Cost and Management Accounting II

As per new B Com CBCS syllabus 2017 for CU

J.K. Mitra
Associate Professor, Durgapur Government College
(Formerly Associate Professor,
Goenka College of Commerce and Business Administration, Kolkata)

OXFORD
UNIVERSITY PRESS

OXFORD
UNIVERSITY PRESS

Oxford University Press is a department of the University of Oxford.
It furthers the University's objective of excellence in research, scholarship,
and education by publishing worldwide. Oxford is a registered trade mark of
Oxford University Press in the UK and in certain other countries.

Published in India by
Oxford University Press
Ground Floor, 2/11, Ansari Road, Daryaganj, New Delhi 110002, India

First published in 2019

ISBN-13: 978-0-19-949427-9
ISBN-10: 0-19-949427-4

Typeset in Palatino
by E-Edit Infotech Private Limited (Santype), Chennai
Printed in India by Magic International (P) Ltd., Greater Noida

Cover image: Wichayada Suwanachun / Shutterstock

Preface

Cost accounting and management accounting are regarded as specialized branches of accounting. As the title suggests, this book is concerned with both cost accounting and management accounting but emphasis is placed on the former. In the current curricular set up of the University of Calcutta, the two sub-fields of accounting have been brought under a common umbrella. The dependence of both the sub-fields of accounting on common basic source data and their reliance on exchange of information pave the way for their unison.

Cost accounting involves accounting and control of cost. It is concerned with the measurement of cost and communication of cost-related information to the management for their effective decision making. Cost accounting is useful for locating unprofitable activities and inefficiencies occurring in various forms of wastes. It further facilitates the preparation of projected cost statement and assists in controlling actual cost of production. It is also useful for price fixation, submission of quotation, tender, etc. Thus, cost-related information becomes imperative for planning and controlling the operations of an enterprise. Intelligently used cost information forms the basis of many strategic decisions. Long-term competitive success of an enterprise depends on its proper cost management.

Management accounting deals with the presentation of accounting and other information to the management for managerial decision-making purposes. It provides financial data, cost data, and other qualitative information to the management for their planning, decision making, and control purposes. Management accounting acts as a decision support system for providing the right information to the management at the right time. It guides management's actions and helps managers to run their organizations smoothly. In recent years, the management accounting profession has gained immense importance due to increased competitiveness as a result of globalization and advancement in technology. This book covers various techniques of management accounting guiding operational and strategic decisions. Thus, management accounting is a subject worthy of serious study by the students and professionals of both management and accounting professions. Therefore, existing as well as desirous managers show their keen interest in management accounting.

Objective of the Book

The aim of this book is to acquaint the readers with a conceptual understanding on various principles of cost and management accounting in a logical and systematic manner. This book intends to provide practical knowledge on various methods and techniques of cost and management accounting. It helps students in learning the basics of cost and management accounting and gathering information they need to make important decisions. It also provides exhaustive treatment of various concepts and principles of cost and management accounting. This will enable students and professionals to understand and use accounting data in various managerial decisions.

This knowledge will help students in exploring many career opportunities available in the field of cost and management accounting. Students and professionals will get benefitted by using relevant cost data in making various business decisions. The materials available in this book will cater well to the requirements of the desired target group of students and the book will turn out to be a student friendly textbook.

Proposed Readers

This book is specially conceived for students preparing for B Com (Fourth Semester) Honours course of the University of Calcutta under CBCS curriculum. Besides, students of other universities

in West Bengal (such as Burdwan University, Kalyani University, Barasat State University, North Bengal University, Vidyasagar University, etc.) may also find this book useful to accomplish their objectives. Therefore, in general, students in the field of business studies are the proposed readers of this book.

Pedagogical Features

- This book is written in a simple style, offering clarity of presentation so that the readers can very easily grasp the subject matter.
- Proper emphasis has been laid on conceptual clarity, due explanation of formulae, detailed illustrations, and chapter-end assignment for work practice.
- It provides an exhaustive treatment of various methods and techniques on cost and management accounting in practical business situations.
- Theoretical portion is substantiated with a number of illustrations and diagrams for easy understanding.
- This book incorporates current thoughts, latest trends, and balancing theories with practical application.
- It contains a sufficiently large number of worked-out problems on each topic, properly graded and with full-length solutions. Alternative solutions have been given wherever necessary. Special care has been taken in explaining the points that students find difficult and tricky.
- Terms appearing in the latest terminology of CIMA, London, have been used and thoroughly explained with suitable examples.
- Each chapter ends with a set of theoretical and practical assignments so that the students can reinforce their understanding properly and prepare themselves well for examinations.
- Questions recently set at various professional and university examinations have been incorporated so as to expose students with the latest trends adopted by those institutions in conducting their examinations.
- This book aims at preparing students effectively by providing conceptual understanding in a logical and systematic manner.

Content and Structure

This book contains 5 chapters, which are as follows:

Chapter 1 provides an insight into the basics on Joint Products and By-products Costing and Activity-based Costing.

Chapter 2 deals with the concept of Budget and Budgetary Control.

Chapter 3 focuses on the concept of Standard Costing.

Chapter 4 covers Marginal Costing and CVP Analysis.

Chapter 5 describes the Short-term Decision Making.

Acknowledgements

I am indebted to my parents for their constant encouragement, support, and motivation that inspired me to write this textbook. I am grateful to my respected teachers from whom I learnt the basics of this subject. I have relied on authoritative treatises and published articles in the field of cost and

management accounting in my country and abroad. The sources have been duly acknowledged at appropriate places. I convey my best wishes to my beloved student Prof. Soumya Mukherjee and my ex-colleague Prof. Amlan Majumder for their valuable support.

I express my gratitude to Oxford University Press for inspiring me to instil quality in this book. I owe a lot to the editorial team of Oxford University Press India for their nice care of the book while composing, proofreading, and printing.

I convey my affection to my daughter Miss Alankrita Mitra for her efficient secretarial assistance at the time of preparing the manuscript.

There might have been certain gaps in my work. I request the readers to send me their constructive suggestions, comments, and criticisms for the improvement of the book. Any suggestion sent to me at jkm_50@yahoo.co.in will be highly appreciated.

J.K. Mitra

Features of

Chapter Outcomes

◗ Concept of Standard Cost ◗ Concept of Standard Costing ◗ Difference between Budgetary Control and Standard Costing ◗ Similarities between Standard Costing and Budgetary Control ◗ Types of Standard: Basic Standard; Ideal Standard; Expected Standard; Normal Standard; Current Standard ◗ Preliminaries in Establishing a System of Standard Costing ◗ Advantages and Limitations of Standard Costing ◗ Variance Analysis: Favourable and Adverse Variances; Controllable and Uncontrollable Variances

● **Section I: Material Variances** ◗ Material Cost Variance ◗ Material Price Variance ◗ Material Usage Variance—(a) Material Mix Variance; (b) Material Yield Variance

● **Section II: Labour Variances** ◗ Labour Cost Variance ◗ Labour Rate Variance ◗ Labour Efficiency Variance—(a) Labour Mix Variance; (b) Idle Time Variance; (c) Labour Revised Efficiency (or Yield) Variance.

● **Section III: Overhead Variance** ◗ (A) Variable Overhead Variance—(a) Variable Overhead Cost Variance; (b) Variable Overhead Expenditure Variance; (c) Variable Overhead Efficiency Variance.

◗ (B) Fixed Overhead Variance—(a) Fixed Overhead Cost Variance; (b) Fixed Overhead Expenditure Variance; (c) Fixed Overhead Volume Variance; (d) Fixed Overhead Efficiency Variance; (e) Fixed Overhead Capacity Variance; (f) Fixed Overhead Calendar Variance.

Chapter Outcomes
Provide a bird's eye view of the topics covered in the chapters.

Illustration 3.1

The following information is given:

Standard quantity of raw materials required for producing Product-X	5 kg. per unit
Standard price of raw materials	₹10 per kg.
The actual production details during a month are as follows:	
Number of units of Product-X produced	1,000 units
Actual quantity of raw materials used	5,500 kg.
Actual price of raw materials	₹11 per kg.

al Usage.

Illustration 3.4

An output is produced by mixing two materials A and B. The standard cost per unit of output consists of the following:

Material-A: ₹16 (₹4 per kg.); Material-B: ₹18 (₹3 per kg.).

Actual Cost (for 200 units):

Material-A: ₹3,400; Material-B: ₹4,000.

Determine the Material Cost Variance.

Solution:

		Material-A	Material-B
(i)	Standard Quantity per unit	₹16/₹4 per kg. = 4 kg.	₹18/₹3 per kg. = 6 kg.
(ii)	Standard Quantity (SQ) for actual output	200 × 4 kg = 800 kg.	200 × 6 kg. = 1,200 kg.
(iii)	Standard Price (SP) per kg.	₹4	₹3
(iv)	Standard Cost (SQ × SP)	₹3,200	₹3,600

Illustrative Examples
Numerous examples are provided to lend clarity to the key concepts used in the chapters.

the Book

Review Illustrations
A large number of graded solved examples are provided to elucidate the concepts.

Review Illustrations

Problem 4.1

P/V Ratio	50%	Margin of Safety	40%
Sales Value	₹10,00,000		

Calculate: (i) Fixed Cost; (ii) Profit; (iii) How much additional sales would be necessary to increase the above profit by ₹50,000?

Solution:

Margin of Safety = 40% of Sales of ₹10,00,000 = ₹4,00,000;
Margin of Safety = Actual Sales – Break-even Sales
∴ Break-even Sales = Actual Sales – Margin of Safety = ₹10,00,000 – ₹4,00,000 = ₹6,00,000
Contribution at Break-even Point = Break-even Sales × P/V Ratio
= ₹6,00,000 × 50% = ₹3,00,000
At Break-even Point: Contribution = Fixed Cost [Since there is no profit at this point]

(i) ∴ Fixed Cost = ₹3,00,000

(ii) **Profit on sales of ₹10,00,000**
Contribution = Sales × P/V Ratio = ₹10,00,000 × 50% = ₹5,00,000
Profit = Contribution – Fixed Cost = ₹5,00,000 – ₹3,00,000 = ₹2,00,000

(iii) Desired Profit = ₹2,00,000 + ₹50,000 = ₹2,50,000
Desired Contribution = Fixed Cost + Desired Profit = ₹3,00,000 + ₹2,50,000 = ₹5,50,000

Exercises

Review Questions

3.1 Define Standard Costing. Explain the advantages and limitations of Standard Costing.
3.2 Distinguish between Standard Costing and Budgetary Control. Discuss the utility of variance analysis in cost control.
3.3 Describe the basic principles in any Standard Costing System. In what type of industries is standard costing employed?
3.4 What are the several types of standards and what are the assumptions as to the factors on which these standards are based?
3.5 Certain
these r
3.6 Describ
3.7 In Stan
Define

Practical Questions

Difficult Problems

3.1 Standard quantity of raw materials required 3 kg per unit
Standard price of raw materials ₹2.50 per kg.
Actual details during a month are as follows:
Actual production 1,000 units
Actual quantity of raw materials used 3,500 kg.
Actual price of raw materials ₹3 per kg.
Compute: (i) Material Cost Variance; (ii) Material Price Variance; (iii) Material Usage Variance.
[**Ans.:** Material Cost Variance ₹3,000 (A); Material Price Variance ₹1,750 (A); Material Usage Variance ₹1,250 (A)]

3.2 X Ltd. operates a standard costing system and has set ₹3 as standard price per kg. for the standard usage of 1,200 kg. of raw materials.

Exercises—Review Questions and Practical Questions
Exhaustive chapter-end exercises are provided to test understanding of concepts and techniques.

Detailed Contents

Preface iii
Features of the Book vi
Roadmap to Cost and Management Accounting xi

1. Joint Products and By-products Costing and Activity-based Costing 1

Section-I: Joint Products and By-products Costing *1*

1.1 Concept of Joint Products *1*
1.1.1 Features (or Characteristics) of Joint Products 2
1.2 Concept of By-products *2*
1.2.1 Features (or Characteristics) of By-products 2
1.3 Concept of Co-products *3*
1.3.1 Features (or Characteristics) of Co-products 3
1.4 Distinction Between Joint Products and By-products *3*
1.5 Accounting for Joint Products (Methods of Assigning Costs to Joint Products) *3*
1.5.1 Average Unit Cost Method 4
1.5.2 Physical Units Method 4
1.5.3 Survey Method (or Weighted Average Method) 5
1.5.4 Contribution Margin Method 6
1.5.5 Market Value Method 7
1.6 Accounting of By-products *9*
1.6.1 Non-cost or Sales Value Method 10
1.6.2 Cost Methods 13
1.7 Selling at the Split-off Point or Processing Further *14*

Section-II: Activity-based Costing *25*

1.8 Concept of Activity-based Costing *25*
1.8.1 Characteristics of Activity-based Costing System 25
1.8.2 Steps Involved in Implementing Activity-based Costing 26
1.8.3 Applicability of Activity-based Costing 26
1.8.4 Key Terms Associated with the Concept of Activity-based Costing 27
1.9 Traditional Approach of Absorbing Overheads *28*
1.9.1 Limitations of Traditional Approach of Absorbing Overheads 29
1.10 Differences Between Traditional Costing and Activity-based Costing *29*
1.11 Benefits (or Merits) of Activity-based Costing *30*
1.12 Limitations (or Disadvantages) of Activity-based Costing *30*

2. Budget and Budgetary Control 48

2.1 Concept of a Budget *48*
2.2 Concept of Budgetary Control *48*
2.3 Classification of Budgets *49*
2.4 Budget Principles *50*
2.5 Objectives of Budgets *51*
2.6 Advantages of Budgets *51*
2.7 Limitations of Budgets *52*
2.8 Preparation and Monitoring of Budgeting System *52*
2.9 Principal Budget Factors (or Key Factors or Limiting Factors) *54*
2.10 Steps in Preparing Budgets *54*

Section-I: Functional (or Operational) Budgets *54*

2.11 Steps in Preparing Functional (Operational) Budgets *55*
2.12 Sales Budget *56*

2.13 Production Budget *59*
2.14 Production Cost Budget *62*
2.15 Raw Materials Purchase Budget *64*
2.16 Raw Materials Cost Budget *66*
2.17 Direct Labour (Personnel) Cost Budget *67*
2.18 Manpower Budget *68*
2.19 Production (Factory) Overhead Budget *69*
2.20 Administration Overhead Budget *70*
2.21 Selling and Distribution Overhead Budget *72*
2.22 Plant Utilisation Budget *73*
2.23 Capital Expenditure Budget *73*
2.24 Cash Budget *73*
2.25 Master Budget *73*

Section-II: Cash Budget *77*
2.26 Concept of Cash Budget *77*
2.27 Construction of Cash Budget *78*

Section-III: Flexible Budget *91*
2.28 Concept of Flexible Budget *91*
2.29 Uses of Flexible Budget *92*
2.30 Preparation of Flexible Budgets *92*

