

About The Author :

CA. PARAG GUPTA is a fellow member of ICAI. He has graduated from University of Delhi as one of the top scorers in "Mathematics", "Cost Analysis & Control" & "Financial management" at University level. Thereafter, he raised his bars further and qualified as a Chartered Accountant with amazing scores in each level. His teaching career began after his much appreciated spell at ICICI Bank.

During his college education, his extra-curricular activities helped him stay ahead of the crowd. Playing chess was his hobby and his participation in various chess competition won his various acclaims. He also cleared National Olympiad in Mathematics. His business plans were very much appreciated by TIE, a global network of entrepreneurs.

He has served as an examiner of CA Final (New Course). He has served as visiting faculty member at several professional institutes including ICAI, and has been taking active steps to improve quality of teaching at many private educational bodies. He has also pioneered a free consultancy yahoo group for CA Final students (world's largest). His friendly nature & helpful behaviour has popularized him as a friend-cum-coach and not just a teacher among students.

Costing By Parag Gupta

A-156, Gali No. 4, Shakarpur, Delhi-92
(Opp. Metro Pillar No-40)
Ph.: 9968875529, 9891432632

Bright Professionals Pvt. Ltd.

1/53, 1st Floor, Lalita Park,
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*To my family,
who always stood beside me in every phase of my life.
Love You!*

*Special thanks to my friends, students,
teachers & my competitors
This book mightn't have been completed without them.*



Preface to Forth Edition

I feel a great sense of pride and enthusiasm in presenting forth edition of my book. This book has primarily been written with the aim of meeting the needs and interest of C.A. final students.

Every topic has been dealt precisely and to the point in a simple and understandable language. Things have been explained with proper reasoning, wherever possible. A good number of practical problems have been provided to understand the theoretical aspect. Many new exercises from have been introduced with hints for all difficult exercises. The book covers around past 25 year questions of CA, CWA & CIMA examination till Nov. '10. While carrying out changes, the general approach to the subject, with an inclusion of a variety of practical problems, and the lucidity of presentation of the subject matter of the previous edition have been retained and an endeavor has been made to give a lot more content to the user-both students and instructors. I have deliberately kept this book in question bank format, to help students in solving the problem on their own. This helps in gaining confidence. Solutions of this book are separately provided. While making this book I have tried to cover full new course syllabus & have inserted both new course syllabus & old syllabus, to make aware about the differences between 2 syllabuses.

Human efforts are not perfect. In spite of my best efforts, I am aware of possible errors and omissions that escaped my notice. I shall, therefore, be extremely thankful to the learned ones who will extend their cooperation by sending their valuable criticism, suggestions and observations for further improvement of the book. I am reachable at paraggupta_ca@yahoo.co.in.

Dec. ' 2010

CA. Parag Gupta

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For any Costing & O.R. related query, you may call me during **9:00 p.m.-11:00 p.m.** @ +91 9891432632 or mail me at
paraggupta_ca@yahoo.co.in.

For registration enquiry, any other query, etc. call +91 9968875529,
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Syllabus - New Course

Paper 5: Advanced Management Accounting (One paper – Three hours – 100 marks)

Level of Knowledge: Advanced knowledge

Objective:

To apply various management accounting techniques to all types of organizations for planning, decision making and control purposes in practical situations.

To develop ability to apply quantitative techniques to business problems

1. Cost Management

- (a) Developments in the business environment; just in time; manufacturing resources planning; (MRP); automated manufacturing; synchronous manufacturing and back flush systems to reflect the importance of accurate bills of material and routings; world class manufacturing; total quality management.
- (b) Activity based approaches to management and cost analysis
- (c) Analysis of common costs in manufacturing and service industry
- (d) Techniques for profit improvement, cost reduction, and value analysis
- (e) Throughput accounting
- (f) Target costing; cost ascertainment and pricing of products and services
- (g) Life cycle costing
- (h) Shut down and divestment.

2. Cost Volume Profit Analysis

- (a) Relevant cost
- (b) Product sales pricing and mix
- (c) Limiting factors
- (d) Multiple scarce resource problems
- (e) Decisions about alternatives such as make or buy, selection of products, etc.

3. Pricing Decisions

- (a) Pricing of a finished product
- (b) Theory of price
- (c) Pricing policy
- (d) Principles of product pricing
- (e) New product pricing
- (f) Pricing strategies
- (g) Pricing of services
- (h) Pareto analysis

4. Budgets and Budgetary Control

The budget manual, Preparation and monitoring procedures, Budget variances, Flexible budgets, Preparation of functional budget for operating and non-operating functions, Cash budgets, Capital expenditure budget, Master budget, Principal budget factors.

