overhead Cost Variance
(*viii*) Fixed Overhead Cost Variance [*CA Inter Nov. 2013*]

Solution:

(*i*) Material Usage Variance = Standard price (Standard quantity – Actual quantity)
= ₹ 45 (9,000 – 8,900)
= **₹ 4,500 (*F*)**

(*ii*) Material Price Variance = Actual quantity (Standard price – Actual price)
= 8,900 (45 – 46)
= **8,900 (*A*)**

(*iii*) Material Cost Variance = Standard cost – Actual cost
= (9,000 × 45) – (8,900 × 46)
= 4,05,000 – 4,09,400
= **4,400 (*A*)**

(*iv*) Labour Efficiency Variance = Standard rate (Standard hours for actual output – Actual hours)

$$= 50\left(9{,}000 \times \frac{8}{10} - 7{,}000\right)$$

= **10,000 (*F*)**

(*v*) Labour Rate Variance = Actual time (Std. rate – Actual rate)
= 7,000 (50 – 52)
= **14,000 (*A*)**

(*vi*) Labour Cost Variance = Labour efficiency variance + Labour rate variance
= 10,000 + (– 14,000)
= **4,000 (*A*)**

(*vii*) Variable Overhead Cost Variance = (Standard hours × Standard rate) – Absorbed variable overhead

$$= \left(9{,}000 \times \frac{8}{10} \times 10\right) - 72{,}500$$

= **500 (*A*)**

(*viii*) Fixed Overhead Cost Variance = (Actual output × Std. hours) – Absorbed Fixed OH

$$= \left(9{,}000 \times \frac{200}{10}\right) - 1{,}92{,}500$$

= **12,000 (*A*)**

Illustration 65:

Pawan Associates undertake to prepare income tax returns for individuals for a fee. They use the weighted average method and actual costs for the financial reporting purposes. However, for internal reporting, they use a standard cost system. The standards, based on equivalent performance, have been established as follows:

Labour per return	5 hrs	@ ₹ 40 per hour
Overhead per return	5 hrs	@ ₹ 20 per hour

For March 2022 performance, budgeted overhead is ₹ 98,000 for standard labour hours allowed. The following additional information pertains to the month of March 2022:

42429	Return-in-process (25% complete)	200 Nos
	Return started in March	825 Nos
42459	Return-in-process (80% complete)	125 Nos
Cost Data:		
42429	Return-in-process labour	₹ 12,000
	Overheads	₹ 5,000
March 1 to 31	Labour : 4000 hours	₹ 1,78,000
	Overheads	₹ 90,000

You are required to compute:

(*a*) For each element, equivalent units of performance and the actual cost per equivalent unit.

(*b*) Actual cost of return-in-process on March 31.

(*c*) The standard cost per return.

(*d*) The labour rate and labour efficiency variance as well as overhead volume and overhead expenditure variance.

Solution:

(a) **Statement Showing Cost Elements Equivalent Units of Performance and the Actual Cost per Equivalent Unit**

Detail of Returns	*Detail of Input Units*	*Details*	*Equivalent Units*				
			Output Units	*Labour*		*Overheads*	
				Units	*%*	*Units*	*%*
Returns in Process at Start	200	Returns Completed in March	900	900	100	900	100
Returns Started in March	825	Returns in Process at the end of March	125	100	80	100	80
	1,025		1,025	1,000		1,000	

Costs	*Labour (₹)*	*Overheads (₹)*
From previous month	12,000	5,000
During the month	1,78,000	90,000
Total Cost	1,90,000	95,000
Cost per Equivalent Unit	190.00	95.00

(*b*) **Actual Cost of Returns in Process on March 31**

	Numbers	*Stage of Completion*	*Rate per Return (₹)*	*Total*
Labour	125 returns	0.80	190.00	19,000
Overhead	125 returns	0.80	95.00	9,500
				28,500

(*c*) **Standard Cost per Return**

Labour	= 5 Hrs. × ₹ 40 per hour	= ₹ 200
Overhead	= 5 Hrs. × ₹ 20 per hour	= ₹ 100
		= ₹ 300
Budgeted volume for March	= ₹ 98,000/1,000 Returns	= 980
Actual labour rate	= ₹ 1,73,000/4,000	= ₹ 44.50

(*d*) **Computation of Variances**

Statement Showing Output (March only) Element Wise	*Labour*	*Overhead*
Actual performance in March in terms of equivalent units as calculated above	1,000	1,000
Less: Returns in process at the beginning of March in terms of equivalent units *i.e.,* 25% of returns (200)	50	50
	950	950

Variance Analysis

Labour Rate Variance = Actual Time × (Standard Rate – Actual Rate)
or (Standard Rate × Actual Time) – (Actual Rate × Actual Time)
= ₹ 40 × 4,000 hrs. – ₹ 1,78,000 = ₹ 18,000 (A)

Labour Efficiency Variance = Standard Rate × (Standard Time – Actual Time)
or (Standard Rate × Standard Time) – (Standard Rate × Actual Time)
= ₹ 40 × (950 units × 5 hrs.) – ₹ 40 × 4,000 hrs.
= 1,90,000 – 1,60,000 = ₹ 30,000 (*F*)

Overhead Expenditure or Budgeted Variance = Budgeted Overhead – Actual Overhead
= ₹ 98,000 × ₹ 90,000 = ₹ 8,000 (*F*)

Overhead Volume Variance = Recovered/ Absorbed Overhead – Budgeted Overhead
= 950 Units × 5 hrs. × ₹ 20 – ₹ 98,000
= ₹ 3,000 (*A*)

Illustration 66:

PQR Ltd. had prepared the following estimation for the month of April:

	Quantity	*Rate (₹)*	*Amount (₹)*
Material – *A*	800 kg.	45.00	36,000
Material – *B*	600 kg.	30.00	18,000
Skilled labour	1,000 hours	37.50	37,500
Unskilled labour	800 hours	22.00	17,600

Normal loss was expected to be 10% of total input of materials and an idle labour time of 5% of expected labour hours was also estimated.

At the end of the month the following information has been collected from the cost accounting department:

The company has produced 1,480 kg. finished product by using the following:

	Quantity	*Rate (₹)*	*Amount (₹)*
Material – *A*	900 kg.	43.00	38,700
Material – *B*	650 kg.	32.50	21,125
Skilled labour	1,200 hours	35.50	42,600
Unskilled labour	860 hours	23.00	19,780

You are required to Calculate:

(*a*) Material Cost Variance;
(*b*) Material Price Variance;
(*c*) Material Mix Variance;
(*d*) Material Yield Variance;
(*e*) Labour Cost Variance;
(*f*) Labour Efficiency Variance and

Solution:

Material Variance

Labour	*SH (WN-3)*	*SR (₹)*	*SH × SR (₹)*	*RSH (WN-4)*	*RSH × SR (₹)*	*AH*	*AH × SR (₹)*	*AR (₹)*	*AH × AR (₹)*
A	940 kg.	45.00	42,300	886 kg.	39,870	900 kg.	40,500	43.00	38,700
B	705 kg.	30.00	21,150	664 kg.	19,920	650 kg.	19,550	32.50	21,125
	1,645 kg.		63,450	1,550 kg.	59,790	1,550 kg.	60,000 kg.		59,825

Working Notes:

WN-1: Standard Quantity (*SQ*)

Material *A* $= \left(\frac{800 \text{ kg.}}{0.9 \times 1,400 \text{ kg.}} \times 1,480 \text{ kg.}\right) = 939.68$ or 940 kg

Material *B* $= \left(\frac{600 \text{ kg.}}{0.9 \times 1,400 \text{ kg.}} \times 1,480 \text{ kg.}\right) = 704.76$ or 705 kg.