3. Standard Costing 123

3.1 Concept of Standard Cost *123*
3.2 Concept of Standard Costing *123*
3.3 Difference between Budgetary Control and Standard Costing *124*
3.4 Similarities between Standard Costing and Budgetary Control *124*
3.5 Types of Standard *125*
3.6 Preliminaries in Establishing a System of Standard Costing *125*
3.7 Advantages of Standard Costing *126*
3.8 Limitations of Standard Costing *127*
3.9 Variance Analysis *127*
3.9.1 Requirements of a Good Variance Analysis 127

Section-I: Material Variances *128*
3.10 Material Cost Variance (MCV) *128*
3.11 Material Price Variance (MPV) *129*
3.12 Material Usage (or Quantity) Variance (MUV) *129*
3.12.1 Material Mix Variance (MMV) 129
3.12.2 Material Revised Usage Variance (MRUV) 130

Section-II: Labour Variances *153*
3.13 Labour Cost Variance *153*
3.14 Labour Rate Variance *154*
3.15 Labour Efficiency Variance *154*
3.15.1 Labour Mix Variance 154
3.15.2 Idle Time Variance 155
3.15.3 Labour Revised Efficiency (or Yield) Variance 155

Section-III: Overhead Variances *170*
3.16 Overhead Variances *170*
3.17 Variable Overhead Cost Variance *171*
3.17.1 Variable Overhead Expenditure Variance 171
3.17.2 Variable Overhead Efficiency Variance 172
3.18 Fixed Overhead Cost Variance *175*
3.18.1 Fixed Overhead Expenditure Variance 175
3.18.2 Fixed Overhead Volume Variance 175
3.18.3 Fixed Overhead Efficiency Variance 176
3.18.4 Fixed Overhead Capacity Variance 176
3.18.5 Fixed Overhead Calendar Variance 176

4. Marginal Costing and CVP Analysis 201

4.1 Concept of Marginal Costing *201*
4.1.1 Basic Assumptions of Marginal Costing 201
4.2 Concept of Marginal Cost *202*
4.3 Features of Marginal Costing *202*
4.4 Methods of Segregation of Semi-variable Costs *202*

4.4.1 High and Low Points Method (or Range Method) 202
4.4.2 Simultaneous Equations Method 203
4.4.3 Method of Least Squares 204
4.4.4 Scatter Diagram Method 205
4.5 Marginal Cost Equation *206*
4.6 Profit/Volume Ratio (P/V Ratio) [or Contribution-Sales Ratio (C/S Ratio)] *206*
4.6.1 Utility of P/V Ratio 207
4.6.2 Improvement of P/V Ratio 207
4.7 Break-even Analysis *207*
4.8 Break-even Chart *208*
4.8.1 Usefulness of Break-even Chart 211
4.8.2 Limitations of Break-even Chart 211
4.9 Margin of Safety *211*
4.10 Angle of Incidence *212*
4.11 Cost-Volume-Profit (CVP) Analysis *213*
4.11.1 Objects of Cost-Volume-Profit (CVP) Analysis 214
4.11.2 Limitations of Cost-Volume-Profit (CVP) Analysis 214
4.12 Advantages of Marginal Costing *214*
4.13 Limitations of Marginal Costing *215*
4.14 Absorption Costing Vs. Marginal Costing *216*
4.15 Comparative Income Statements under Marginal Costing and Absorption Costing *217*

5. Short-term Decision Making 264

5.1 Introduction *264*
5.2 Marginal Costing and Short-term Decision Making *264*
5.3 Make or Buy Decision *264*
5.4 Selection of Most Profitable Product-mix *269*
5.5 Fixation of Selling Price (i.e., Product Pricing) *272*
5.6 Alternative Methods of Production *279*
5.7 Shut Down Decision *283*

About the Author 297

1

Joint Products and By-products Costing and Activity-based Costing

Chapter Outcomes

● **Section I: Joint Products and By-products Costing** ◗ Concept of Joint Products ◗ Concept of By-products ◗ Concept of Co-products ◗ Distinction between Joint products and By-products ◗ Accounting for Joint Products ◗ Accounting for By-products

● **Section II: Activity-based Costing** ◗ Concept of Activity-based Costing ◗ Traditional Approach of Absorbing Overheads ◗ Traditional Costing Vs. Activity-based Costing ◗ Benefits of Activity-based Costing ◗ Limitations of Activity-based Costing

SECTION-I: JOINT PRODUCTS AND BY-PRODUCTS COSTING

In some process industries, two or more ***products*** are produced simultaneously from a common input and in the same manufacturing process. These products are often termed as joint products, by-products and co-products. This section deals with various methods used for ascertaining the cost of joint products and by-products.

1.1 CONCEPT OF JOINT PRODUCTS

Sometimes, two or more products of almost equal importance are produced together from the same raw materials and in the common manufacturing process. These products are termed as joint products. In other words, joint products are different products inevitably produced from the same manufacturing process and they possess equal importance in terms of either *sales value* or *profit*. Joint products are impossible to differentiate from each other until the *point of separation*. The point at which joint products become separately identifiable is known as separation point (or split-off point). Some of the joint products may sold in their original form without further processing and some require further processing after the *separation point* so as to make them more refined and easily saleable.

■ Joint products are "two or more products separated in course of processing, each having a sufficiently high saleable value to merit recognition as a main product". ***[C.I.M.A. (London)]***

A few examples of joint products are as follows:

(i) **In Oil Refining Industry:** Petrol, Diesel, Kerosene, Paraffin and Liquid petroleum gas (produced from crude petroleum oil) are considered as joint products.

(ii) **In Coal Industry:** Coke, Benzol, Tar and Sulphate of ammonia (produced from raw coal ore) are treated as joint products.

(iii) **In Sugar Industry:** Sugar, Sugar cubes and Molasses (produced from sugar cane) are joint products.

(iv) **In Dairy Industry:** Ghee, Butter and Cheese (produced from milk) are joint products.

(v) **In Mining Industry:** Copper, Silver and Iron (i.e., metals produced from the same ore) are joint products.

1.1.1 Features (or Characteristics) of Joint Products

Joint products possess the following features:

(i) Joint products are treated as main products due to their equal economic importance.

(ii) They are produced simultaneously from the same basic raw materials and other inputs.

(iii) They are produced by a common manufacturing process (up to the point of separation).

(iv) They are almost of equal importance mainly in terms of their *sales value* or *profit*.

(v) They cannot be separated from each other until the *point of separation (split-off point).*

(vi) They are produced simultaneously in huge quantities. A single product cannot be produced separately.

(vii) They may require further processing after the *point of separation* for making them easily saleable.

1.2 CONCEPT OF BY-PRODUCTS

By-products are incidentally produced in addition to the joint products (i.e., main products). They arise as secondary products in the production of joint products. In other words, by-products emerge as a result of the processing operation of joint products. They are recovered from the materials discarded in the manufacturing process of joint products. By-products have relatively small sales value as compared to joint products. Some by-products may require further processing after the *point of separation* to increase their sales value.

- By-products are "products recovered incidentally from the materials used in the manufacture of main products". ***[C.I.M.A. (London)]***

A few examples of by-products are as follows:

Name of Industry	*Joint Products*	*By-products*
1. Sugar industry	Sugar, Sugar cubes and Molasses	Fibers of sugar cane
2. Dairy industry	Ghee, Butter and Cheese	Buttermilk
3. Timber industry	Wood and Ply	Saw dust and Barks
4. Meat-processing industry	Meat and Wool	Bones and Grease

1.2.1 Features (or Characteristics) of By-products

By-products possess the following features:

(i) By-products are treated as secondary products due to their lower sales (or usable) value.

(ii) By-products are produced simultaneously in addition to joint products.

(iii) They remain inseparable up to the *separation (split-off) point*.

(iv) They are recovered incidentally in the manufacturing process of joint products.

(v) They can be sold out *either* in their original form *or* after further processing.

(vi) They are usually produced in lesser quantities in relation to the main products.

1.3 CONCEPT OF CO-PRODUCTS

Co-products represent different varieties of a particular type of product. These products are produced in different quantities without any co-relation to the other. Co-products do not arise from the same manufacturing process. However, certain basic common facilities are required for the manufacture of co-products.

A few examples of co-products are as follows:

(i) **In Automobile Industry:** Cars, Buses, Trucks, Mini-buses, Jeeps and Utility vehicles are considered as co-products.

(ii) **In Fan-manufacturing Industry:** Ceiling fan, Table fan, Pedestal fan, Cabin fan, Tower fan etc. are co-products.

(iii) **In Furniture-making Industry:** Almirahs, Cots, Chairs, Tables etc. are co-products.

(iv) **In Two-wheeler-manufacturing Industry:** Motorcycles, Bicycles, Mopeds, Scooters etc. are co-products.

1.3.1 Features (or Characteristics) of Co-products

Co-products possess the following features:

(i) Co-products are easily identifiable at each stage in the manufacturing process.

(ii) They can be produced in different varieties to fulfill the needs of different groups of customers.

(iii) They can also be produced in desired quantities as per the demand of the market.

(iv) They follow different manufacturing processes for their completion.

(v) The production of a particular co-product does not have any effect on other co-products.

1.4 DISTINCTION BETWEEN JOINT PRODUCTS AND BY-PRODUCTS

The following are the main points of difference between joint products and by-products:

Basis of Distinction	*Joint Products*	*By-products*
(a) Nature of product	Main (primary) products	Minor (secondary) products
(b) Economic importance	Equal economic importance	Small economic importance
(c) Sales value	Higher sales value	Lower sales value
(d) Objective	Primary target of a manufacturing concern	Incidentally produced in addition to the joint products
(e) Nature of production	Produced simultaneously from the same basic raw materials	Produced supplementary to the joint products
(f) Certainty of market	Sales can be predicted	Sales cannot be predicted
(g) Scope of further processing	Higher possibility	Lower possibility

1.5 ACCOUNTING FOR JOINT PRODUCTS (METHODS OF ASSIGNING COSTS TO JOINT PRODUCTS)

Total costs incurred up to the *separation point* (i.e., split-off point) are called joint costs. Accounting for joint products means the apportionment of joint costs to each of the joint products. Therefore, the

objective of joint cost accounting is to assign a portion of joint costs to each joint product. This helps the management to assess the total cost and per unit cost of each of the joint products. Management can fix the selling price and determine the profit easily based on per unit cost of each joint product. The following methods are widely used for the apportionment of joint costs:

(1) Average unit cost method; (2) Physical units method; (3) Survey method; (4) Contribution margin method; (5) Market value method—(a) At the point of separation; (b) After further processing; (c) Net realizable value.

1.5.1 Average Unit Cost Method

Under this method, total process costs (upto the point of separation) are ascertained and divided by total units produced to get average cost per unit of production. According to this method, no effort is made to calculate separate cost for each of the joint products. Adoption of this method is justified on the ground that all joint products arise from the same process.

Illustration 1.1

A timber merchant incurred ₹1,00,000 in the milling operation upto the split-off point during the month of January 2012 with the following production:

Timber Grade I	1,50,000 ft.
Timber Grade II	2,00,000 ft.
Timber Grade III	1,50,000 ft.
	5,00,000 ft.

Calculate the cost to be assigned to each joint product by average unit cost method.

Solution:

$$\text{Average cost per unit} = \frac{\text{Joint Cost}}{\text{Total Units Produced}} = \frac{₹1,00,000}{5,00,000 \text{ ft.}} = ₹0.20 \text{ per ft.}$$

So, joint cost to be apportioned among three grades would be:

			₹
Grade I	1,50,000 × 0.20	=	30,000
Grade II	2,00,000 × 0.20	=	40,000
Grade III	1,50,000 × 0.20	=	30,000
			1,00,000

1.5.2 Physical Units Method

Under this method, the joint cost is apportioned to different products on the basis of some physical coefficient, e.g., unit or weight of products, volume of output, labour hours, percentage of raw materials etc. This method is technically sound. This method, however, is not suitable where one product is gas and another a liquid and all products cannot be expressed in the same physical unit.

Illustration 1.2

Following data have been extracted from the books of Coal India Limited:

Joint Products	*Yield per Tonne of Coal*
Coke	600 kg.
Coal Tar	100 kg.
Benzol	150 kg.
Gas	125 kg.
Sulphate of Ammonia	25 kg.
	1,000 kg.

The price of coal is ₹200 per tonne. Direct labour and overhead costs upto the point of split off are ₹175 and ₹125 respectively. Calculate cost to be assigned to each joint product by physical unit method.

Solution:

	Per Tonne
Cost of coal	₹200
Labour cost	₹175
Overheads	₹125
Pre-separation costs (i.e. joint costs)	₹500

Joint Products	*Yield per Tonne of Coal (kg.)*	*Percentage of Total*	*Apportioned Cost (₹)*
Coke	600	60%	300.00
Coal-Tar	100	10%	50.00
Benzol	150	15%	75.00
Gas	125	12.5%	62.50
Sulphate of Ammonia	25	2.5%	12.50
Total	1,000	100%	500.00

1.5.3 Survey Method (or Weighted Average Method)

Under this method, all the important factors such as volume, selling price, technical side, marketing processes, etc., affecting costs are ascertained by means of extensive survey. For each factor, a point value is assigned. Each product gets point values on the basis of these factors. The joint cost is apportioned in the ratio of (Production units × point value). So, this method is also known as "*Point Value Method*".

Illustration 1.3

Pre-separation cost:

	₹	₹
Materials cost	10,000	
Wages	8,000	
Production overhead	6,000	24,000

Production: Product A—500 Units; Product B—700 Units; Product C—340 Units.

Apportion the joint costs to the products if the value assigned for A, B and C are 3, 4 and 5 respectively.

Solution:

(1) *Products*	(2) *Output (Units)*	(3) *Value Assigned*	(4) = (2) × (3) *Equivalent Units*	(5) *Ratio*	(6) *Apportioned Cost (₹)*	(7) = (6) ÷ (2) *Cost Per Unit (₹)*
A	500	3	1,500	15/60	6,000	12
B	700	4	2,800	28/60	11,200	16
C	340	5	1,700	17/60	6,800	20
			6,000		24,000	

1.5.4 Contribution Margin Method

This method uses the technique of marginal costing where joint costs are segregated into two parts—variable cost and fixed cost. The variable cost of the joint cost is apportioned on the basis of weight or quantity of each product and fixed cost is apportioned on the basis of contribution made by each of the products.

Illustration 1.4

X Ltd. obtains three joint products A, B and C from a process of manufacture. From the following particulars, apportion the joint costs to A, B and C on the basis of contribution margin method and also ascertain profit or loss.