WN-2: Revised Standard Quantity (*RSQ*)

Material *A* $= \left(\frac{800 \text{ kg.}}{1,400 \text{ kg.}} \times 1,550 \text{ kg.}\right) = 885.71$ or 886 kg.

Material *B* $= \left(\frac{600 \text{ kg.}}{1,400 \text{ kg.}} \times 1,550 \text{ kg.}\right) = 664.28$ or 664 kg.

(*a*) **Material Cost Variance** (*A* + *B*) = (*SQ* × *SP*) – (*AQ* × *AP*)
= (63,450 – 59,825) = 3,625 (*F*)

(*b*) **Material Price Variance** (*A* + *B*) = (*AQ* × *SP*) – (*AQ* × *AP*)
= (60,000 – 59,825) = 175 (*F*)

(*c*) **Material Mix Variance** (*A* + *B*) = (*RSQ* × *SP*) – (*AQ* × *SP*)
= (59,790 – 60,000) = 210 (*A*)

(*d*) **Material Yield Variance** (*A* + *B*) = (*SQ* × *SP*) – (*RSQ* × *SP*)
= (63,450 – 59,790) = 3,660 (*F*)

Labour Variances:

Labour	*SH (WN-3)*	*SR (₹)*	*SH × SR (₹)*	*RSH (WN-4)*	*RSH × SR (₹)*	*AH*	*AH × SR (₹)*	*AR (₹)*	*AH × AR (₹)*
Skilled – A	1,116 hrs.	37.50	41,850	1,144	42,900	1,200	45,000	35.50	42,600
Un-skilled – B	893 hrs.	22.00	19,646	916	20,152	860	18,920	23.00	19,780
	2,009 hrs.		61,496	2,060	63,052	2,060	63,920		62,380

WN-3: Standard Hours (*SH*)

Skilled labour $= \left(\frac{0.95 \times 1{,}000\text{hrs.}}{0.90 \times 1{,}400\text{kg.}} \times 1{,}480\text{kg.}\right)$ = 1,115.87 or 1,116 hrs.

Unskilled labour $= \left(\frac{0.95 \times 800\text{hrs.}}{0.90 \times 1{,}400\text{kg.}} \times 1{,}480\text{kg.}\right)$ = 892.69 or 893 hrs.

WN-4: Revised Standard Hours (*RSH*)

Skilled labour $= \left(\frac{1{,}000\text{hrs.}}{1{,}800\text{hrs.}} \times 2{,}060\text{hrs.}\right)$ = 1144.44 or 1,144 hrs.

Unskilled labour $= \left(\frac{800\text{hrs.}}{1{,}800\text{hrs.}} \times 2{,}060\text{hrs.}\right)$ = 915.56 or 916 hrs.

(*a*) **Labour Cost Variance (Skilled + Unskilled)** = (*SH* × *SR*) – (*AH* × *AR*)
= (61,496 – 62,380) = 884 (*A*)

(*b*) **Labour Efficiency Variance (Skilled + Unskilled)** = (*SH* × *SR*) – (*AH* × *SR*)
= (61,496 – 63,920) = 2,424 (*A*)

OBJECTIVE QUESTIONS

I. Choose the correct answer

A. Standard costing involves the:
(*a*) Fixation of estimated cost (*b*) Determination of standard cost
(*c*) Setting of budgeted cost (*d*) None of these

B. The difference between actual cost and standard cost is known as:
(*a*) Variance (*b*) Profit
(*c*) Differential cost (*d*) Balance

C. Standard costing helps in
(*a*) Measuring efficiency (*b*) Reducing losses
(*c*) Controlling cost (*d*) Reducing Cost

D. Standard costing cannot be used:
(*a*) Where management is inefficient (*b*) Workers are slow
(*c*) Where non-standard products are manufactured: (*d*) Financial Accounting is not used

E. Basic standard is established for a:
(*a*) Short period (*b*) Current period
(*c*) Indefinite period (*d*) Post period

Ans: A. (b) B. (a) C. (a) D. (c) E. (c).

II. Correct the following

(*a*) Material Price Variance = Standard Quantity × (Standard Price – Actual Price)
(*b*) Material Mix Variance = Standard Cost of Standard Mix – Actual Cost of Actual Mix
(*c*) Idle Time Variance = Idle Hours × Actual Rate
(*d*) Expenditure Variance = (Budgeted Fixed Overheads – Standard Fixed Overheads
(*e*) Sales Price Variance = Standard Quantity (Actual Price – Standard Price)

Ans: (a) Actual quantity (b) Standard cost of actual mix (c) Standard Rate
(d) Actual Fixed Overheads (d) Actual Quantity

III. Fill in the blanks

(*a*) Three types of standards are ..... .
(*b*) Idle time variance is ..... .
(*c*) The technique of standard costing may not be applicable in case of ..... .
(*d*) Total labour cost variance ..... .
(*e*) Material usage variance = Material Mix Variance + ...

Ans: (a) Current Standard, Basic Standard and Normal Standard (b) Idle Time × Standard Rate
(c) Small Concerns (d) Wage Rate Variance + Labour Efficiency Variance
(e) Material Yield Variance

ASSIGNMENTS

Theoretical Questions

1. Define "Standard Cost" and "Standard Costing". In which type of industries standard costing is employed.
2. What is meant by standard costing? State its main objectives.
3. 'Standard costs today are basis for a proper managerial control of manufacturing operation'. Define standard cost and explain the above statement.
4. What are the various circumstances in which material price and usage variances are likely to arise?
5. Define and explain briefly the following terms:
   (*a*) Material Price Variance (*b*) Material Usage Variance
   (*c*) Material Mix Variance (*d*) Material Yield Variance
6. Indicate briefly, the meaning, causes and disposal of the following types of variances:
   (*i*) Material Price Variance (*ii*) Material Quantity Variance
   (*iii*) Wage Rate Variance (*iv*) Labour Efficiency Variance
   (*v*) Overhead Budget Variance (*vi*) Overheads Capacity Variance
   (*vii*) Overhead Volume Efficiency Variance
7. 'Setting of standards is the most vital and critical step in standard costing technique'. Discuss the above statement and show the standards are fixed for direct material and direct labour.
8. Explain the possible causes for Material Price Variances and Material Usage Variance in standard costing. What are remedial measures.

Numerical Questions

1. The standard material and standard cost per kg of material required for the production of one unit of Product *A* is as follows;
   Material 5 kg Standard Price ₹ 5 per kg.
   The actual production and related material data are as follows:
   400 units of Product *A*

Material used	2,200 kg
Price of Material	₹ 4.80 per kg

Calculate (*i*) Material Cost Variance (*ii*) Material Usage Variance (*iii*) Material Price Variance.

Ans. (i) ₹ 560 (A), (ii) ₹ 1,000 (A), (iii) ₹ 440 (F)

2. A manufacturing concern which has adopted standard costing furnishes the following information:

Standard	
Material (for 70 kg. of finished products)	100 kg
Price of materials	₹ 1 per kg
Actual:	
Output	2,10,000 kg
Materials used	2,80,000 kg
Cost of materials	₹ 2,52,000

Calculate :

(*a*) Material Usage Variance

(*b*) Material Price Variance

(*c*) Material Cost Variance.

Ans. (a) ₹ 20,000 (F); (b) ₹ 28,000 (F) (c) ₹ 48,000 (F)

Hint: *Standard Quantity for Actual Output*

2,10,000 × 100/70 = 3,00,000 kg;

Actual rate per kg 2,52,000/2,80,000 = 0.90

3. Gemini Chemical Industries provide the following information from their records:

For making 10 kg of GEMCO the standard material requirement is:

Material	*Quantity (kg)*	*Rate per kg (₹)*
A	8	6.00
B	4	4.00

During April, 2022, 1,000 kg. of GEMCO were produced. The actual consumption of materials is as under:

Material	*Quantity (kg)*	*Rate per kg (₹)*
A	750	7.00
B	500	5.00

Calculate:

(*a*) Material Cost Variance;

(*c*) Material Usage Variance.

(*b*) Material Price Variance

Ans. DMCV = ₹ 1,350 (A), DMPV ₹ 1,250 (A), DMUV ₹ 100 (A)

Hint: *Standard Cost for Actual Output ₹ 6,400, Actual Cost ₹ 7,750*

4. The standard quantity and standard price of raw material required for one unit of product *A* are given as follows:

Material	*Quantity*	*Standard Price*
X	2 kg	₹ 3 per kg
Y	4 kg	₹ 2 per kg
	6 kg	

The actual production and relevant data are as follows:

Material	*Total Quantity for 500 units*	*Total Cost* ₹
X	1,100 kg	₹ 3,410
Y	1,800 kg	₹ 2,960

Calculate material variances

Ans. Material Cost Variance = 410 (A) + 40 (F) = 370 (A)
Material Usage Variance = 300 (A) + 400 (F) = 100 (F)
Material Price Variance = 110 (A) + 360 (A) = 470 (A)

5. From the following information of Production No. 142 calculate (1) Material Cost Variance (2) Material Mix Variance (3) Material Sub-usage Variance (4) Material Price Variance.

Material	*Standard Quantity Kg*	*Standard Price* ₹	*Actual Quantity Kg.*	*Actual Price* ₹
X	10	5	12	4.00
Y	8	4	7	4.50
Z	6	3	5	3.25
	24		24	

Ans. Material Cost Variance ₹ 2.00 (F) + 0.50 (F) + 1.75 (F) = 4.25 (F)
Material Price Variance ₹ 12.00 (F) + 3.50 (A) + 1.25 (A) = 7.25 (F)
Material Mix Variance ₹ 10 (A) + 4 (F) + 3 (F) = ₹ 3 (A)
Material Sub usage Variance. Since input and output is same there is no difference in Standard Quantity and RSQ, hence no sub usage variance

6. From the following figures given to you, calculate material variances.

Production for the period 192 units

	Material X	*Material Y*
Standard price per ton	₹ 240	₹ 320
Actual price per ton	₹ 227.50	₹ 308
Actual weight	16 tons	13 tons

The standard production for the period represented by the above figures is 400 units for which the standard quantity for material are 30 tons of *X* and 25 tons of *Y*.

Ans. Material Cost Variance = 184 (A) + 164 (A) = ₹ 348 (A)
Material Price Variance = 200 (F) + 156 (F) = ₹ 356 (F)
Material Mix Variance = 43.64 (A) + 58.18 (F) = 14.54 (F)
Material Sub-usage Variance = 340.36 (A) + 378.18 (A) = 718.54 (A)
Material Usage Variance = 704 (A) Mix Variance + Sub-usage Variance

7. Given the following information, calculate material yield variance.

Material	*Standard*			*Actual*		
	Qty kg.	*Price per unit* ₹	*Total* ₹	*Qty kg.*	*Price per unit* ₹	*Total* ₹
A	200	5	1,000	200	5	1,000
B	500	3	1,500	500	3	1,500
	700		2,500	700		2,500
Less: Normal Wastage	75			Actual wastage	100	
Output	625			600		

Ans. MYV = ₹ 100 (A)

8. 80 kgs. of Material *A* at a standard price of ₹ 2 per kg and 40 kgs of Material *B* at a standard price of ₹ 5 per kg were to be used to manufacture 100 kgs of a Chemical.

During a month, 70 kgs of Material *A* priced at ₹ 2.10 per kg and 50 kgs of Material *B* priced at ₹ 4.50 per kg. were actually used and the output of the Chemical was 102 kgs.

Find out the Material Variances. [*CMA Inter*]

Ans. DMCV ₹ 4.8 (A), DMPV ₹ 18 (F), DMUV ₹ 22.8 (A) DMMV ₹ 30 (A) DMYV ₹ 7.20 (F).

Hints: *Standard Output 100 kg, Actual output 102 kg]*

9. The Standard Cost of a certain chemical mixture is

40% Material *A* at 200 per ton

60% Material *B* at 300 per ton

A standard loss of 10% is expected in production. During a period there is used,

90 tons Material *A* at the cost of ₹ 180 per ton

110 tons Material *B* at the cost of ₹ 340 per ton.

The weight produced is 182 tons of production. Calculate (*a*) Material Price Variance (*b*) Material Usage Variance (*c*) Material Mix Variance (*d*) Material Yield Variance.