Products	*Units Producted*	*Per Unit Selling Price (₹)*	*Per Unit Post-Separation Point Cost (Variable)*
A	500	20	8
B	300	15	4
C	200	10	1.50
	1,000		

Pre-separation costs	₹
Direct Materials cost	2,000
Direct Labour cost	3,000
Variable Overheads	1,000
Fixed Overheads	4,000
	10,000

Solution:

Total variable costs at split-off point = ₹ (2,000 + 3,000 + 1,000) = ₹6,000; Total output = 1,000 units.

$$\therefore \text{ Variable Cost per unit} = \frac{6,000}{1,000} = ₹6$$

(1) *Products*	(2) *Per Unit Variable Cost at Split-off Point*	(3) *Post-separation Cost Per Unit (₹)*	(4) = (2) + (3) *Marginal Cost (Variable Cost) (₹)*	(5) *Selling Price Per Unit (₹)*	(6) = (5) – (4) *Contribution Per Unit (₹)*
A	6	8	14	20	6
B	6	4	10	15	5
C	6	1.50	7.50	10	2.50

Total contribution

A	500 × 6	3,000
B	300 × 5	1,500
C	200 × 2.50	500
		5,000

Fixed Overhead should be apportioned as below:

					₹
A	=	3,000 / 5,000	×	4,000	= 2,400
B	=	1,500 / 5,000	×	4,000	= 1,200
C	=	500 / 5,000	×	4,000	= 400
					4000

Profit = Contribution – Fixed overhead

		₹
A	(3,000 – 2,400)	600
B	(1,500 – 1,200)	300
C	(500 – 400)	100
		1,000

1.5.5 Market Value Method

This method of apportioning joint costs to products on the basis of relative market value is the most popular and convenient method. According to this method, the number of units of each product manufactured is multiplied by the product's selling price to obtain the sales value of product. Joint costs are apportioned in the ratio of sales value of individual products.

Market value may mean any of the following: (a) Market value at separation point; (b) Market value after further processing; (c) Net realisable value.

(a) Market value at separation point: Under this method, market value of the Joint products at the separation point is ascertained and the joint cost is apportioned in the ratio of sales value. This method is useful where further processing of products incurs disproportionate costs.

Illustration 1.5

Joint costs—₹1,20,000

Products	*Production (Units)*	*Selling Price Per Unit at Separation Point (₹)*
A	500	20
B	300	30
C	200	25

The products did not require any further processing cost after split-off point. You are required to apportion the joint cost on sales value at separation point.

Solution:

Joint Cost Apportionment

Products	*Production (Units)*	*Selling Price Per Unit (₹)*	*Sales Value (₹)*	*Apportioned Joint Cost (in the ratio of 10 : 9 : 5) (₹)*
A	500	20	10,000	50,000
B	300	30	9,000	45,000
C	200	25	5,000	25,000
	1,000		24,000	1,20,000

Statement of Cost

Products	*Apportioned Joint Cost (₹)*	*Production (Units)*	*Cost Per Unit (₹)*
A	50,000	500	100
B	45,000	300	150
C	25,000	200	125

(b) Market value after processing: This method is easy to operate because selling price of the various joint products (after further processing) will be readily available. Pre-separation costs (i.e. joint costs) are apportioned in proportion to the sales value of the finished products after deducting further processing cost. This method is, however, unfair where further processing costs of products are disproportionate.

Illustration 1.6

Joint cost—₹810

Products	*Production (Units)*	*Selling Price Per Unit (₹)*	*Further Processing Cost (₹)*
X	400	5	500
Y	500	4	800

Apportion joint costs.

Solution:

Apportionment of Joint Cost

Products	*Units*	*Selling Price Per Unit (₹)*	*Sales Value (₹)*	*Further Processing Cost (₹)*	*Sales Value Less Processing Cost (₹)*	*Ratio*	*Apportioned Joint Cost*
X	400	5	2,000	500	1,500	$\frac{15}{27}$	450
Y	500	4	2,000	800	1,200	$\frac{12}{27}$	360
					2,700		810

(c) Net Realisable Value (or Reverse Cost) Method: Under this method, from the sales value of joint products (at finished stage), the following are deducted—(1) Estimated profit margin; (2) Selling & Distribution expenses (if any); (3) Post split-off cost.

The resultant figure is net realisable value of joint products and joint costs are apportioned in the ratio of net realisable values.

Illustration 1.7

A factory produces three products X, Y and Z, which originate from a joint process.
Joint cost—₹20,000

	Subsequent Processing Costs		
	X	*Y*	*Z*
Materials cost	1,500	1,550	400
Labour cost	800	200	200
Production overheads	700	250	400
	3,000	2,000	1,000
Sales value	30,000	24,000	20,000
Estimated profit on sales value	30%	25%	20%
Selling and distribution expenses	5,000	1,000	3,000

Prepare a statement showing the apportionment of Joint cost of different products.

Solution:

Apportionment of Joint Costs

Particular		*Product-X*	*Product-Y*	*Product-Z*
	Sales value	30,000	24,000	20,000
Less:	Estimated profit	(30% of 30,000) 9,000	(25% of 24,000) 6,000	(20% of 20,000) 4,000
	Estimated total cost	21,000	18,000	16,000
Less:	Selling & Distribution expenses	5,000	1,000	3,000
		16,000	17,000	13,000
Less:	Subsequent processing cost	3,000	2,000	1,000
	Net Realisable value (i.e. basis of apportionment of joint cost)	13,000	15,000	12,000

Joint Cost assigned to products

$$\text{Product-X} = \frac{13,000}{40,000} \times 20,000 = ₹6,500$$

$$\text{Product-Y} = \frac{15,000}{40,000} \times 20,000 = ₹7,500$$

$$\text{Product-Z} = \frac{12,000}{40,000} \times 20,000 = ₹6,000$$

$$20,000$$

1.6 ACCOUNTING OF BY-PRODUCTS

By-products can be classified into two groups according to their marketable condition at the split-off point:

(1) By-products requiring no further processing after separation from the main product;

(2) By-products requiring additional processing after separation from the main product.

Accounting of by-products may broadly be classified into two categories:

(A) Non-Cost or Sales Value Method: (1) Other Income or Miscellaneous Income Method; (2) By-product sales value added to the main product sales; (3) By-product sales value deducted from total cost; (4) Credit of by-product sales value less selling and distribution costs of by-products; (5) Credit of sales value less selling and distribution costs as well as costs incurred on by-product after split-off point; (6) Reverse cost method.

(B) Cost Methods: (1) Opportunity or Replacement cost method; (2) Standard cost method; (3) Joint cost proration.

1.6.1 Non-Cost or Sales Value Method

(1) Other Income or Miscellaneous Income Method: Under this method, by-products do not bear any portion of joint costs. Here, any amount realised from the sale of by-products is transferred to the Costing Profit & Loss Account as 'Other Income' or 'Miscellaneous Income'. The sale proceeds are regarded as windfall income. This method can be justified in the following circumstances:

(i) The market value of the by-products is negligible as compared to that of main products.

(ii) Costing of by-products is undesirable owing to clerical cost involved.

(iii) The cost of joint products does not vary appreciably as a result of non-costing of by-products.

(2) By-product sales value added to the main product sales: Under this method, all costs incurred on joint products and by-products are accumulated and their sum is deducted from the sales value of all products (joint products as well as by-products).

Illustration 1.8

		₹	₹
Sales Value:			
	Join products (2,000 units @ ₹20)	40,000	
	By-products (50 units @ ₹2)	100	40,100
Less:	Cost of production (joint product and by-products combined)		20,000
	Gross profit		20,100

(3) By-product sales value deducted from total cost: Under this method, although the by-products do not bear any portion of joint costs, the cost of the main products is reduced by deducting the sales value of by-products from joint costs.

Illustration 1.9

Joint processing cost—₹40,000

	Production (units)
Main product-X	10,000 units
By-product-Y	200 units

No further costs are incurred after the separation point. Market value of By-product-Y is ₹5 per unit. Determine the cost to be borne by main product-X under this method.

Solution:

Cost of Main Product

	Particulars	₹
	Joint Processing cost	40,000
Less:	Sales value of by-product-Y (200 units @ ₹5)	1,000
	Cost to be borne by Main Product-X	39,000
	Units produced	10,000
	Cost per unit (₹)	3.90

(4) Credit of by-product sales value less selling and distribution costs of by-products: Under this method, the selling and distribution costs incurred for disposing of the by-product is deducted from the sales value of by-product and the net amount is deducted from total cost.

Illustration 1.10

Joint processing cost—₹40,000

	Production (units)
Main Product-X	10,000 units
By-product-Y	200 units
Market value of By-product-Y ₹5 per unit	

Selling & Distribution overheads of By-product-Y ₹300

Determine the cost to be borne by Main Product-X under this method.

Solution:

Cost of Main Product

	Particulars	₹	₹
	Joint Processing cost		40,000
Less:	By-product value:		
	Sales value of By-product-Y (200 units @ ₹5)	1,000	
Less:	Selling and distribution overheads of By-product-Y	300	
			700
	Cost to be borne by Main product-X		39,300
	Units produced		10,000
	Cost per unit (₹)		3.93

(5) Credit of sales value less selling and distribution costs as well as costs incurred on By-product after split-off point: Where by-product requires some further operations after split-off point, the costs after split-off point as well as selling and distribution costs are deducted from sales value of by-product and net amount is deducted from total costs to be borne by main products or joint products.

Illustration 1.11

	₹	₹
Joint costs incurred		
(for producing Main Product-X and By-product-Y)		50,000
Post split-off cost		
Product-X	7,000	
Product-Y	3,000	10,000
Cost of production		60,000
		Production (units)
Product-X		1,000
Product-Y		600
Selling and distribution expenses (Product-Y)	₹500	
Selling Price per unit of Product-Y	₹10	

Determine the costs to be borne by Main Product-X.

Solution:

Cost of Main Product

Particulars	₹	₹	₹
Joint cost		50,000	
Post split-off cost (Product-X)		7,000	57,000
Less: Net value of By-Product-Y:			
Sales value of By-product-Y [600 × ₹10]		6,000	
Less: Post split-off costs	3,000		
Selling and distribution expenses	500	3,500	2,500
Costs to be borne by Main Product-X			54,500
Units produced (Product-X)			1,000 units
Cost per unit			₹54.50

(6) Reverse Cost Method: Under this method, the sales value of By-product is reduced by: (a) Estimated profit margin; (b) Selling and distribution expenses; and (c) Post split-off costs.

The net value thus obtained is deducted from joint costs to determine the costs to be borne by main products or joint products.

Illustration 1.12

While manufacturing the main product-A, a company processes the resulting waste materials into two By-products-B_1 and B_2. Using the method of working back from sales values to an estimated cost, prepare a comparative profit and loss statement of the three products from the following data:

(i) Total cost upto separation point was ₹68,000

	A (₹)	B_1 (₹)	B_2 (₹)
(ii) Sales (entire production)	1,64,000	16,000	24,000
(iii) Cost after separation		4,800	7,200
(iv) Estimated net profit percentage to sales value		20%	30%
(v) Estimated selling expenses as percentage of sales value	20%	20%	20%

Solution:

Cost of By-products

Particulars	B_1 ₹		B_2 ₹	
Sales Value		16,000		24,000
Less: Estimated net profit	3,200		7,200	
Selling expenses	3,200		4,800	
Cost after separation	4,800		7,200	
		11,200		19,200
Joint costs to be borne by By-products		4,800		4,800

Therefore, Main product-A will bear cost of ₹58,400 (i.e. 68,000 – 4,800 – 4,800).

Comparative Profit & Loss Statement

Particulars	*A* ₹	B_1 ₹	B_2 ₹	*Total* ₹
1. Sales	1,64,000	16,000	24,000	2,04,000
2. Cost of Sales:				
Pre-separation costs	58,400	4,800	4,800	68,000
Post-separation costs	—	4,800	7,200	12,000
Cost of production	58,400	9,600	12,000	80,000
Selling expenses	32,800	3,200	4,800	40,800
Cost of sales	91,200	12,800	16,800	1,20,800
3. Profit (1–2)	72,800	3,200	7,200	83,200
4. Profit as a percentage of sales value	44.4%	20%	30%	40.8%

1.6.2 Cost Methods

(1) Opportunity (or Replacement) Cost Method: This method is adopted where by-products are utilized by the factory itself as input material for some other process. The opportunity costs (i.e. the cost which would have been incurred had the by-products been purchased from outside suppliers), is taken as the cost of the by-product.

(2) Standard Cost Method: A standard cost is set on the basis of technical assessment for each by-product and credit is given to the process account on this basis. Because of the stability of this method, an effective control can be exercised on the cost of the main product.

(3) Joint Cost Proration: When by-products are of considerable value, it is desirable to apportion the joint costs to main products and by-products on some suitable basis (i.e. physical measurement, market value etc.) This method is followed where by-products are processed (i) to dispose of waste materials more profitably, or (ii) to utilize idle plant capacity. In the first case, by-product after separation is charged with overhead at full rates, whereas in the second case, by-product costs after separation will include variable costs only.

1.7 SELLING AT THE SPLIT-OFF POINT OR PROCESSING FURTHER

A joint product may be sold at the 'split-off point' or it may be sold as a refined product immediately after processing. In order to make a decision in this regard, it is necessary to compare the additional cost to be incurred for further processing and the additional revenue expected to be derived from further processing.

Decision Guidelines

(i) Decision to Process Further: If the incremental revenue is higher than the incremental cost, it is necessary to sell the joint product after further processing.

(ii) Decision to Sell at the Split-off Point: If the incremental revenue is lower than the incremental cost, it is necessary to sell the joint product at the split-off point (without further processing).

Points to Remember:

(a) The joint cost incurred up to the 'split-off point' is not relevant for this decision making purpose.

(b) Sometimes, it becomes essential to consider certain non-cost (i.e., qualitative) factors to arrive at a correct decision.

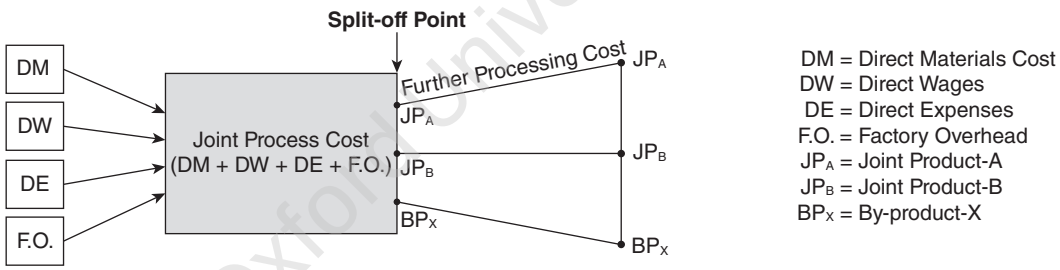

Fig. 1.1

Illustration 1.13

Gamon Ltd. is considering further processing of one of its joint products 'X'. The joint cost apportioned to Product-X at the split-off point is ₹25 per unit and its selling price at this stage is ₹30 per unit. Alternatively, the product can also be sold after further processing. An additional cost of ₹8 is expected to be incurred for its further processing. You are required to comment on selling the product at the split-off point or after further processing under the following circumstances:

The refined product is expected to be sold at a price of: (i) ₹40 per unit; (ii) ₹37 per unit; (iii) ₹38 per unit.