[*CS Inter*]

Ans. Material Price Variance ₹ *2,600 (A); Material Usage Variance* ₹ *1,577.77 (F), Material Mix Variance* ₹ *1,000 (F), Material Yield Variance* ₹ *577.77 (F).*

10. A company manufacturing 'distempers' operates a costing system. The standard cost of one of the products of the company shows the following standards:

Materials	*Quantity*	*Standard price per kg*	*Total*
		₹	₹
A	40 kg	75	3,000
B	10 kg	50	500
C	50 kg	20	1,000
Material cost per unit (Total)			4,500

The standard input of mix is 100 kg. and the standard output of the finished product is 90 kg. The actual results for period are:

A	2,40,000 kg	@ ₹ 80 per kg.
B	40,000 kg	@ ₹ 52 per kg.
C	2,20,000 kg	@ ₹ 21 per kg.
Actual output of the finished product	4,20,000 kg	

You are required to calculate the material price, mix and yield variances. *[CIMA Inter]*

[Ans. DMCV ₹ *49,00,000 (A), DMPV* ₹ *15,00,000 (A), DMUV* ₹ *34,00,000 (A), DMMV* ₹ *19,00,000, DMYV* ₹ *15,00,000 (A).*

Hint*: Standard output 4,50,000 kg, Actual Output 4,20,000 kg, Standard Cost per unit* ₹ *50*

11. The standard material cost for a normal mix of one tonne of Chemical *X* is based on:

Chemical	*Usage kg*	*Price per kg.* ₹
A	240	6
B	400	12
C	640	10

During a month, 6.25 tonnes of *X* were produced from:

Chemical	*Consumption (Tonnes)*	*Cost (₹)*
A	1.6	11,200
B	2.4	30,000
C	4.5	47,250
	8.5	88.450

Analyse the variances. (*CA*)

Ans. DMCV ₹ *9,450 (A), DMPV* ₹ *5,050 (A); DMUV* ₹ *4,400 (A), DMMV* ₹ *537.5 (F) DMYV* ₹ *4,937.5 (A)*

Hint*. Standard cost for Actual output* ₹ *79,000 Actual Cost* ₹ *88,450; Standard Cost per unit* ₹ *12,640]*

12. The following information is gathered from the labour records of Ramesh & Co.

Payroll allocation for direct labour ₹ 20,000.

Time card analysis show: that 9,000 hours were worked on production lines.

Production reports for the period showed that 4,000 units have been completed, each having standard labour time of 1.5 hours and a standard labour rate of ₹ 2 per hour.

Calculate the labour variances.

Ans: Labour Rate Variance ₹ 2,000 (A); Labour Efficiency Variance ₹ 6,000 (A); Labour Cost Variance ₹ 8,000 (A).

Hint: *Standard time for one unit : 1.5 hours; For 4,000 Units : 6,000 hours*

13. Using the following information, calculate each of three labour variances for each department.

	Dept X	*Dept Y*
Gross Direct Wages (₹)	28,080	19,370
Standard hours produced	8,640	6,015
Standard Rate per hour (₹)	3	3.40
Actual hours worked	8,200	6,345

Ans. Labour Cost Variance X ₹ 2,160 (A); Y 1,081 (F)
Labour Rate Variance X ₹ 3,480 (A); Y 2,203 (F)
Labour Efficiency Variance X ₹ 1,320 (F), Y 1,122 (A)

14. The details regarding composition and the weekly wage rate of labour force engaged on a job scheduled to be completed in 30 weeks are as follows:

Category of Workers	*Standard*		*Actual*	
	No. of labourers	*Weekly wage rate (₹)*	*No. of labourers*	*Weekly wage rate (₹)*
Skilled	75	60	70	70
Semi-skilled	45	40	30	50
Unskilled	60	30	80	20

The work is actually completed in 32 weeks. Calculate the various labour variances.

Ans. DLCV ₹ 13,000 (A) DLRV ₹ 6,400 (A); DLEV ₹ 6,600 (A)
DL Mix or Gang V = ₹ 9,600 (F) Revised LEV ₹ 16,200 (A).

15. Standard labour hours and rates for production of Article *A* are given

	Hours	*Rate*	*Total*
		₹	₹
Skilled Worker	5	1.50 per hour	7.50
Unskilled worker	8	0.50 per hour	4.00
Semi-skilled worker	4	0.75 per hour	3.00
			14.50

Actual data:

Articles Produced (1,000 Units)			
Skilled worker	4,500	2.00	9,000
Unskilled worker	10,000	0.45	4,500
Semi-skilled worker	4,200	0.75	3.150
			16,650

Calculate (*a*) Labour Cost Variance (*b*) Labour Rate Variance (*c*) Labour Efficiency Variance (*d*) Labour Mix Variance.

Ans. Labour Cost Variance ₹ 2,150 (A); Labour Price Variance ₹ 1,750 (A),
Labour Mix Variance ₹ 1,050 (F) Labour Efficiency Variance 400 (A),
Revised Efficiency Variance ₹ 1,450 (F)

16. The following details relating to the Product *X* during the month of March are available. You are required to compute the material and labour cost variances and also to reconcile the standard and the actual costs with the help of such variances:

Standard Cost per Unit:

Materials	50 kg. @ ₹ 40 per kg.
Labour	400 hours @ ₹ 1 per hour

Actual Cost for the months

Material	4,900 kgs. @ ₹ 42 per kg.
Labour	39,600 hours @ ₹ 1.10 per hour.

Actual Production – 100 units

[*CMA Inter*]

Ans. Direct Material Cost Variance ₹ *5,800 (A), DMPV* ₹ *9,800 (A), DMUV* ₹ *4,000 (F)*
Direct Labour Cost Variance ₹ *3,560 (A), DLRV* ₹ *3,960 (A); DLEV* ₹ *400 (F)*
Total Standard Cost of 100 units ₹ *2,40,000 Actual Cost of 100 unit* ₹ *2,49,360.*

17. Following data are available :

		Standard	₹		*Actual*	₹
Input	500 kg	Material 500 kg @ ₹ 39 per kg	19,500	500 kg	Material @ ₹ 42 per kg	21,000
		Labour 4,000 hours @ ₹ 1.50 per hour	6,000		Labour 4,000 hours @ ₹ 1.50 per hour	6,000
Normal Loss	20			40		
Output	480		25,500	460 kg		27,000

Calculate (*i*) Material Cost Variance (*ii*) Material Price Variance (*iii*) Material Yield Variance (*iv*) Labour Cost Variance (*v*) Labour Price Variance (*vi*) Labour Yield Variance.

Ans. Standard Quantity for actual production = 500 × 460/480 = 479.16667 kg.
Standard labour for actual production = 4,000 × 460/480 = 3,833.3333 hrs.
Material Cost Variance ₹ *2,312.50 (A); Material Price Variance* ₹ *1,500 (A)*
Material Yield Variance ₹ *812.50 (A) Labour Cost Variance* ₹ *250 (A),*
Labour Rate Variance Nil; Labour Yield Variance ? 250 (A).

18. From the following data, calculate Overhead Cost Variance and Overhead Budget Variance Budgeted hours for month of March: 180 hours, Actual production for March: 9,200 units; Standard rate of articles produced per hour: 50 units, Actual hour for production: 175 hrs. Budgeted Fixed Overheads ₹ 2,700, Actual Fixed Overheads: ₹ 2,800.

Ans. Overhead Cost Variance ₹ *40 (A); Overhead Budget or Expenditure Variance* ₹ *100 (A)*

19. (*a*) From the data of above Question, Calculate Overhead Volume Variance (*i*) when standard overhead rate per unit is given (*ii*) when standard overhead rate per hour is given.

Ans. (i) (9,200 – 9,000) × 0.30 = ₹ *60 (F) (ii), (184 – 180) × 15 =* ₹ *60 (F)*

(*b*) From the data given in the above Question calculate Overhead Efficiency Variance and Overhead Capacity Variance. *Ans.* ₹ *135 (F);* ₹ *75 (A)*

20. (*a*) The Budget for a period indicates:

Works Overhead Fixed	₹ 50,000	Works Overhead Variable	₹ 1,50,000
Normal Activity	100%		

During the period the actual activity was only 70% of the normal load for a total expenditure of ₹ 1,50,000. What are the budget and volume variances?

(*b*) Determine the budget and capacity variances from the following data:

Estimated Factory Overhead	₹ 25,000	Actual Overhead Expenses	₹ 26,500
Estimated Direct Labour Hrs.	5,000	Applied Overhead Expense	₹ 22,500

[*CMA - Inter*]

Ans. (a) Budgeted Works Overhead for Actual Quantity ₹ 1,55,000
Recovered Works Overhead for Actual Activity ₹ 1,40,000;
Overhead Budget Variance ₹ 5,000 (F);
Overhead Volume Variance ₹ 15,000 (A).
(b) Overhead Budget Variance ₹ 1,500 (A);
Overhead Capacity Variance ₹ 2,500 (A)]

21. In Department *A*, the following data is submitted for the week ended 31st October:

Standard Output for 40 hours per week	1,400 units
Standard Fixed Overhead	₹ 1,400
Actual Output	1,200 units
Actual Hours Worked	32 hours
Actual Fixed Overhead	₹ 1,500

Prepare a Statement of Fixed Overhead Variances

[*CA Inter]*

Ans. St. Overhead Rate per unit ₹ 1, St Fixed Overhead Rate per hour ₹ 35.
Standard output per hour 35 units; Fixed Overhead Cost Variance ₹ 300 (A);
Fixed Overhead Expenditure Variance ₹ 100 (A);
Fixed Overhead Volume Variance ₹ 200 (A);
Fixed Overhead Capacity Variance ₹ 80 (F)

22. The following information is available from the records of factory:

	Budget	*Actual*
Fixed overhead for June (₹)	10,000	12,000
Production in June (units)	2,000	2,100
Standard time per unit (hours)	10	
Actual hours worked in June	22,000	

Compute

(*i*) Fixed Overhead Cost Variance (*ii*) Expenditure Variance
(*iii*) Volume Variance (*iv*) Capacity Variance
(*v*) Efficiency Variance

[*CA Inter*]

Ans. (i) FOCV ₹ 1,500 (A), (ii) FOEXPV ₹ 2,000 (A) (iii) FOVV ₹ 500 (F)
(iv) FOCAPV ₹ 1,000 (F); (v) FOEFV ₹ 500 (A)]

23. The following information was obtained from the records of a manufacturing unit using Standard Costing System:

	Standard	*Actual*
Production	4,000 units	3,800 units
Working Days	20	21
Fixed Overhead	₹ 40,000	₹ 39,000
Variable Overhead	₹ 12,000	₹ 12,000

You are required to calculate the following Overhead Variances:

(*a*) Variable Overhead Variances
(*b*) Fixed Overhead Variance

(*i*) Expenditure Variance (*ii*) Volume Variance
(*iii*) Efficiency Variance (*iv*) Calendar Variance

(*c*) Also prepare a Reconciliation Statement for the standard fixed expenses worked but at Standard Fixed Overhead Rate and the Actual Fixed Overhead.

[*CA Inter*]

Ans. St. Variable overhead rate per unit ₹ *3, St. Production per day 200 units, St Fixed overhead per day* ₹ *2,000.*

(a) Variable Overhead Variance ₹ *600 (A).*

(b) Fixed Overhead Cost Variance ₹ *1,000 (A);*

Fixed Overhead Exp. Variance ₹ *1,000 (F);*

Fixed Overhead Volume Variance ₹ *2,000 (A);*

Fixed Overhead Efficiency Variance ₹ *4,000 (A);*

Fixed Overhead Calender Variance ₹ *2,000 (F).*

(c) Reconciliation – Standard Fixed Overhead (3,800 × 10) = ₹ *38,000*
Less [Fixed Overhead Expenditure Variance ₹ *1,000 (F)*
+ Fixed Overhead Calender Variance ₹ *2,000 (F)]*
Add Fixed Overhead Efficiency Variance ₹ *4,000 (A)*
= Actual Fixed Overhead ₹ *39,000]*

24. AH Ltd. furnishes the following information relating to budgeted sales and actual sales for the month of April,

	Product	*Sales Quantity Units*	*Selling Price Per unit.*
Budgeted Sales			₹
	A	1,200	15
	B	800	20
	C	2,000	40
Actual Sales			
	A	880	18
	B	880	20
	C	2,640	38

Calculate the following Variances:
(*i*) Sales Quantity or Volume Variance (*iii*) Sales Price Variance
(*ii*) Sales Mix Variance (*iv*) Total Sales Variance

[C.A. Inter]

Ans. (i) ₹ *22,400 (F), (ii)* ₹ *11,000 (F), (iii)* ₹ *2,640 (A) (iv)* ₹ *19,760 (F)*

25. From the following information about sales, calculate.
(*a*) Total Sales Variance (*b*) Sales Price Variance
(*c*) Sales Volume Variance (*d*) Sales Mix Variance
(*e*) Sales Revised Quantity Variance

Product	*Standard*			*Actual*		
	Nos	₹ *in unit*	₹	*Nos.*	₹ *per unit*	*unit*
A	5,000	5	25,000	6,000	6	36,000
B	4,000	6	24,000	5,000	5	25,000
C	3,000	7	21,000	4,000	8	32,000
	12,000		70,000	15,000		93,000

[*CA Inter*]

Ans. (a) Total Sales Variance ₹ 23,000 (F);
(b) Sales Price Variance ₹ 5,000 (F);
(c) Sales Volume Variance ₹ 18,000 (F);
(d) Sales Mix Variance ₹ 500 (F); Sales Quantity Variance ₹ 17,500 (F)

26. From the following data Calculate (1) Sales Value Variance (2) Sales Price Variance (3) Sales Mix Variance (4) Sales Sub-Volume Variance.

Product	*Standard*			*Actual*		
	Qty.	*Sale*	*Total*	*Qty*	*Sale*	*Total*
	(Kg.)	*Price* ₹	₹	*Kg*	*Price* ₹	₹
x	500	5	2,500	500	5.00	2,500
y	400	6	2,400	600	6.25	3,750
z	300	7	2,100	400	6.75	2,700
	1,200		7,000	1,500		8,950

Ans. Sales Value Variance ₹ 1,950 (F); Sales Price Variance ₹ 50 (F)
Sales Mix Variance ₹ 150 (F) Sales Sub-Volume Variance ₹ 1,750 (F).