Solution:

(i) (a) Incremental Cost of further processing = ₹8

(b) Incremental Revenue from further processing = ₹40 – ₹30 = ₹10

(c) Incremental Profit = Incremental Revenue – Incremental Cost = ₹10 – ₹8 = ₹2

Therefore, the product should be processed further as incremental revenue is higher than incremental cost. Further processing of Product-X is justified as it helps in earning of additional profit of ₹2 per unit.

Alternative calculation for situation (i):

(a) Profit per unit (at the split-off point) = ₹30 – ₹25 = ₹5

(b) Profit per unit (after further processing) = ₹40 – (₹25 + ₹8) = ₹7

Therefore, further processing ensures an additional profit of ₹2 per unit. Therefore, it is recommended to sell the product after further processing.

(ii) (a) Incremental Cost = ₹8

(b) Incremental Revenue = ₹37 – ₹30 = ₹7

Therefore, the product should not be processed further as incremental revenue is lower than incremental cost.

(iii) (a) Incremental Cost = ₹8

(b) Incremental Revenue = ₹38 – ₹30 = ₹8

The company may or may not process the product further as incremental revenue equals to incremental cost. The final decision depends on consideration of certain non-cost factors (such as utilization of idle capacity, creating more employment opportunity, selling more refined product, etc.).

Illustration 1.14

Sterling Ltd. manufactures three joint products X, Y and Z using a common manufacturing process. The facts and figures relating to the three products are furnished below:

Particulars	*Product-X*	*Product-Y*	*Product-Z*
Output	2,000 units	5,000 units	3,000 units
Share of joint cost of ₹3,00,000 (in proportion to the output)	₹60,000	₹1,50,000	₹90,000
Selling price per unit (at the split-off point)	₹50	₹60	₹40
Further processing cost	₹40,000	₹75,000	₹60,000
Selling price per unit (after further processing)	₹80	₹70	₹60

(i) Comment on the further processing decision of the above products.

(ii) Determine the profit or loss of each product as per given decision.

Solution:

(i) *Further Processing Decision*

Particulars	*Product-X (2,000 Units)*	*Product-Y (5,000 Units)*	*Product-Z (3,000 Units)*
(a) Incremental Cost	₹40,000	₹75,000	₹60,000
(b) Extra Revenue per unit due to further processing (₹80 – ₹50); (₹70 – ₹60); (₹60 – ₹40)	₹30	₹10	₹20
(c) Total Incremental Revenue [Output × (b)]	₹60,000	₹50,000	₹60,000
Decision	**Further processing (As IR > IC)**	**No further processing (As IR < IC)**	**Indifference attitude (As IR = IC)**

Therefore, (a) Product-X can be processed further as it ensures incremental profit of ₹20,000. (b) Product-Y should be sold out at split-off point without further processing. (c) Product-Z may be processed further or may not be processed that depends on the attitude of the management (after considering other non-cost factors).

(ii) *Profit or Loss of Each Product as per Above Decision*

Particulars	*Product-X (2,000 Units)*	*Product-Y (5,000 Units)*	*Product-Z (3,000 Units)*
(a) Share of joint cost	₹60,000	₹1,50,000	₹90,000
(b) Further processing cost	₹40,000	Nil	Nil
(c) Total cost [(a) + (b)]	₹1,00,000	₹1,50,000	₹90,000
(d) Total revenue (2,000 × ₹80); (5,000 × ₹60); (3,000 × ₹40)	₹1,60,000	₹3,00,000	₹1,20,000
Profit [(d) – (c)]	**₹60,000**	**₹1,50,000**	**₹30,000**

We assume that the company decides to sell Product-Z at the split-off point.

Illustration 1.15

Snoopy Ltd. manufactures three joint products X, Y and Z. The products can be processed further separately after the split-off point. The following data relating to three products are given:

Particulars	*Product-X*	*Product-Y*	*Product-Z*
Output	5,000 units	4,000 units	3,000 units
Selling price per unit (at the split-off point)	₹10	₹12	₹13
Selling price per unit (after further processing)	₹14	₹24	₹28
Further processing cost	₹22,000	₹15,000	₹34,000
Share of joint cost of ₹40,000	₹18,000	₹12,000	₹10,000

(i) Comment on the further processing decision of the above products.

(ii) Determine the profit or loss of each product as per given decision.

Solution:

(i) *Further Processing Decision*

Particulars	*Product-X (5,000 Units)*	*Product-Y (4,000 Units)*	*Product-Z (3,000 Units)*
(a) Incremental Cost	₹22,000	₹15,000	₹34,000
(b) Extra Revenue per unit due to further processing (₹14 – ₹10); (₹24 – ₹12); (₹28 – ₹13)	₹4	₹12	₹15
(c) Total Incremental Revenue [Output × (b)]	₹20,000	₹48,000	₹45,000
Decision	**No further processing (As IR < IC)**	**Further processing (As IR > IC)**	**Further processing (As IR > IC)**

Therefore, (a) Product-X cannot be processed further as it leads to an incremental loss of ₹2,000. (b) Product-Y should be processed further as it ensures incremental profit of ₹33,000. (c) Product-Z needs to be processed further as it ensures incremental profit of ₹11,000.

(ii) ***Profit or Loss of Each Product as per Above Decision***

Particulars	*Product-X (5,000 Units)*	*Product-Y (4,000 Units)*	*Product-Z (3,000 Units)*
(a) Share of joint cost	₹18,000	₹12,000	₹10,000
(b) Further processing cost	Nil	15,000	34,000
(c) Total Cost [(a) + (b)]	₹18,000	₹27,000	₹44,000
(d) Total Revenue (5,000 × ₹10); (4,000 × ₹24); (3,000 × ₹28)	₹50,000	₹96,000	₹84,000
Profit [(d) – (c)]	**₹32,000**	**₹69,000**	**₹40,000**

The company decides to sell Product-X at the split-off point and other two products after further processing.

Illustration 1.16

A firm manufactures three joint products A, B, C and a by-product X by processing a common stock of materials. The initial joint processing costs are as follows:

Direct materials	10,000 kg. of raw materials at ₹8 per kg.
Direct labour	1,000 labour hours worked at ₹20 per hour
Variable Overhead	80% of direct labour cost
Fixed overhead	₹21,000

The company apportions common cost among joint products on physical unit basis.

All the products can be further processed and sold at a higher market price, with some sales promotion efforts. The relevant details of four products are as follows:

Particulars	*Product-A*	*Product-B*	*Product-C*	*Product-X*
Output	5,000 kg.	2,500 kg.	1,500 kg.	500 kg.
Current market price (per kg.)	₹18	₹20	₹24	₹4
Further processing cost (per kg.)	₹4	₹5	₹6	₹2
Further marketing cost (per kg.)	₹2	₹2	₹2	₹1
Final price after processing (per kg.)	₹28	₹26	₹34	₹6

You are required to:

(i) Compute the cost of joint products at the point of separation (i.e., split-off point).

(ii) Determine the profit or loss if the products are sold without further processing.

(iii) Which of the products can be processed further for maximizing profits?

Solution:

(i) ***Cost of Joint Products at the Point of Separation***	₹
Direct materials cost (10,000 kg. × ₹8 per kg.)	80,000
Direct labour cost (1,000 hours × ₹20 per hour)	20,000

Variable overheads (80% of ₹20,000)	16,000
Fixed overheads	21,000
Total Cost	1,37,000
Less: Sales value of by-products (500 kg. × ₹4 per kg.)	2,000
Joint Process Cost	1,35,000

Allocation of joint cost among joint products on the basis of physical units (i.e., 5,000 : 2,500 : 1,500)

Product-X ₹1,35,000 × 5,000/9,000 = ₹75,000
Product-Y ₹1,35,000 × 2,500/9,000 = ₹37,500
Product-Z ₹1,35,000 × 1,500/9,000 = ₹22,500

(ii) ***Statement of profit or loss if joint products are sold without further processing***

Particulars	*Product-A*	*Product-B*	*Product-C*	*Total*
(a) Output	5,000 Kg.	2,500 Kg.	1,500 Kg.	
(b) Current market price (per kg.)	₹18	₹20	₹24	
(c) Sales value [(a) × (b)]	₹90,000	₹50,000	₹36,000	₹1,76,000
(d) Allocation of joint costs [See (i) above]	₹75,000	₹37,500	₹22,500	₹1,35,000
(e) Profit at the point of separation [(c) – (d)]	₹15,000	₹12,500	₹13,500	₹41,000

(iii) ***Further processing decision***

Particulars	*Product-A*	*Product-B*	*Product-C*	*Product-X*
(a) Sales value at split-off point	₹18	₹20	₹24	₹4
(b) Sales value after further processing	₹28	₹26	₹34	₹6
(c) Incremental revenue [(b) – (a)]	₹10	₹6	₹10	₹2
(d) Further processing cost	₹4	₹5	₹6	₹2
(e) Further marketing cost	₹2	₹2	₹2	₹1
(f) Incremental cost [(d) + (e)]	₹6	₹7	₹8	₹3
(g) Incremental profit/loss [(c) – (f)]	₹4	₹(–) 1	₹2	₹(–) 1

Therefore, products A and C should be processed further as they give incremental profits. On the other hand, products B and X should be sold at the split-off point as they suffer incremental losses.

Review Illustrations

Problem 1.1

Simple Average Cost Method

Find out the cost of joint products X, Y and Z using average cost method from the following particulars:

(i) Joint processing cost (cost up to the split-off point) – ₹4,50,000;

(ii) Number of units of joint products manufactured:
Product-X – 10,000 units; Product-Y – 5,000 units; Product-Z – 7,500 units.

Solution:

(a) Joint cost = ₹4,50,000; (b) Total units produced = 10,000 + 5,000 + 7,500 = 22,500 units.

Average cost per unit = ₹4,50,000/22,500 units = ₹20 per unit

Apportionment of Joint Cost

Joint Products	*Units Produced*	*Cost per Unit (₹)*	*Apportioned Cost (₹)*
X	10,000	20	2,00,000
Y	5,000	20	1,00,000
Z	7,500	20	1,50,000
Total	22,500		4,50,000

Problem 1.2

Weighted Average Cost Method (Point Value Method or Survey Method)

Four joint products M, N, O and P are produced simultaneously using a common manufacturing process. You are required to apportion joint cost using the weighted average (i.e., point value) method from the following information:

(i) Joint processing cost (pre separation point cost) – ₹12,00,000;

(ii) Number of units of joint products manufactured:

Product-M 20,000 units; Product-N 15,000 units; Product-O 10,000 units; Product-P 15,000 units.

(iv) The weight factor assigned to joint products:

Product-M – 10; Product-N – 8; Product-O – 5; Product-P – 2.

Solution:

Apportionment of Joint Cost

Joint Products	*Units Produced*	*Weight Points*	*Equivalent Units*	*Average Cost** per Unit (₹)*	*Apportioned Cost (₹)*
M	20,000	10	2,00,000	3	6,00,000
N	15,000	8	1,20,000	3	3,60,000
O	10,000	5	50,000	3	1,50,000
P	15,000	2	30,000	3	90,000
Total			4,00,000		12,00,000

**Average Cost per unit = Total Joint Costs/Total Equivalent units = ₹12,00,000/4,00,000 units = ₹3 per unit

Problem 1.3

Physical Units Method

The following data have been extracted from the books of Bharat Mining Company Ltd.:

Joint Products	*Weight per 1,000 kg. of Input*
Coke	700 kg.
Coal tar	200 kg.
Benzol	100 kg.

Joint processing cost:

Direct materials cost – ₹10 per kg.; Direct wages – ₹40,000; Power cost – ₹20,000; Other charges – ₹30,000. You are required to apportion joint costs on the basis of weight of each product.

Solution:

Joint Processing Cost	₹
Direct materials cost (1,000 kg. @ ₹10)	10,000
Direct wages	40,000
Power cost	20,000
Other charges	30,000
Total	1,00,000

Apportionment of Joint Cost (on the basis of weight of each product)

Coke – ₹1,00,000 × 700 kg./1,000 kg. = ₹70,000

Coal tar – ₹1,00,000 × 200 kg./1,000 kg. = ₹20,000

Benzol – ₹1,00,000 × 100 kg./1,000 kg. = ₹10,000

Problem 1.4

Physical Units Method

Prepare a statement showing costs of joint products and by-products from the following particulars:

Products	*Yield (in Percentage of Input)*
Joint Product-A	50%
Joint Product-B	35%
By-product-X	10%
Normal loss	05%

8,000 units of raw material were introduced into the process at ₹4 per unit. Direct wages, power cost and other charges are ₹25,000, ₹8,000 and ₹5,000 respectively.

Solution:

Joint Processing Cost	₹
Direct materials cost (8,000 units @ ₹4)	32,000
Direct wages	25,000
Power cost	8,000
Other charges	5,000
Total	70,000

(a) Yield of Product-A = 50% of 8,000 units = 4,000 units

(c) Yield of Product-B = 35% of 8,000 units = 2,800 units

(c) Yield of Product-X = 10% of 8,000 units = 800 units

(d) Normal loss = 05% of 8,000 units = 400 units

Apportionment of Joint Cost (on the basis of yield)

Product-A – ₹70,000 × 4,000 units/7,600 units = ₹36,842

Product-B – ₹70,000 × 2,800 units/7,600 units = ₹25,789

Product-X – ₹70,000 × 800 units/7,600 units = ₹ 7,369

Problem 1.5

Standard Cost Method

You are required to apportion joint costs using standard cost method from the following particulars:

(i) Joint processing cost (up to the split-off point) – ₹36,00,000;

(ii) Number of units of joint products manufactured:

Product-W – 2,00,000 units; Product-X – 2,00,000 units; Product-Y – 1,00,000 units; Product-Z – 1,50,000 units.

(iii) Other relevant details are given below:

Particulars	*Product-W*	*Product-X*	*Product-Y*	*Product-Z*
Estimated sales value (₹)	10,00,000	8,00,000	5,00,000	7,50,000
Profit margin on sales	10%	5%	20%	20%
Selling & Distribution overhead (₹)	1,50,000	1,00,000	50,000	50,000
Conversion cost (₹)	1,50,000	1,60,000	50,000	1,50,000

Solution:

Apportionment of Joint Cost (Based on standard cost of raw materials)

Particulars	*Product-W (₹)*	*Product-X (₹)*	*Product-Y (₹)*	*Product-Z (₹)*
Estimated sales value	10,00,000	8,00,000	5,00,000	7,50,000
Less: Profit margin on sales	1,00,000 (10% on sales)	40,000 (5% on sales)	1,00,000 (20% on sales)	1,50,000 (20% on sales)
Cost of Sales	9,00,000	7,60,000	4,00,000	6,00,000
Less: Selling & Distribution overhead	1,50,000	1,00,000	50,000	50,000
Cost of Production	7,50,000	6,60,000	3,50,000	5,50,000
Less: Conversion Cost	1,50,000	1,60,000	50,000	1,50,000
Cost of Raw Materials	6,00,000	5,00,000	3,00,000	4,00,000
Apportionment of Joint Cost (In the ratio of standard cost of Raw Materials i.e., 6 : 5 : 3 : 4)	12,00,000	10,00,000	6,00,000	8,00,000

Problem 1.6

Market Value Method

You are required to apportion joint costs using market value method from the following particulars:

(i) Joint processing cost (up to the split-off point) – ₹60,00,000;

(ii) Number of units of joint products manufactured:

Product-A – 2,00,000 units; Product-B – 1,50,000 units; Product-C – 1,00,000 units; Product-D – 1,50,000 units.

(iii) Market price per unit of joint products (at the split-off point):

Product-A – ₹4.75; Product-B – ₹4; Product-C – ₹5.50; Product-D – ₹6.

Solution:

Apportionment of Joint Cost

Particulars	*Product-A*	*Product-B*	*Product-C*	*Product-D*
(a) Number of units produced	2,00,000	1,50,000	1,00,000	1,50,000
(b) Market price (at split-off point)	₹4.75	₹4.00	₹5.50	₹6.00
(c) Total Market Value [(a) × (b)] (₹)	9,50,000	6,00,000	5,50,000	9,00,000
Apportionment of Joint Cost (In the ratio of Market Value i.e., 95 : 60 : 55 : 90)	19,00,000	12,00,000	11,00,000	18,00,000

Problem 1.7

Sales Value Method

Four joint products A, B, C and D emerge from the processing of one basic raw material. You are required to apportion joint costs using sale value method from the following particulars:

Joint Products	*Number of Units Produced*	*Selling Price per Unit (₹)*
A	3,000 units	₹52
B	2,000 units	₹55
C	2,800 units	₹50
D	2,200 units	₹60

The company estimated a profit of 10% of sales value.

Solution:

(i) Statement showing computation of joint costs

Sales value of joint products:

Product-A	3,000 units @ ₹52 = ₹1,56,000
Product-B	2,000 units @ ₹55 = ₹1,10,000
Product-C	2,800 units @ ₹50 = ₹1,40,000
Product-D	2,200 units @ ₹60 = ₹1,32,000
Total Sales Value	₹5,38,000
Less: Estimated Profit (10% on sales)	₹53,800
Joint Cost (Balancing figure)	₹4,84,200

(ii) Statement showing apportionment of joint costs (on sales value basis)

Product-A = ₹4,84,200 × 1,56,000/5,38,000 = ₹1,40,400

Product-B = ₹4,84,200 × 1,10,000/5,38,000 = ₹99,000

Product-C = ₹4,84,200 × 1,40,000/5,38,000 = ₹1,26,000

Product-D = ₹4,84,200 × 1,32,000/5,38,000 = ₹1,18,800

Problem 1.8

Reverse Cost Method

In manufacturing the main Product-X, two by-products (A and B) were incidentally produced from the same basic raw materials. You are required to (i) Apportion the joint costs; and (ii) Prepare a statement of Profit and Loss from the following details:

(a) Joint processing cost (up to separation point) – ₹1,36,000

	Product-X	*Product-A*	*Product-B*
(b) Sales value (₹)	3,28,000	32,000	48,000
(c) Post separation cost (₹)	–	9,400	14,600
(d) Estimated net profit (percentage of sales)	–	20%	30%
(e) Estimated selling expenses (percentage of sales)	20%	20%	20%

Solution:

(i) ***Apportionment of Joint Costs***

Particulars		*By-product A* (₹)	*By-product B* (₹)
Sales Value		32,000	48,000
Less: Estimated Net Profit (20% & 30% of Sales Value)		6,400	14,400
Cost of Sales		25,600	33,600
Less: Estimated Selling Expenses (20% of Sales Value)		6,400	9,600
Cost of Production		19,200	24,000
Less: Post Separation Cost		9,400	14,600
Cost of By-products (up to Separation Point)		9,800	9,400
Joint Processing Cost (up to Separation Point)	₹1,36,000		
Less: Cost of By-products (9,800 + 9,400)	₹19,200		
Cost of Main Product-X	₹1,16,800		

(ii) ***Statement of Profit and Loss***

Particulars	*Main Product-X* (₹)	*By-Products*	
		Product-A (₹)	*Product-B* (₹)
Share of Joint Costs	1,16,800	9,800	9,400
Add: Post Separation Cost	–	9,400	14,600
Cost of Production	1,16,800	19,200	24,000
Add: Selling Expenses (20% of sales value)	65,600	6,400	9,600
Cost of Sales	1,82,400	25,600	33,600
Add: Profit (Balancing figure for Product-X)	1,45,600	6,400	14,400
Sales Value	3,28,000	32,000	48,000

Problem 1.9

Reverse Cost Method

In the course of manufacturing of the main Product-P, two by-products (X and Y) emerged. The joint costs of manufacture amount to ₹1,19,550. All the products are processed further after separation and sold as per the details given below:

	Product-P	*Product-X*	*Product-Y*
(a) Sales value (₹)	90,000	60,000	40,000
(b) Post separation cost (₹)	6,000	5,000	4,000
(c) Net profit (percentage of sales)	25%	20%	15%
(d) Administration and selling expenses (% of cost of sales)	10%	10%	10%

You are required to apportion joint costs to the main product and by-products.

Solution:

Apportionment of Joint Costs

Particulars	*Main Product-P* (₹)	*By-product X* (₹)	*By-product Y* (₹)
Sales Value	90,000	60,000	40,000
Less: Net Profit (25%; 20% & 15% of Sales Value)	22,500	12,000	6,000
Cost of Sales	67,500	48,000	34,000
Less: Administration and Selling Expenses (10% of Cost of Sales)	6,750	4,800	3,400
Cost of Production	60,750	43,200	30,600
Less: Post Separation Cost	6,000	5,000	4,000
Share of Joint Costs	54,750	38,200	26,600

Problem 1.10

Net Realizable Value Method

You are required to apportion joint costs using net realizable value method from the following particulars:

(i) Joint processing cost (up to the split-off point) – ₹66,00,000;

(ii) Number of units of joint products manufactured:

Product-A – 2,00,000 units; Product-B – 1,50,000 units; Product-C – 1,00,000 units; Product-D – 1,50,000 units.

(iii) Market price per unit of joint products (after the split-off point):

Product-A – ₹5.75; Product-B – ₹5; Product-C – ₹6.50; Product-D – ₹7.

(iv) Further processing cost (i.e., cost incurred after split-off point)

Product-A – ₹1,50,000; Product-B – ₹50,000; Product-C – ₹50,000; Product-D – ₹50,000.

Solution:

Apportionment of Joint Cost

Particulars	*Product-A*	*Product-B*	*Product-C*	*Product-D*
(a) Number of units produced	2,00,000	1,50,000	1,00,000	1,50,000
(b) Market price (at split-off point)	₹5.75	₹5.00	₹6.50	₹7.00
(c) Total Market Value [(a) × (b)] (₹)	11,50,000	7,50,000	6,50,000	10,50,000
Less: Further Processing Cost (₹)	1,50,000	50,000	50,000	50,000
Net Realizable Value	10,00,000	7,00,000	6,00,000	10,00,000
Apportionment of Joint Cost (In the ratio of Net Realizable Value i.e., 10 : 7 : 6 : 10)	20,00,000	14,00,000	12,00,000	20,00,000

SECTION-II: ACTIVITY-BASED COSTING

1.8 CONCEPT OF ACTIVITY-BASED COSTING

Activity-Based Costing (ABC) is a new technique of absorption of overheads (i.e., indirect costs). ABC attempts to absorb overheads on a more realistic basis. It was developed by Professors *Robin Cooper* and *Robert S. Kaplan* of Harvard Business School. ABC helps in overcoming the shortfall of traditional methods of absorbing overheads. It is especially suitable for manufacturing concerns producing a large variety of products (or rendering services).

Several activities are necessary to produce various products and services. ABC focuses on "*major activities*" needed to produce products and services. Such *major activities* are considered as "*Cost Pools*". These activities consume resources. Therefore, it is necessary to measure indirect costs incurred for all "*major activities performed*".

Firstly, indirect costs (i.e., overheads) associated with all major activities are measured. Thereafter, appropriate *Cost Drivers* are used in charging overheads to various products and services. Cost Drivers are "*measures of quantity*" of the main activities performed. Cost Driver Rate plays a vital role in assigning overheads to various products and services. Appropriate Cost Drivers are used for assigning costs to major activities and finally, costs to various products and services.

- "Activity-Based Costing is a process of attributing indirect costs to various cost units on the basis of benefits received from indirect activities (such as ordering, setting up, assuring quality, etc.)".

[C.I.M.A., London]

Thus, ABC is a process that measures overheads for each major activity (i.e., *cost pools*) and absorbs those overheads to various products by using appropriate *cost driver*.

1.8.1 Characteristics of Activity-Based Costing System

The following are the features of ABC system:

(i) ABC system focuses on major *activities performed* to produce goods and services.

(ii) Major activities are treated as focal points for indirect costs (overhead) accumulation.

(iii) Activities are considered as forces for the incurrence of overheads.

(iv) Overheads are charged to products on the basis of the products' use of each activity.
(v) Major activities (i.e., cost centers) are also known as "cost pools".
(vi) Cost drivers are "*measure of activities*" performed.
(vii) Cost drivers are used to assign overheads to products.
(viii) Cost data available as per ABC are more accurate and reliable.
(ix) ABC puts importance on value-added activities and eliminates non-value-added activities.
(x) ABC enhances efficiency of an organisation.

1.8.2 Steps Involved in Implementing Activity-Based Costing

The following steps are involved in the implementation of ABC:
(i) Identify major activities (i.e., cost pools) relating to overheads such as machine set up, ordering, etc.
(ii) Measure indirect costs (i.e., overheads) of each major activity.
(iii) Select an appropriate cost driver (i.e., measure of quantity) for each activity.
(iv) Calculate total units of the cost driver relevant to each activity.
(iv) Compute the cost driver rate (dividing the cost of an activity by the total units of cost driver).
(v) Apply cost driver rate to various products manufactured.
(vi) Charge overheads to products based on products' use of each activity.

Structure of Activity-Based Costing

Stage I: Activity identification

Stage II: Attribution of overheads to activities

Stage III: Identification and measurement of cost driver

Stage IV: Calculation of cost driver rate

Stage V: Application of cost driver rate to products

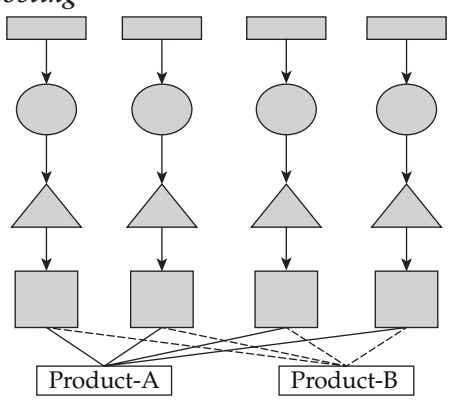

Fig. 1.2

Source: Cost Management by T. Yoshikawa, J. Innes, and others.

1.8.3 Applicability of Activity-Based Costing

The ABC system is useful both for the production sector and the service sector in the following ways:
(i) Where overheads (i.e., indirect costs) are high because of automated production;
(ii) Where a large variety of products are produced;
(iii) Where products and services consume different amounts of overhead resources;
(iv) Where consumption of overhead resource is affected by the major activities performed;
(v) Where overheads are influenced by product diversity and quality of output;
(vi) Where realistic overhead absorption is necessary for measuring accurate product cost;
(vii) Where accurate cost information is necessary for proper decision making.

1.8.4 Key Terms Associated with the Concept of Activity-Based Costing

The following terms are often used in connection to ABC analysis:

(i) **Activity:** An activity is a particular task (or function) in relation to production of goods and services.

(ii) **Cost Pools:** Cost pool is also known as cost center. Cost pool means grouping of individual cost items. It is an activity in respect of which overhead is measured. Initially, overheads are assigned to various cost pools. Overheads are accumulated for each activity center as a separate cost object.

(iii) **Cost Driver:** The force behind incurring indirect costs (overheads) is termed as cost driver. A cost driver influences the cost of an activity. It acts as a link between an activity and its cost. Appropriate cost drivers are to be used in tracing indirect costs to various cost pools. The cost driver rate is computed by applying the following formula:

$$\text{Cost Driver Rate} = \frac{\text{Total Cost of an Activity}}{\text{Activity Cost Driver Chosen}}$$

Cost Pools (i.e., Major Activities)	*Cost Drivers (i.e., Measures of Activities)*
(a) Machine set up	(a) Number of set ups (or production runs)
(b) Machine repair and maintenance	(b) Machine hours worked (or No. of breakdowns)
(c) Materials handling	(c) Number of material requisitions (or movements)
(d) Materials acquisition (or procurement)	(d) Number of transactions
(e) Purchase	(e) Number of purchase orders placed
(f) Inspection	(f) Number of inspections
(g) Quality testing	(g) Number of tests (or Hours of test time)
(h) Packing	(h) Number of packing orders
(i) Warehousing	(i) Number of items in stock
(j) Repair	(j) Number of parts repair
(k) Power	(k) Kilowatt hours
(l) Heat, light and water	(l) Number of units
(m) Production scheduling	(m) Number of production runs

Illustration 1.17

Compute the overhead rate for each cost driver from the following details:

Cost Pools (Major Activities)	*Production Overhead (₹)*	*Cost Drivers (Measures of Activity)*	*Quantity of Cost Drivers*
Machine maintenance	6,00,000	Machine hours	15,000 hours
Machine set up	1,00,000	Number of set ups	2,000 set ups
Purchase orders	2,00,000	Number of orders	2,500 orders
Materials handling	3,00,000	Number of requisitions	1,000 requisitions
Testing of products	50,000	Number of tests	100 tests
Inspection	1,50,000	Number of inspections	750 inspections

Solution:

Cost Driver's Rate (Activity Cost Rate)

Cost Pools (Major Activities)	*Production Overhead (₹)*	*Cost Driver (Measure of Activities)*	*Cost Driver Rate (Activity Cost Rate) (₹)*
(i) Machine maintenance	6,00,000	15,000 hours	₹40 per hour
(ii) Machine set up	1,00,000	2,000 set ups	₹50 per set up
(iii) Purchase orders	2,00,000	2,500 orders	₹80 per order
(iv) Material handling	3,00,000	1,000 requisitions	₹300 per requisition
(v) Testing of products	50,000	100 tests	₹500 per test
(vi) Inspection	1,50,000	750 inspections	₹200 per inspection

1.9 TRADITIONAL APPROACH OF ABSORBING OVERHEADS

The stages involved in absorbing overheads under traditional approach are as follows:

(i) **Primary Distribution of Overheads:** Firstly, overheads are allocated and apportioned to various production and service departments.

(ii) **Secondary Distribution of Overheads:** Secondly, service departments' overheads are reapportioned to production departments.

(iii) **Absorption of Overheads:** Thus, overheads are aggregated at the production departments. Finally, production departments' overheads are absorbed by the end product of the concerned department.