27. From the following budgeted and actual figures, calculate the variance on sales margin basis.

Budget

Sales – 2,000 units @ ₹ 15 each		₹ 30,000
Cost of Sales @ ₹ 12 each		24,000
	Profit	6,000

Actual

Sales – 1,900 units @ ₹ 14 each		26,600
Cost of Sales @ ₹ 10 each		19,000
	Profit	7,600

Ans. Sales Margin Quantity Variance ₹ 300 (A), Sales Margin Price Variance ₹ 1,900 (F);
Total Sales Margin Variance ₹ 1,600 (F)

28. Compute the sales variances (total, price and volume) from the following figures :

Product	*Budgeted quantity*	*Budgeted Price per Unit (₹)*	*Actual quantity*	*Actual Price per Unit (₹)*
P	4,000	25	4,800	30
Q	3,000	50	2,800	45
R	2,000	75	2,400	70
S	1,000	100	800	105

[CA Inter]

Ans. SPV ₹ 2,000 (F), SVV ₹ 20,000 (F).

Appendix

A

Recent Developments in Cost Accounting

There are certain noteworthy emerging trends in Cost and Management Accounting. Some relevant concepts and terms are narrated below briefly.

Chapter Outline

- Life Cycle Costing
- Target Costing
- Kaizen Costing
- Throughput Costing
- Back-flush Costing
- Lean Accounting
- Socio Economic Costing
- Enterprise Resource Planning (*ERP*)
- Value Analysis and Value Engineering
- Theory of Constraints
- Business Process Re-engineering
- Just in Time (*JIT*)
- Activity Based Cost Management
- Bench Marking
- Total Quality Management (*TQM*)
- Praise Analysis
- Six Sigma
- Pareto Analysis
- Quality Costs

LIFE CYCLE COSTING

Life Cycle Costing; aims at cost ascertainment of a product, project *etc*., over its projected life. It is a system that tracts and accumulates the actual costs and revenues attributable to be cost object (i.e., product) from its inception to its abandonment. Sometimes the terms; cradle-to-grave costing and womb-to-tomb costing convey the meaning of fully capturing all costs associated with the product from its initial to its final stages.

TARGET COSTING

Target Costing: This technique has been developed in Japan. It aims at profit planning. It is a device to continuously control costs and manage profit over a product's life cycle. In short, it is a part of a comprehensive strategic profit management system. For a decision to enter a market prices of the competitors' products are given due consideration. Target Costing initiates cost management at the earliest stages of product development and applies it throughout the product life cycle by actively involving the entire value chain. In the product concept stage selling price and required profit are set after consideration of the medium term profit plans, which links the operational strategy to the long-term strategic plans.

Target Cost = Planned Selling Price – Required Profit.

From this, the necessary target cost can be arrived at. Target cost, then, becomes the residual or allowable sum. If it is thought that the product cannot generate the required profit, it will not be produced as such and aspects of the product would be redesigned until the target is met. Value engineering and value analysis may be used to identify innovative and cost effective product features in the planning and concept stages. Throughout the product's life target costing continues to be used to control costs. After the initial startup stage target costs will be set through short-period budget. Thus all costs including both variable and fixed overheads are expected to reduce on a regular (monthly) basis. Target profit is a commitment agreed by all the people in a firm, who have any part to play in achieving it.

KAIZEN COSTING

The initial review may not be complete and perfect in all cost aspects. There may be further chances of waste reduction, cost and time reduction and product improvement. Such continuous cost reduction technique is called as Kaizen Costing.

The review of product costs under the target costing methodology is not reserved just for the period up to the completion of design work on a new product. There are always opportunities to control costs after the design phase is completed, though these opportunities are fewer than during the design phase.

Kaizen Costing refers to the ongoing continuous improvement program that focuses on the reduction of waste in the production process, thereby further lowering costs below the initial targets specified during the design phase. It is a *Japanese term* for a number of cost reduction steps that can be used subsequent to issuing a new product design to the factory floor.

THROUGHPUT COSTING

Throughput Accounting is a management accounting technique used as a performance measure in the theory of constraints. It is the business intelligence used for maximizing profits. It focuses importance on generating more throughput. It seeks to increase the velocity or speed of production of products and services keeping in view of constraints. It is based on the concept that a company must determine its overriding goal and then it should create a system that clearly defines the main capacity constraint that allows it to maximize that goal. The changes that this concept causes are startling.

Throughput accounting is a system of performance measurement and costing which traces costs to throughput time. It is claimed that it complements JIT principles and forces attention to the true determinants of profitability. Throughput accounting is defined as follows:

"A management accounting system which focuses on ways by which the maximum return per unit of bottleneck activity can be achieved".

BACK-FLUSH ACCOUNTING

Back-flush accounting is when you wait until the manufacture of a product has been completed, and then record all of the related issuances of inventory from stock that were required to create the product. This approach has the advantage of avoiding all manual assignments of costs to products during the various production stages, thereby eliminating a large number of transactions and the associated labour.

This system records the transaction only at the termination of the production and sales cycle. The emphasis is to measure cost at the beginning and at the end with greater emphasis on the end or outputs. Since back flushing is usually employed in parallel with *JIT*, there is no work-in-progress to be considered nor, does work -in-progress materially fluctuate. What is essential, however, is an accurate bill materials goods measures of yield generally effective production control and accurate engineering change notice when yields do change.

LEAN ACCOUNTING

What we now call lean manufacturing was developed by Toyota and other Japanese companies. Toyota executives claim that the famed Toyota Production System was inspired by what they learned during visits to the Ford Motor Company in the 1920s and developed by Toyota leaders such as Taiichi Ohno and consultant Shigeo Shingo after World War II. As pioneer American and European companies embraced lean manufacturing methods in the late 1980s, they discovered that lean thinking must be applied to every aspect of the company including the financial and management accounting processes.

Lean Accounting is the general term used for the changes required to a company's accounting, control, measurement, and management processes to support lean manufacturing and lean thinking. Most companies embarking on lean manufacturing soon find that their accounting processes and management methods are at odds with the lean changes they are making. The reason for this is that traditional accounting and management methods were designed to support traditional manufacturing; they are

based upon mass production thinking. Lean manufacturing breaks the rules of mass production, and so the traditional accounting and management methods are (at best) unsuitable and usually actively hostile to the lean changes the company is making.

SOCIOECONOMICS COSTING

Socioeconomics (also known as social economics) is the social science that studies how economic activity affects and is shaped by social processes. In general, it analyzes how societies progress, stagnate, or regress because of their local or regional economy, or the global economy.

Socioeconomics is sometimes used as an umbrella term with different usages. The term 'social economics' may refer broadly to the "use of economics in the study of society."

In many cases, socioeconomists focus on the social impact of some sort of economic change. Such changes might include a closing factory, market manipulation, the signing of international trade treaties, new natural gas regulation, *etc*. Such social effects can be wide-ranging in size, anywhere from local effects on a small community to changes to an entire society. Examples of causes of socioeconomic impacts include new technologies such as cars or mobile phones, changes in laws, changes in the physical environment (such as increasing crowding within cities), and ecological changes (such as prolonged drought or declining fish stocks). These may affect patterns of consumption, the distribution of incomes and wealth, the way in which people behave (both in terms of purchase decisions and the way in which they choose to spend their time), and the overall quality of life.