In the past, business concerns would manufacture a limited variety of products. As a result, overheads would constitute a small percentage of total cost. A single overhead rate (either machine hour rate or labour hour rate) was used for absorbing overheads to products.

Nowadays, companies have been producing a wide variety of products. As a result, overheads are increased heavily due to automation and complexity of production. Presently, overheads constitute a large portion of total cost. Therefore, the practice of using a single overhead rate for absorbing overheads leads to inaccurate product cost determination. The limitation of traditional approach has led to the emergence of ABC.

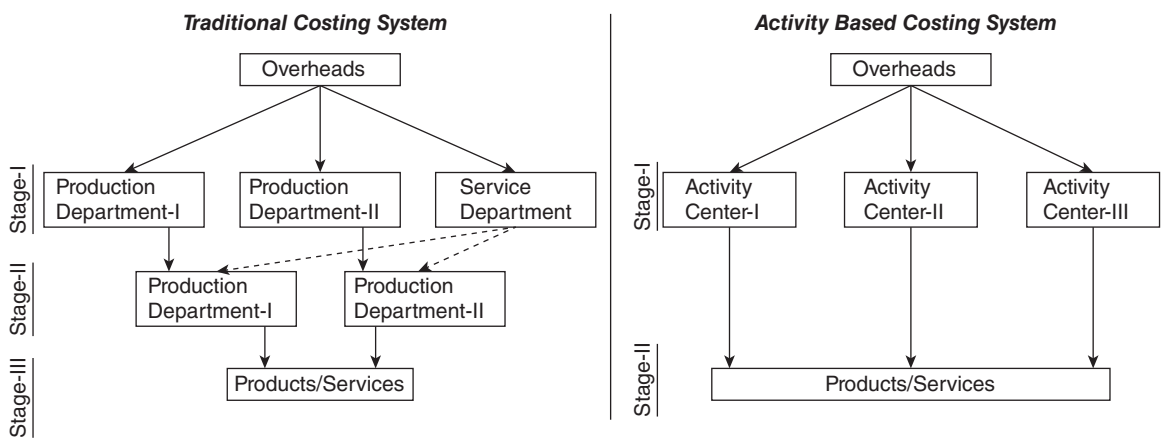

Fig. 1.3

1.9.1 Limitations of Traditional Approach of Absorbing Overheads

The limitations of the traditional approach of absorbing overheads are as follows:

(i) The traditional approach considers only volume-based measure of overheads (such as machine hours worked, labour hours used, etc.). There are certain overhead items that may not be related to physical volume.

(ii) This approach assumes that the products consume overhead resources in proportion to their production volume. As a result, high overheads are charged to high volume products and vice versa.

(iii) This approach fails to differentiate between high-valued and low-valued products.

(iv) This approach does not consider major activities of the production department.

(v) The approach is unrealistic for companies manufacturing diverse range of products.

(vi) This approach leads to inaccurate product (or service) cost determination.

(vii) Cost data available for decision making (such as product pricing and product mixing) are not reliable.

(viii) This approach fails to consider several factors other than production volume (such as quality of output, product diversity, complexity of operation, etc.).

1.10 DIFFERENCES BETWEEN TRADITIONAL COSTING AND ACTIVITY-BASED COSTING

The main differences between the two systems of costing regarding overhead absorption are as follows:

Points of Distinction	*Traditional Costing*	*Activity-Based Costing*
(i) Basis of absorbing overheads	Volume-based	Activity-based
(ii) Applicability	Low overhead organisations	High overhead organisations
(iii) Accumulation of overheads through	Various departments (cost centers)	Major activities (cost pools)
(iv) Absorption of overheads	Firstly, overheads are allocated to different departments and thereafter to various products	Firstly, overheads are assigned to major activities and thereafter to various products
(v) Range of products manufactured	Limited number of products	Diverse range of products
(vi) Suitable for industries	Labour intensive industries	Capital intensive industries
(vii) Overhead rate applied	Machine hour rate, labour hour rate, etc.	Cost per activity (cost driver)
(viii) Number of cost centers (or cost pools)	Limited departments	Many activities
(ix) Accounting process	Simple	Complicated
(x) Expenses involved	Low	High
(xi) Reliability of cost data	Less reliable	More reliable
(xii) Product cost measurement	Inaccurate	Accurate
(xiii) Number of cost driver used	Single (either machine hour rate or labour hour rate.	Multiple
(xiv) Cost efficiency	Low	High

1.11 BENEFITS (OR MERITS) OF ACTIVITY-BASED COSTING

The following benefits are received from the adaptation of ABC system:

(i) ABC focuses attention on major activities to be performed in producing diverse goods and services.

(ii) ABC considers only *value-added activities* in relation to absorption of overheads.

(iii) It helps in proper allocation of resources to value-added activities only.

(iv) It helps in identifying indirect costs (overheads) in relation to major activities performed.

(v) It provides an accurate basis for the absorption of overheads to products and services.

(vi) It ensures accuracy in ascertaining cost of products and services.

(vii) It highlights problem areas by identifying non-value-added activities for the management's attention.

(viii) It provides a rational basis for implementing an activity-based budget.

(ix) It is a powerful tool that can be used by the management for continuous improvement.

(x) It provides an excellent basis for proper managerial decision on fixing selling price of products.

(xi) It can be used effectively both for production and for service organisations.

(xii) It can also be used to assign non-production overheads (such as administration, selling and distribution) to various products and services.

1.12 LIMITATIONS (OR DISADVANTAGES) OF ACTIVITY-BASED COSTING

The ABC system suffers from the following limitations:

(i) It is a complex system to operate and expensive as compared to traditional overhead absorption.

(ii) It is also inappropriate for organisations that do not produce a variety of products.

(iii) This system is inappropriate for organisations where small amount of overhead is incurred.

(iv) It may not be beneficial for small organisations to operate.

(v) It appears to be complicated when there exists a large number of cost pools and cost drivers.

(vi) This system provides information only on historic cost (i.e., past cost).

(vii) Sometimes, it becomes difficult to identify an appropriate cost driver for a certain major activity.

(viii) It is difficult to adapt this new system as proper skills are required to manage its accounting procedure.

(ix) This system fails to change work processes in order to make the business more competitive.

(x) It requires maintaining a lot of records and involving intricate calculations.

Review Illustrations

Problem 1.1

A company uses Activity-Based Costing and provides you the following details regarding its production overhead:

Cost Pools	*Production Overheads (₹)*	*Cost Drivers Used*	*Cost Driver Quantity*
Machine set up	1,00,000	Number of set ups	200 set ups
Parts repair	1,40,000	Number of parts repaired	700 parts

The company receives a special order that requires the use of the following resources:

Direct material cost	₹70,000
Direct wages	₹20,000
Direct expenses	₹10,000
Number of machine set ups	40 set ups
Number of parts to be repaired	25 parts

Determine the factory cost of the proposed job.

Solution:

Cost Driver's Rate

Cost Pools	*Production Overhead (₹)*	*Cost Drivers Quantity*	*Cost Driver Rate (₹)*
(i) Machine set up	1,00,000	200 set ups	₹500 per set up
(ii) Parts repair	1,40,000	700 parts	₹200 per parts

Factory Cost of the Special Order

Particulars		*Amount (₹)*
Direct Materials Cost		70,000
Direct Wages		20,000
Direct Expenses		10,000
	Prime Cost	1,00,000
Add: Production Overhead		
(i) Machine set up cost (40 set ups @ ₹500)	₹20,000	
(ii) Parts repair cost (25 parts @ ₹200)	₹5,000	25,000
	Factory Cost	1,25,000

Problem 1.2

A company manufactures two products X and Y, using the same common facilities. The following details for a month are as follows:

Machine maintenance expenses ₹12,00,000

Machine set up expenses ₹1,20,000

Purchase Order expenses ₹1,40,000

Particulars	*Product-X*	*Product-Y*
Production during the month	4,000 units	8,000 units
Machine hours per unit	6 hours	2 hours
Number of machine set ups	60	180
Number of purchase orders	70	280

Compute the overhead absorbed per unit using ABC.

Solution:

(a) Total machine hours worked = 4,000 units × 6 hours per unit + 8,000 units × 2 hours per unit
= 24,000 hours + 16,000 hours = 40,000 hours

(b) Total number of machine set ups = 60 + 180 = 240 set ups

(c) Total number of purchase orders = 70 + 280 = 350 orders

Cost Driver's Rate (Activity Cost Rate)

Major activities (Cost Pools)	*Production Overhead (₹)*	*Measure of Activities (Cost Driver)*	*Cost Driver Rate (Activity Cost Rate) (₹)*
(i) Machine maintenance	12,00,000	40,000 hours	30 per hour
(ii) Machine set ups	1,20,000	240 set ups	500 per set up
(iii) Purchase orders	1,40,000	350 orders	400 per order

Production Overhead Charged to Products

Major Activities	*Product-X (₹)*	*Product-Y (₹)*
(i) Machine maintenance [(24,000 × ₹30); (16,000 × ₹30)]	7,20,000	4,80,000
(ii) Machine set ups [(60 × ₹500); (180 × ₹500)]	30,000	90,000
(iii) Purchase orders [(70 × ₹400); (280 × ₹400)]	28,000	1,12,000
Total (A)	7,78,000	6,82,000
Number of units produced (B)	4,000 units	8,000 units
Overhead absorbed per unit [(A)/(B)]	₹194.50	₹85.25

Problem 1.3

A company manufactures five diverse products at a time using the same basic facilities. Compute the overhead to be absorbed by one of its product "ACE" from the following details:

Main Activities	*Annual Overheads (₹)*	*Cost Drivers Quantity (Annual)*	*Product ACE's Consumption*
Inspection	8,00,000	20,000 hours	900 hours
Machine set ups	3,00,000	5,000 set ups	200 set ups
Production orders	1,00,000	4,000 orders	15 orders
Material handling	30,000	1,000 requisitions	10 requisitions
Parts repair	2,40,000	12,000 parts	18 parts

Solution:

Cost Driver's Rate (Activity Cost Rate)

Main Activities (Cost Pools)	*Annual Overhead (₹)*	*Cost Drivers Quantity (Annual)*	*Cost Driver Rate (Activity Cost Rate) (₹)*
(i) Inspection	8,00,000	20,000 hours	₹40 per hour
(ii) Machine set ups	3,00,000	5,000 set ups	₹60 per set up
(iii) Production orders	1,00,000	4,000 orders	₹25 per order
(iv) Materials handling	30,000	1,000 requisitions	₹30 per requisition
(v) Parts repair	2,40,000	12,000 parts	₹20 per parts

Production Overhead Charged to Product ACE

Major Production Activities	*Product ACE (₹)*
(i) Inspection (900 × ₹40)	36,000
(ii) Machine set ups (200 × ₹60)	12,000
(iii) Production orders (15 × ₹25)	375
(iv) Materials handling (10 × ₹30)	300
(v) Parts repair (18 × ₹20)	360
Total Production Overhead Absorbed	49,035

Problem 1.4

Thompson Ltd. produces three products, namely BEE, CEE and DEE. The company uses ABC system for absorption of overheads. The company expects to produce 3,000 units of BEE, 10,200 units of CEE and 1,800 units of DEE in the next year. The production overhead and other details of three products are as follows:

Major Activities (Cost Pools)	*BEE*	*CEE*	*DEE*	*Total*	*Production Overhead (₹)*
Machine set ups	15 set ups	27 set ups	60 set ups	102 set ups	5,10,000
Engineering work	420 works	24 works	756 works	1,200 works	9,60,000
Inspection & Packing	3,000 units	10,200 units	1,800 units	15,000 units	14,10,000

You are required to:

(i) Compute activity cost rates (i.e., cost driver's rates).

(ii) Measure production overheads charged to three products.

Solution:

(i) *Cost Driver's Rate (Activity Cost Rate)*

Major Activities (Cost Pools)	*Production Overhead (₹)*	*Measure of Activities (Cost Driver)*	*Cost Driver Rate (Activity Cost Rate) (₹)*
(i) Machine set ups	5,10,000	102 set ups	₹5,000 per set up
(ii) Engineering work	9,60,000	1,200 works	₹800 per work
(iii) Inspection & Packing	14,10,000	15,000 units	₹94 per unit

(ii) *Production Overhead Charged to Products*

Major Production Activities	*BEE (₹)*	*CEE (₹)*	*DEE (₹)*
(i) Machine set ups	75,000	1,35,000	3,00,000
[(15 × ₹5,000); (27 × ₹5,000); (60 × ₹5,000)]			
(ii) Engineering work			
[(420 × ₹800); (24 × ₹800); (756 × ₹800)]	3,36,000	19,200	6,04,800
(iii) Inspection & Packing			
[(3,000 × ₹94); (10,200 × ₹94); (1,800 × ₹94)]	2,82,000	9,58,800	1,69,200
Total	6,93,000	11,13,000	10,74,000

Problem 1.5

A company manufactures conference tables and follows ABC to absorb overheads. The company has chosen the following cost pools and cost drivers for the production overhead:

Cost Pools	*Production Overheads (₹)*	*Cost Drivers*	*Cost Drivers Quantity*
Machine set ups	4,00,000	Number of set ups	5,000 set ups
Production orders	1,00,000	Number of orders	200 orders
Machine maintenance	1,60,000	Machine hours	4,000 hours
Parts repair	2,40,000	Number of parts	8,000 parts

You are required to:

(i) Compute the overhead rate for each cost driver.

(ii) The company receives a special order of 20 conference tables that requires the following number of support activities:

Number of machine set ups – 60; Number of production orders – 25; Number of machine hours – 400; Number of parts to be repaired – 50.

How much production overhead would be charged to this order?

(iii) Compute the factory cost for this order from the following cost data:

Direct material cost per unit – ₹4,000; Direct wages per unit – ₹2,500; Direct expenses per unit – ₹1,000.

Solution:

(i) *Cost Driver's Rate*

Main Activities (Cost Pools)	*Production Overhead (₹)*	*Cost Drivers Quantity*	*Cost Driver Rate (₹)*
(i) Machine set ups	4,00,000	5,000 set ups	₹80 per set up
(ii) Production orders	1,00,000	200 orders	₹500 per order
(iii) Machine maintenance	1,60,000	4,000 hours	₹40 per hour
(iv) Parts repair	2,40,000	8,000 parts	₹30 per parts

(ii) *Production Overhead to be Charged to the Special Order*

Cost Pools	*Amount (₹)*
(i) Machine set ups (60 × ₹80)	4,800
(ii) Production orders (25 × ₹500)	12,500
(iii) Machine maintenance (400 × ₹40)	16,000
(iv) Parts repair (50 × ₹30)	1,500
Production Overhead to be Charged	34,800

(iii) *Factory Cost for the Order (i.e., 20 conference tables)*

Direct Materials cost (20 × ₹4,000)	₹80,000
Direct Wages (20 × ₹2,500)	₹50,000
Direct Expenses (20 × ₹1,000)	₹20,000
Prime Cost	₹1,50,000
Add: Production Overhead [See Part (ii)]	₹34,800
Factory Cost	₹1,84,800

Problem 1.6

A company manufacturing two products furnishes the following data for a year:

Product	*Annual output (units)*	*Total machine hours*	*Total number of purchase orders*	*Total number of set-ups*
A	5,000	20,000	160	20
B	60,000	1,20,000	384	44

The annual overheads are as follows:

	₹
Volume related activity costs	5,50,000
Set-up related costs	8,20,000
Purchase related costs	6,18,000

You are required to calculate the overhead charge per unit of each product A and B, based on:

(1) Traditional method of charging overheads;

(2) Activity-based costing method.