Companies are increasingly interested in measuring socio-economic impact as part of maintaining their license to operate, improving the business enabling environment, strengthening their value chains, and fueling product and service innovation.

ENTERPRISE RESOURCE PLANNING (*ERP*)

Enterprise Resource Planning (*ERP*) is the latest high-end solution which information technology has lent to business application. The *ERP* solution seek to streamline and integrate operation process and information flows in the company to synergies the resources of an organisation namely men, material, money and machine though information. Initially implementation of an *ERP* packages was possible only for large multinationals and infrastructure companies due to high cost. Today, many companies in India have gone in for implementation of *ERP*. It is expected that in the next future, 60 per cent of the companies will be implementing one or the other *ERP* packages since this will become a must for gaining competitive advantage.

Meaning of *ERP*

Enterprise resource planning software or *ERP* attempts to integrate all departments and functions across a company into a single computer system that can serve all those different departments particular needs. In fact, *ERP* combines all computerized departments together with the help of a single integrate software program that runs off as single database so that various departments can more easily share information and commission with each other.

The Need for *ERP*

Most organisations across the world have realised that in a rapidly changing environment, it is impossible to create and maintain customer designed software package which will cater to all their requirements and be up-to-date. Realising the requirement of user organisations, some of the leading software companies have designed Enterprise Resource Planning software, which offers an integrated software solution to all the functions of an organisation.

Components of *ERP*

To enable the easy handling of the system, *ERP* has been divided the following core subsystems, sales and marketing, master scheduling, materials requirements planning, capacity requirement planning, bill of materials, purchasing, shop floor control, accounts payable/receivable, logistic, assets management and financial accounting.

VALUE ANALYSIS AND VALUE ENGINEERING

Value Analysis

The Value Analysis (*VA*) techniques was developed after the Second World War in America at General Electric during the late 1940s. Since this time the basic *VA* approach has evolved and been supplemented with new techniques that have become available and have been integrated with the formal *VA* process. Today, *VA* is enjoying a renewed popularity as competitive pressures are forcing companies to re-examine their product ranges in an attempt to offer higher levels of customization without incurring high cost penalties. In parallel, many major corporations are using the *VA* process with their suppliers to extend the benefits of the approach throughout the supply chain. Businesses, big and small, will therefore benefit from understanding and applying the *VA* process.

It is likely that those companies that do not take the time to develop this capability will face an uncertain future as the lessons and problems of the past are redesigned into the products of the future.

Value Analysis can be defined as a process of systematic review that is applied to existing product designs in order to compare the function of the product required by a customer to meet their requirements at the lowest cost consistent with the specified performance and reliability needed.

Value Engineering

Value Engineering is an organized/systematic approach directed at analyzing the function of systems, equipment, facilities, services, and supplies for the purpose of achieving their essential functions at the lowest life-cycle cost consistent with required performance, reliability, quality, and safety. *Society* of *Japanese Value* Engineering defines *VE* as:

"A systematic approach to analyzing functional requirements of products or services for the purposes of achieving the essential functions at the lowest total cost".

Value Engineering is an effective problem solving technique. Value engineering is essentially a process which uses function analysis, team- work and creativity to improve value. Value Engineering is not just "good engineering." It is not a suggestion

program and it is not routine project or plan review. It is not typical cost reduction in that it doesn't "cheapen" the product or service, nor does it "cut corners."

Value Engineering simply answers the question "what else will accomplish the purpose of the product, service, or process we are studying?". *VE* technique is applicable to all type of sectors. Initially, *VE* technique was introduced in manufacturing industries. This technique is then expanded to all type of business or economic sector, which includes construction, service, government, agriculture, education and healthcare.

THEORY OF CONSTRAINTS

The theory of constraints is applied within an organization by following what are called 'the five focusing steps.' These are a tool that *Goldratt* developed to help organizations deal with constraints, otherwise known as bottlenecks, within the system as a whole (rather than any discrete unit within the organization.) The steps are as follows: (*a*) Identify the bottle neck in the system *i.e.*, identification of the limiting factor of the production (or) process such as installing capacity or hours *etc*. (*b*) Decide how to exploit the systems bottleneck that means bottleneck resource should be actively and effectively used as much as possible to produce as many goods as possible, (*c*) Subordinate everything else to the decision made in step (*b*). The production capacity of the bottleneck resource should determine production schedule, (*d*) Augment the capacity of the bottleneck resource with the minimum capital input, (*e*) Identify the new bottlenecks in the process and repeat the same above steps to address the bottlenecks.

BUSINESS PROCESS RE-ENGINEERING

Business Process Re-engineering (*BPR*) refers to the fundamental rethinking and redesign of business processes to achieve improvement in critical measures of performance such as cost, quality, service, speed and customer satisfaction. In contrast the concept of *Kaizen*, which involves small, incremental steps towards gradual improvement, re-engineering involves a giant leap. It is the complete redesign of a process with an emphasis on finding creative new way to accomplish an objective. It has been described as taking a blank piece of paper and starting from scratch to redesign a business process. Rather than searching continually for minute improvement, reengineering involves a radical shift in thinking about how an objective should be met. Re-engineering prescribes radical, quick and significant change. Admittedly, it can entail high risks, but it can also bring big rewards. These benefits are most dramatic when new models are discovered for conducting business.

JUST-IN-TIME (*JIT*)

Just in time (*JIT*) is a 'pull' system of production, so actual orders provide a signal for when a product should be manufactured. Demand-pull enables a firm to produce only what is required, in the correct quantity and at the correct time. *JIT* is explained in the chapter 'Material'.

This means that stock levels of raw materials, components, work in progress and finished goods can be kept to a minimum. This requires a carefully planned scheduling and flow of resources through the production process. Modern manufacturing firms

use sophisticated production scheduling software to plan production for each period of time, which includes ordering the correct stock. Information is exchanged with suppliers and customers through *EDI* (Electronic Data Interchange) to help ensure that every detail is correct.

Supplies are delivered right to the production line only when they are needed. For example, a car manufacturing plant might receive exactly the right number and type of tyres for one day's production, and the supplier would be expected to deliver them to the correct loading bay on the production line within a very narrow time slot.

The *JIT* Strategy: By taking a *JJT* approach to inventory and product handling, companies can often cut costs significantly. Inventory costs contribute heavily to the company expenses, especially in manufacturing organizations. By minimizing the amount of inventory you hold, you save space, free up cash resources, and reduce the waste that comes from obsolescence.

ACTIVITY BASED COST MANAGEMENT

A powerful tool for measuring performance, Activity-Based Costing (*ABC*)[1] is used to identify, describe, assign costs to, and report on agency operations. A more accurate cost management system than traditional cost accounting; *ABC* identifies opportunities to improve business process effectiveness and efficiency by determining the "true" cost of a product or service. Activity Based Costing is a method for developing cost estimates in which the project is subdivided into discrete, quantifiable activities or a work unit. *ABC* systems calculate the costs of individual activities and assign costs to cost objects such as products and services on the basis of the activities undertaken to produce each product or services. It accurately identifies sources of profit and loss.