Solution:

Working

(a) **Total annual overhead charges**

Volume-related activity costs	₹5,50,000
Set-up related costs	₹8,20,000
Purchase related costs	₹6,18,000
Total	₹19,88,000

(b) Total machine hours = 20,000 + 1,20,000 = 1,40,000 hours

(c) Machine Hour Rate = $\frac{₹19,88,000}{1,40,000 \text{ hours}}$ = ₹14·20 per hour

(1) ***Traditional Method of Absorption (or recovery) of overheads***

Particulars	*Product-A*	*Product-B*
(i) Annual output	5,000 units	60,000 units
(ii) Total Machine Hours	20,000 hours	1,20,000 hours
(iii) Machine Hour Rate [See Note (c) above]	₹14·20 per hour	₹14·20 per hour
(iv) Overheads apportioned to products [(ii) × (iii)]	₹2,84,000	₹17,04,000
(v) Overhead charge per unit of product [(iv) ÷ (i)]	₹56·80	₹28·40

(2) ***Computation of Cost Driver Rate***

(a) Cost per volume related activity $= \frac{\text{Annual volume related activity cost}}{\text{Total machine hours}}$

$= \frac{₹5,50,000}{1,40,000 \text{ hours}}$ = ₹3·9286 per hour

(b) Cost per set up = $\frac{\text{Annual set-up related cost}}{\text{Total number of set-ups}} = \frac{₹8,20,000}{(20+44)\text{set-ups}}$ = ₹12,812·50 per set-up

(c) Cost per purchase order = $\frac{\text{Annual purchase related cost}}{\text{Total number of purchase orders}} = \frac{₹6,18,000}{(160+384)\text{ orders}}$ = ₹1,136·03 per order

Activity-based costing method of charging overheads

Particulars	*Product-A* ₹	*Product-B* ₹
(i) Overheads related to volume based activities (Respective machine hours × Cost per volume related activity) [20,000 × 3·9286; 1,20,000 × 3·9286]	78,572	4,71,432
(ii) Overheads related to set-ups (Number of set-ups × Cost per set-up) [20 × 12,812·50; 44 × 12,812·50]	2,56,250	5,63,750
(iii) Overheads related to purchases (Number of orders × Cost per order) [160 × 1,136·03; 384 × 1,136·03]	1,81,765	4,36,235
(iv) Total overheads charges [(i) + (ii) + (iii)]	5,16,587	14,71,417
(v) Annual output	5,000 units	60,000 units
(vi) Overheads charge per unit [(iv) ÷ (v)]	103·32	24·52

Therefore, per unit overhead charge is much higher for Product-A under Activity-Based Costing because of its use of more activities.

Problem 1.7

MST Limited has collected the following data for its two activities. It calculates activity cost rate based on cost driver capacity:

	Activity	*Cost driver*	*Capacity*	*Cost*
(i)	Power	Kilowatt hours	50,000 Kilowatt hours	₹2,00,000
(ii)	Quality inspection	Number of inspections	10,000 inspections	₹3,00,000

The company makes three products M, S and T. For the year ended on 31st March 2018, the following consumption of cost driver was reported:

Product	*Kilowatt hours*	*Number of inspections*
M	10,000	3,500
S	20,000	2,500
T	20,000	4,000

Compute the overheads allocated to each product from each activity.

Solution:

Computation of Cost Driver Rates

(a) Cost per unit of power = $\frac{\text{Power cost}}{\text{Total Kilowatt hours}} = \frac{₹2,00,000}{50,000\text{ Kilowatt hours}}$ = ₹4 per Kilowatt hour

(b) Cost per inspection = $\frac{\text{Inspection cost}}{\text{Total number of inspections}} = \frac{₹3,00,000}{10,000\text{ inspections}}$ = ₹30 per inspection

Overheads allocated to each product

Particulars	*Product-M* (₹)	*Product-S* (₹)	*Product-T* (₹)
(i) Power cost (Respective kilowatt hours × Cost per unit of power) [10,000 × 4; 20,000 × 4; 20,000 × 4]	40,000	80,000	80,000
(ii) Quality inspection cost (Number of inspections × Cost per inspection) [3,500 × 30; 2,500 × 30; 4,000 × 30]	1,05,000	75,000	1,20,000
Total overheads allocated	1,45,000	1,55,000	2,00,000

Problem 1.8

X Ltd. uses the ABC system for absorption of overheads. The company has two overhead departments whose indirect costs are as follows:

Production overhead ₹7,00,000

Administration & selling overhead ₹4,00,000

The company uses the following cost pools and cost drivers for absorption of overheads:

Major Activities (i.e., Cost Pools)	*Measures of Activities (i.e., Cost Drivers)*
Assembling parts	Number of units
Processing orders	Number of orders
Customer services	Number of customers

The following information shows the percentage of consumption of resources across activity cost pools:

Particulars	*Assembling Parts*	*Processing Orders*	*Customer Services*
Production overhead	40%	50%	10%
Administration & selling overhead	50%	20%	30%
Total activity	2,000 units	500 orders	200 customers

You are required to:

(i) Allocate overheads to various activities (i.e., cost pools).

(ii) Compute activity cost rates (i.e., cost driver's rates).

Solution:

(i) *Allocation of Overheads to Major Activities (i.e., Cost Pools)*

Particulars	*Activity Cost Pools*			*Total* (₹)
	Assembling Parts (₹)	*Processing Orders* (₹)	*Customer Services* (₹)	
(a) Production Overhead (40: 50: 10)	2,80,000	3,50,000	70,000	7,00,000
(b) Administration & Selling Overhead (50: 20: 30)	2,00,000	80,000	1,20,000	4,00,000
Total	4,80,000	4,30,000	1,90,000	11,00,000

(ii) *Cost Driver's Rate (Activity Cost Rate)*

Major Activities (Cost Pools)	*Total Overhead (₹)*	*Measure of Activities (Cost Driver)*	*Cost Driver Rate (Activity Cost Rate) (₹)*
(i) Assembling Parts	4,80,000	2,000 units	₹240 per unit
(ii) Processing Orders	4,30,000	500 orders	₹860 per order
(iii) Customer Services	1,90,000	200 customers	₹950 per customer

Problem 1.9

The production department of a manufacturing company has the responsibility for processing purchase orders of its suppliers. The department paid indirect wages (fixed) of ₹9,00,000 per year and spent ₹90,000 per year for printing of forms, postage, and other indirect expenses (variable). The company is capable of processing 30,000 purchase orders per year. During the current year, the company processed 25,000 purchase orders.

You are required to compute:

(i) Purchase order rate (break the activity rate into fixed and variable components);

(ii) Cost of unused activity.

Solution:

(a) Cost of Processing Purchase Orders = Indirect Wages (Fixed) + Printing and Other Expenses (Variable)
= ₹9,00,000 + ₹90,000 = ₹9,90,000

(b) Number of Purchase Orders Capable of Processing Per Year = 30,000 orders

(1) Purchase Order Rate = ₹9,90,000/30,000 orders = ₹33 per order

(a) Fixed Purchase Order Rate = ₹9,00,000/30,000 orders = ₹30 per order

(b) Variable Purchase Order Rate = ₹90,000/30,000 orders = ₹3 per order

(2) Cost of Resources Supplied = Cost of Activity Used + Cost of Unused Activity
Or, ₹9,00,000 + (25,000 × ₹3) = (25,000 orders @ ₹33) + Cost of Unused Activity
Or, ₹9,75,000 = ₹8,25,000 + Cost of Unused Activity
Or, Cost of Unused Activity = ₹9,75,000 – ₹8,25,000 = ₹1,50,000

Problem 1.10

A company produces four products—P, Q, R and S. The data relating to production activity are as under:

Product	*Quantity of production (units)*	*Direct material cost per unit (₹)*	*Direct labour cost per unit (₹)*	*Machine hours per unit*
P	1,000	10	6	0·50
Q	10,000	10	6	0·50
R	1,200	32	24	2·00
S	14,000	34	18	3·00

Production Overheads are as follows:

		₹
(i)	Machine related cost	1,49,700
(ii)	Material ordering costs	7,680
(iii)	Set-up costs	17,400

The following further information are available:

Product	*Number of Set-ups*	*Number of materials orders*
P	3	3
Q	18	12
R	5	3
S	24	12
Total	50	30

Required:

(1) Select a suitable cost driver for each item of production overhead and calculate overhead charge per unit of respective cost driver.

(2) Compute factory cost per unit of each product by recovering overheads using Activity-Based Costing.

Solution:

Total Machine Hours Required = (1,000 × 0·50) + (10,000 × 0·50) + (1,200 × 2) + (14,000 × 3)
= 500 + 5,000 + 2,400 + 42,000
= 49,900 Machine Hours

(1) ***Statement showing cost driver rate***

Items of Production overhead	*Traceable cost (₹)*	*Suitable cost driver*	*Quantity of cost driver*	*Cost driver rate*
(a) Machine related cost	1,49,700	Machine hours	49,900 hours	₹3 per hour
(b) Material ordering cost	7,680	Number of materials order	30 orders	₹256 per order
(c) Set-up cost	17,400	Number of set-ups	50 set-ups	₹348 per set-up

(2) ***Computation of Factory cost per unit of each product (using Activity-based costing)***

Particulars	*Product-P (₹)*	*Product-Q (₹)*	*Product-R (₹)*	*Product-S (₹)*
Direct material cost	10·00	10·00	32·00	34·00
Direct labour cost	6·00	6·00	24·00	18·00
Prime cost	16·00	16·00	56·00	52·00
Production overhead (See note later)	3·31	2·43	8·09	9·82
Factory cost	19.31	18.43	64·09	61·82

Working

Production overhead charges per unit

Items of production overhead	*Product-P* (₹)	*Product-Q* (₹)	*Product-R* (₹)	*Product-S* (₹)
(i) Machine related cost @ ₹3 [500 × 3; 5,000 × 3; 2,400 × 3; 42,000 × 3]	1,500	15,000	7,200	1,26,000
(ii) Material ordering cost @ ₹256 [3 × 256; 12 × 256; 3 × 256; 12 × 256]	768	3,072	768	3,072
(iii) Set-up cost @ ₹348 [3 × 348; 18 × 348; 5 × 348; 24 × 348]	1,044	6,264	1,740	8,352
Total production overheads	3,312	24,336	9,708	1,37,424
Units produced	1,000 units	10,000 units	1,200 units	14,000 units
Production overhead per unit	3.312	2·4336	8·09	9·816
	3·31 *(Approx)*	2·43 *(Approx)*		9·82 *(Approx)*

Exercises

(Section-I)

Review Questions

1.1 What do you mean by joint products? Mention the main features of joint products.

1.2 What are by-products? Discuss the characteristics of by-products.

1.3 Distinguish between joint products and by-products.

1.4 Give a few examples of joint products and by-products.

1.5 What are co-products? State the significant features of co-products.

1.6 Discuss the common methods of allocating joint costs of production to joint products.

1.7 Discuss the methods of accounting for by-products.

1.8 What is split-off point? What is its significance in product costing?

1.9 How would you decide to process a product after spilt off point?

1.10 Discuss the guiding factors to decide whether to sell a product either at the split-off point or after further processing.

Practical Questions

1.1 The following data have been extracted from the books of Bharat Mining Company Ltd.:

Joint Products	*Weight per 1,000 kg. of Input*
Coke	600 kg.
Coal tar	250 kg.
Benzol	150 kg.

Joint processing cost:

Direct materials cost – ₹60 per kg.; Direct wages – ₹50,000; Power cost – ₹25,000; Other charges – ₹15,000.

You are required to apportion joint costs on the basis of the weight of each product.

[**Ans.:** Apportioned Joint Cost: Coke – ₹90,000; Coal Tar – ₹37,500; Benzol – ₹22,500.]

1.2 Find out the cost of joint products X, Y and Z using average cost method from the following particulars:

(i) Joint processing cost (cost up to the split-off point) – ₹31,50,000;

(ii) Number of units of joint products manufactured:

Product-X – 70,000 units; Product-Y – 35,000 units; Product-Z – 52,500 units.

[**Ans.:** Share of Joint Cost: Product-A – ₹14,00,000; Product-B – ₹7,00,000; Product-C – ₹10,50,000]

1.3 Four joint products A, B, C and D are produced simultaneously using a common manufacturing process. You are required to apportion joint cost using the weighted average (i.e., point value) method from the following information:

(i) Joint processing cost (pre separation point cost) – ₹36,00,000;

(ii) Number of units of joint products manufactured:

Product-A – 60,000 units; Product-B – 45,000 units; Product-C – 30,000 units; Product-D – 45,000 units.

(iii) The weight factor assigned to joint products:

Product-A – 10; Product-B – 8; Product-C – 5; Product-D – 2.

[**Ans.:** Apportioned Joint Cost: Product-A – ₹18,00,000; Product-B – ₹10,80,000; Product-C – ₹4,50,000; Product-D – ₹2,70,000.]

1.4. Prepare a statement showing costs of joint products and by-products from the following particulars:

Products	*Yield (in Percentage of Input)*
Joint Product-A	40%
Joint Product-B	45%
By-product-X	10%
Normal Loss	05%

10,000 units of raw material were introduced into the process at ₹20 per unit. Direct wages, power cost and other charges are ₹50,000, ₹18,000 and ₹12,000 respectively.

[**Ans.:** Share of Joint Cost: Product-A – ₹1,17,895; Product-B – ₹1,32,632; Product-X – ₹29,473.]

1.5 You are required to apportion joint costs using standard cost method from the following particulars:

(i) Joint processing cost (up to the split-off point) – ₹18,00,000;

(ii) Number of units of joint products manufactured:

Product-W – 1,00,000 units; Product-X – 1,00,000 units; Product-Y – 50,000 units; Product-Z – 75,000 units.

(iii) Other relevant details are given below:

Particulars	*Product-W*	*Product-X*	*Product-Y*	*Product-Z*
Estimated sales value (₹)	5,00,000	4,00,000	2,50,000	3,75,000
Profit margin on sales	10%	5%	20%	20%
Selling & Distribution overhead (₹)	75,000	50,000	25,000	25,000
Conversion cost (₹)	75,000	80,000	25,000	75,000

[**Ans.:** Apportioned Joint Cost (Based on standard cost of raw materials used):

Product-W – ₹6,00,000; Product-X – ₹5,00,000; Product-Y – ₹3,00,000; Product-Z – ₹4,00,000.]