The concepts of *ABC* were developed in the manufacturing sector of the United States during the 1970s and 1980s. It is a practice in which activities are identified and all related costs of performing them are calculated, providing actual costs chargeable. The focus of activity based costing is activities. Thus, identifying activities is a logical first step in designing an activity based costing. An activity is an event, task or unit of work with a specified purpose.

The CIMA terminology defines *ABC* as a cost attribution to cost units on the basis of benefit received from indirect activities. *Peter B. B. Turney* defines *ABC* as "a method of measuring the cost and performance of activities and cost objects. Assigns cost to activities based on their use of resources and assigns cost to cost objects based on their use of activities. *ABC* recognizes the causal relationship of cost drivers to activities." *ABC* can be defined by the following equation:

$$C/A = HD + M + E + S$$

Where C/A = Estimated cost per activity

H = Number of labor hours required to perform the activity one time

D = Wages per labor hour

M = Material costs required to perform the activity one time

E = Equipment costs to perform the activity one time

S = Subcontracting costs to perform the activity one time

1. A separate chapter on *ABC* in given in the book

The total cost for performing the activity will be based on the number of times the activity is performed during a specific time frame. An activity based costing system first traces costs to activities and then to products and other cost objects.

BENCH MARKING

Benching Marking is traditional control. It involves comparison of the actual results with an established standard or target? The practice of setting targets using external information is known as 'Bench marking'.

Benching marking is the establishment – through data gathering of targets and comparatives, with which performance is sought to be assessed.

After examining the firm's present position, benchmarking may provide a basis for establishing better standards of performance. It focuses on improvement in key areas and sets targets which are challenging but evidently achievable. Bench marking implies that there is one best way of doing business and orients the firm accordingly. It is a catching-up exercise and depends on the accurate information about the comparative company — be it inside the group or an outside firm.

Benchmark is the continuous process of enlisting the best practices in the world for the process, goals and objectives leading to world-class levels of achievement.

TOTAL QUALITY MANAGEMENT (*TQM*)

Total Quality Management is a philosophy of continuously improving the quality of all the products and processes in response to continuous feedback for meeting the customers' requirements. It aims to do things right the first time, rather than need to fix problems after they emerge (A company should avoid defects rather than correct them). Its basic objective is customer satisfaction.

(i) **Total:** *Quality* involves everyone and all activities in the company (Mobilizing the whole organization to achieve quality continuously and economically).

(ii) **Quality:** Understanding and meeting the customers' requirements.(Satisfying the customers first time every time).

(iii) **Management:** Quality can and must be managed (Avoid defects rather than correct them).

TQM is a vision based, customer focused, prevention oriented, continuously improvement strategy based on scientific approach adopted by cost conscious people committed to satisfy the customers first time every time. It aims at Managing an organization so that it excels in areas important to the customer.

PRAISE ANALYSIS

Identification of improvement opportunities and implementation of quality improvement process, of the *TQM* Process is through a six-step activity sequence, identified by the acronym '*PRAISE*'.

Step 1:

Activity: Problem Identification

Elements:
- Areas of customer dissatisfaction.
- Absence of competitive advantage.

Step 2:
Activity: Ranking
Elements:
- Priorities problems and opportunities by-
  1. Perceived importance, and
  2. Ease of measurement and solution.

Step 3:
Activity: Analysis
Elements:
- Ask "Why?" to identify possible causes. Keep asking 'Why?' beyond to the move symptoms and to avoid jumping to premature conclusion.
- Ask 'What?' to consider potential implications.
- Ask 'How much?' to quantify cause and effect.

Step 4:
Activity: Innovation
Elements:
- Use creative thinking to generate potential solutions.
- Operationalise these solutions by identifying -

1. Barriers to implementation,
2. Available enablers, and
3. People whose co-operation must be sought.

Step 5:
Activity: Solution
Elements:
- Implement the preferred solution.
- Take appropriate action to bring about the required changes.
- Reinforce with training and documentation back-up.

Step 6:
Activity: Evaluation
Elements:
- Monitor the effectiveness of actions.
- Establish and interpret performance indicators to track progress towards objectives
- Identify the potential for further improvements and return to Step 1.

SIX SIGMA

Six Sigma is a set of practices originally developed by Motorola to systematically improve processes by eliminating defects. A defect is defined as non-conformity of a product or service to its specifications.

While the particulars of the methodology were originally formulated by Bill Smith at Motorola in 1986, Six Sigma was heavily inspired by six preceding decades of quality improvement methodologies such as quality control, *TQM*, and Zero Defects. Like its predecessors, Six Sigma asserts the following:

(*a*) Continuous efforts to reduce variation in process outputs is key to business success.

(*b*) Manufacturing and business processes can be measured; analyzed, improved and controlled.

(*c*) Succeeding at achieving sustained quality improvement requires commitment from the entire organization, particularly from top-level management.

The term "Six Sigma" refers to the ability of highly capable processes to produce output within specification. In particular, processes that operate with six sigma quality produce at defect levels below 3.4 defects per (one) million opportunities (*DPMO*). Six Sigma's implicit goal is to improve all processes to that level of quality or better.

PARETO ANALYSIS

Pareto Analysis is a rule that recommends focus on the most important aspects of the decision making in order to simplify the process of decision making. It is based on the 80 : 20 rule that was a phenomenon first observed by *Vilfredo Pareto*, a nineteenth century Italian economist. He noticed that 80% of the wealth of Milan was owned by 20% of its citizens. This phenomenon, or some kind of approximation of it say, (70: 30 *etc*.,) can be observed in many different business situations. The management can use it in a number of different circumstances to direct management attention to the key control mechanism or planning aspects. It helps to clearly establish top priorities and to identify both profitable and unprofitable targets.

Application of Pareto Analysis

Pareto analysis may be applicable in the presentation of Performance Indicators data through selection of representative process characteristics that truly determine or directly or indirectly influence or conform the desired quality or performance result or outcome.

QUALITY COSTS

Quality of product or service is decided by the customer and is built into the service on product through the design for it. A customer has certain needs or requirements for product or service. It is the design of product or service which builds these requirements as product or service specifications into the product or service-including the way the product or service would be delivered to the customer. The way the product is made or the service is delivered is according to a set of processes which are in sequence. This set of processes, their sequence and interdependence gets defined while the design activity is performed and the design of process has a direct impact on the outcome, that is, the extent to which the outcome meets the specifications developed during design. Process design also contributes to quality.

Cost of Quality

The reason quality has gained such prominence is that organizations have gained an understanding of the high cost of poor quality. Quality affects all aspects of the organization and has dramatic cost implications. The most obvious consequence occurs when poor quality creates dissatisfied customers and eventually leads to loss of business. However, quality has many other costs, which can be divided into two categories. The first category consists of costs necessary for achieving high quality, which are called quality control costs. These are of two types: prevention costs and appraisal costs. The second category consists of the cost consequences of poor quality, which are called quality failure costs. These include external failure costs and internal failure costs. The first two costs are incurred in the hope of preventing the second two.