1.6 You are required to apportion joint costs using market value method from the following particulars:

(i) Joint processing cost (up to the split-off point) – ₹30,00,000;

(ii) Number of units of Joint products manufactured:

Product-A – 1,00,000 units; Product-B – 75,000 units; Product-C – 50,000 units; Product-D – 75,000 units.

(iii) Market price per unit of joint products (at the split-off point):

Product-A – ₹5.75; Product-B – ₹5; Product-C – ₹6.50; Product-D – ₹7.

[**Ans.:** Share of Joint Cost: Product-A – ₹9,58,333; Product-B – ₹6,25,000; Product-C – ₹5,41,667; Product-D – ₹8,75,000.]

1.7 Four joint products A, B, C and D emerge from the processing of one basic raw material. You are required to apportion joint costs using sale value method from the following particulars:

Joint Products	*Number of Units Produced*	*Selling Price per Unit (₹)*
A	6,000 units	₹104
B	4,000 units	₹110
C	5,600 units	₹100
D	4,400 units	₹120

The company estimated a profit of 10% of sales value.

[**Ans.:** Apportioned Joint Cost: Product-A – ₹5,61,600; Product-B – ₹3,96,000; Product-C – ₹5,04,000; Product-D – ₹4,75,200.]

1.8 In manufacturing the main Product-M, two by-products (X and Y) were incidentally produced from the same basic raw materials. You are required to (i) Apportion the joint costs; and (ii) Prepare a statement of Profit and Loss from the following details:

Joint processing cost (up to separation point) – ₹2,72,000

Particulars	*Product-M*	*Product-X*	*Product-Y*
(a) Sales value (₹)	6,56,000	64,000	96,000
(b) Post separation cost (₹)	—	18,800	19,200
(c) Estimated net profit (percentage of sales)	—	20%	30%
(d) Estimated selling expenses (percentage of sales)	20%	20%	20%

[**Ans.:** Share of Joint Cost: Product-M – ₹2,33,600; Product-X – ₹19,600; Product-Y – ₹18,800; Profit: Product-M – ₹2,91,200; Product-X – ₹12,800; Product-Y – ₹28,800.]

1.9 In the course of manufacturing of the main Product-N, two by-products (A and B) emerged. The joint costs of manufacture amount to ₹2,39,100. All the products are processed further after separation and sold as per the details given below:

Particulars	*Product-N*	*Product-A*	*Product-B*
Sales value (₹)	1,80,000	1,20,000	80,000
Post separation cost (₹)	12,000	10,000	8,000
Net profit (percentage of sales)	25%	20%	15%
Administration and selling expenses (% of cost of sales)	10%	10%	10%

You are required to apportion joint costs to the main product and by-products.

[**Ans.:** Share of Joint Cost: Product-N – ₹1,09,500; Product-A – ₹76,400; Product-B – ₹53,200.]

1.10 You are required to apportion joint costs using net realizable value method from the following particulars:

(i) Joint processing cost (up to the split-off point) – ₹33,00,000.

(ii) Number of units of joint products manufactured:

Product-A – 1,00,000 units; Product-B – 75,000 units; Product-C – 50,000 units; Product-D – 75,000 units.

(iii) Market price per unit of joint products (after the split-off point):

Product-A – ₹11.50; Product-B – ₹10; Product-C – ₹13; Product-D – ₹14.

(iv) Further processing cost (i.e., cost incurred after split-off point)

Product-A – ₹1,50,000; Product-B – ₹50,000; Product-C – ₹50,000; Product-D – ₹50,000.

[**Ans.:** Share of Joint Cost: Product-A – ₹10,00,000; Product-B – ₹7,00,000; Product-C – ₹6,00,000; Product-D – ₹10,00,000.]

1.11 Magma Ltd. manufactures three joint products A, B and C. The products can be processed further separately after the split-off point. The data relating to three products are as follows:

Particulars	*Product-A*	*Product-B*	*Product-C*
Output	15,000 units	12,000 units	9,000 units
Selling price per unit (at the split-off point)	₹30	₹36	₹39
Selling price per unit (after further processing)	₹42	₹52	₹54
Further processing cost	₹1,96,000	₹1,75,000	₹1,22,000
Share of joint cost of ₹1,20,000	₹54,000	₹36,000	₹30,000

(i) Comment on the further processing decision of the above products.

(ii) Determine the profit or loss of each product as per given decision.

[**Ans.:** (i) (a) Product – A cannot be processed further as it leads to an incremental loss of ₹16,000. (b) Product – B should be processed further as it ensures incremental profit of ₹17,000. (c) Product – C needs to be processed further as it ensures incremental profit of ₹13,000.

(ii) Profit: Product – A ₹3,96,000; Product – B ₹4,13,000; Product – C ₹3,34,000.]

1.12 Maclin Ltd. manufactures three joint products A, B and C in a common manufacturing process. The facts and figures relating to three products are furnished below:

Particulars	*Product-A*	*Product-B*	*Product-C*
Output	4,000 units	10,000 units	6,000 units
Share of joint cost of ₹6,00,000 (in proportion to the output)	₹1,20,000	₹3,00,000	₹1,80,000
Selling price per unit (at the split-off point)	₹100	₹120	₹80
Further processing cost	₹2,00,000	₹2,20,000	₹2,40,000
Selling price per unit (after further processing)	₹160	₹140	₹120

(i) Comment on the further processing decision of the above products.

(ii) Determine the profit or loss of each product as per given decision.

[**Ans.:** (i) (a) Product – A can be processed further as it ensures incremental profit of ₹40,000. (b) Product – B should be sold out at split-off point without further processing. (c) Product – C may be processed further or may not be processed that depends on the attitude of the management (after considering other non-cost factors).

(ii) Profit: Product – A ₹3,20,000; Product – B ₹9,00,000; Product – C ₹3,00,000]

Exercises
(Section-II)

Review Questions

1.1 What is Activity-Based Costing? What are its characteristics?

1.2 How would you allocate overheads in Activity-Based Costing?

1.3 How is product cost determined in Activity-Based Costing?

1.4 What are the benefits in implementation of the ABC system?

1.5 Why is the ABC system preferred to the conventional costing system?

1.6 Explain the process of implementation of ABC with the help of a diagram.

1.7 State the steps involved in operationalising Activity-Based Costing.

1.8 Make a comparison between Traditional Costing and Activity-Based Costing.

1.9 What are the limitations of Activity-Based Costing.

1.10 What are limitations of traditional methods of absorbing overheads

Practical Questions

1.1 Compute the overhead rate for each cost driver from the following details:

Major Activities (Cost pools)	*Production Overhead (₹)*	*Measures of Activities (Cost Drivers)*	*Annual Quantity of Cost Drivers*
Machine maintenance	5,00,000	Machine hours	20,000 hours
Machine set up	1,00,000	Number of set ups	2,500 set ups
Purchase orders	3,00,000	Number of orders	5,000 orders
Materials handling	4,00,000	Number of requisitions	2,000 requisitions
Testing of products	1,50,000	Number of tests	200 tests
Inspection	2,00,000	Number of inspections	1,250 inspections

[**Ans.:** ₹25 per hour; ₹40 per set up; ₹60 per order; ₹200 per requisition; ₹750 per test; ₹160 per inspection.]

1.2 A company manufactures two products, X and Y, using common facilities. The following details for a month are presented to you:

Machine activity expenses	₹6,00,000
Machine set up expenses	₹60,000
Purchase order expenses	₹70,000

	Product-X	*Product-Y*
Production during the month	2,000 units	4,000 units
Machine hours per unit	6 hours	2 hours
Number of machine set ups	30	90
Number of purchase orders	35	140

Compute the overhead absorbed per unit using ABC.

[**Ans.:** Product-X – ₹194.50 per unit; Product-Y – ₹85.25 per unit]

1.3 A company manufactures three diverse products at a time using the same basic facilities. Compute the overhead to be absorbed for one of its product OTIM from the following details:

Main Activities	*Annual Overheads (₹)*	*Cost Drivers Quantity (Annual)*	*Product OTIM's Consumption*
Inspection	5,00,000	20,000 hours	800 hours
Machine set ups	1,00,000	10,000 set ups	100 set ups
Production orders	2,00,000	2,000 orders	12 orders
Material handling	20,000	1,000 requisitions	5 requisitions
Parts repair	4,80,000	12,000 parts	18 parts

[**Ans.:** Overheads absorbed to Product OTIM – ₹24,020]

1.4 Jhonson Ltd. produces three products, namely, X, Y and Z. The company uses ABC system for absorption of overheads. The company expects to produce 1,000 units of X, 3,400 units of Y and 600 units of Z in the next year. The production overhead and other details of three products are as follows:

Major Activities	*Product-X*	*Product-Y*	*Product-Z*	*Total*	*Production Overhead (₹)*
Machine set ups	5 set ups	9 set ups	20 set ups	34 set ups	1,70,000
Engineering work	140 works	8 works	252 works	400 works	3,20,000
Inspection & Packing	1,000 units	3,400 units	600 units	5,000 units	4,70,000

You are required to:

(i) Compute activity cost rates (i.e., cost driver's rates);

(ii) Measure production overhead charged to three products.

[**Ans.: (i)** Machine set ups – ₹5,000 per set up; Engineering work – ₹800 per work; Inspection & Packing – ₹94 per unit

(ii) X – ₹2,31,000; Y – ₹3,71,000; Z – ₹3,58,000]

1.5 A company manufactures conference tables and follows ABC to absorb overheads. The company has chosen the following cost pools and cost drivers for the production overhead:

Cost Pools	*Production Overheads (₹)*	*Cost Drivers*	*Cost Drivers Quantity*
Machine set ups	6,00,000	Number of set ups	5,000 set ups
Production orders	1,50,000	Number of orders	200 orders
Machine maintenance	2,40,000	Machine hours	4,000 hours
Parts repair	3,60,000	Number of parts	8,000 parts

(i) You are required to compute the overhead rate for each cost driver.

(ii) The company receives a special order of 10 conference tables that requires the following number of support activities:

Number of machine set ups – 30; Number of production orders – 15; Number of machine hours – 200; Number of parts to be repaired – 25.

How much production overhead would be charged to this order?

(iii) Compute the factory cost for this order from the following cost data:

Direct material cost per unit – ₹5,000; Direct wages per unit – ₹1,500; Direct expenses per unit – ₹500.

[**Ans.:** (i) ₹120 per set up; ₹750 per order; ₹60 per hour; ₹45 per parts. (ii) ₹27,975; (iii) ₹97,975]

1.6 Ericson Ltd. uses ABC system for absorption of overheads. The company has two overhead departments whose indirect costs are as follows:

Production overhead	₹5,00,000
Administration & Selling overhead	₹3,00,000

The company uses the following cost pools and cost drivers for absorption of overheads:

Major Activities (i.e., Cost Pools)	*Measures of Activities (i.e., Cost Drivers)*
Assembling parts	Number of units
Processing orders	Number of orders
Customer services	Number of customers

The following information shows the percentage of consumption of resources across activity cost pools:

	Assembling Parts	*Processing Orders*	*Customer Services*
Production overhead	50%	35%	15%
Administration & Selling overhead	10%	45%	45%
Total activity	1,000 units	250 orders	100 customers

You are required to:

(i) Allocate overheads to various activity cost pools;

(ii) Compute cost driver's rates.

[Ans.: (i) Assembling parts – ₹2,80,000; Processing orders – ₹3,10,000; Customer services – ₹2,10,000.

(ii)Assembling parts – ₹280 per unit; Processing orders – ₹1,240 per order; Customer services – ₹2,100 per customer.]

1.7 The production department of a manufacturing company has the responsibility for processing purchase invoices of its suppliers. The department paid indirect wages (fixed) of ₹4,50,000 per year and in addition spent ₹45,000 per year for printing of forms, postage, and other indirect expenses (variable). The company is capable of processing 15,000 purchase invoices per year. During the current year, the company processed 12,500 purchase invoices.

You are required to:

(i) Compute the rate for purchase invoice activity (break the activity rate into fixed and variable components).

(ii) Calculate the cost of unused activity.

[Ans.: (i) Purchase invoice activity rate – ₹33 per invoice; Fixed activity rate – ₹30 per invoice; Variable activity rate – ₹3 per invoice.

(ii) Cost of unused capacity – ₹75,000]

1.8 A company manufacturing two products furnishes the following data for the year 2017:

Products	*Annual output (units)*	*Total machine hours*	*Total number of purchase orders*	*Total number of set-ups*
X	1,250	5,000	40	5
Y	15,000	30,000	96	11
	16,250	35,000	136	16

The annual overheads are as follows:

Volume-related activity costs	₹1,37,500
Set-up related costs	₹2,05,000
Purchase-related costs	₹1,54,500

You are required to calculate per unit overhead charge of products X and Y based on —

(i) Traditional method of charging overheads;

(ii) Activity-based costing method.

[*Ans.*: | ***Per unit overhead charge*** | ***Product-X (₹)*** | ***Product-Y (₹)*** |
|---|---|---|
| (i) Traditional method | 56·80 | 28·40 |
| (ii) Activity-based costing | 103·32 | 24·52] |

1.9 Maclin Ltd. produces two products, X and Y. Product-X is a low volume product with its annual sale limited to 10,000 units. Product-Y is a high volume product with an annual sale of 50,000 units. Both products require three direct labour hours each for completion. Total direct labour hours worked are 18,000. Details of material and labour cost per unit of each product are as follws:

	Product-X	***Product-Y***
Direct material cost	₹40	₹20
Direct labour cost @ ₹20 per hour	₹60	₹60

Manufacturing overheads for the year are ₹45,00,000.

On analysis of its events, the company observes that the following five activities act as cost drivers with regard to overhead cost. The relevant data are as follows:

Activity	***Traceable Cost (₹)***	***Number of Transactions***		
		Product-X	***Product-Y***	***Total***
Machine hours worked	9,00,000	5,000	10,000	15,000
Machine set-ups	12,00,000	2,000	1,000	3,000
Quality inspections	2,50,000	8,000	2,000	10,000
Material orders	11,00,000	5,000	500	5,500
Production runs	10,50,000	100	25	125
	45,00,000			

Calculate per unit factory cost of Product-X and Product-Y using:

(i) Direct Labour Rate method of overhead absorption;

(ii) Activity-Based Costing technique for overhead absorption; and

(iii)Explain the difference in overhead absorption as per the two methods.

[***Ans.***: (i) Factory cost (based on direct labour hour rate): *Product-X* ₹*175;*
Product-Y ₹*155*]

[***Hints:*** *Total direct labour hours—1,80,000 hours*
Direct labour hour rate—₹25 per hour]

(ii) Factory cost (based on Activity-based costing): *Product-X* ₹*414;*
Product-Y ₹*107·20*

[***Hints:*** *Total manufacturing overheads assigned* *Product-X* ₹*31,40,000*
Product-Y ₹*13,60,000*

Manufacturing overhead per unit *Product-X* ₹*314;*
Product-Y ₹*27·20}*