5. Standard Costing and Variance Analysis

Types of standards and sources of standard cost information; evolution of standards, continuous-improvement; keeping standards meaningful and relevant; variance analysis; disposal of variances.

- (a) Investigation and interpretation of variances and their inter relationship
- (b) Behavioural considerations.

6. Transfer pricing

- (a) Objectives of transfer pricing
- (b) Methods of transfer pricing
- (c) Conflict between a division and a company
- (d) Multi-national transfer pricing.

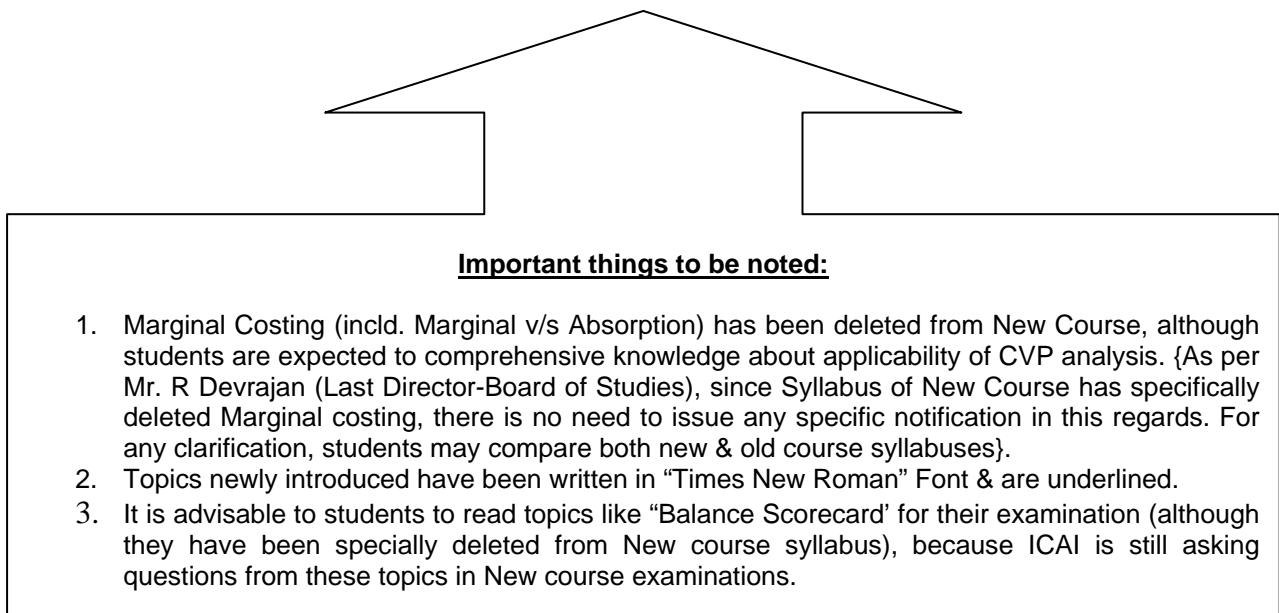
7. Cost Management in Service Sector

8. Uniform Costing and Inter firm comparison

9. Profitability analysis - Product wise / segment wise / customer wise

10. Financial Decision Modeling

- (a) Linear Programming
- (b) Network analysis - PERT/CPM, resource allocation and resource leveling
- (c) Transportation problems
- (d) Assignment problems
- (e) Simulation
- (f) Learning Curve Theory
- (g) Time series forecasting
- (h) Sampling and test of hypothesis



Syllabus - Old Course

Paper 5 : Cost Management (One paper – Three hours – 100 marks)

Level of Knowledge: Expert Knowledge

Objectives: To gain expert knowledge of:

- a) use of costing data for decision-making and control, and
- b) emerging modern cost management concepts.

Contents:

1. Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost.
2. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.
3. Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems.
4. Standard Costing and Variance Analysis.
5. Pricing strategies: Pareto Analysis
6. Target costing, Life Cycle Costing
7. Costing of service sector.
8. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints.
9. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis.
10. Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets.
11. Measurement of Divisional profitability pricing decisions including transfer pricing.
12. Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

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Nov. 2010 -New Course Question Paper

Question No.1 is compulsory.

Answer any **five** from the remaining **six** questions.

Working notes should form part of the answer

- | | | Marks |
|---|--|-------|
| 1(a) | A potato chips manufacturing company decided that the mean net weight per pack of its product must be 90 grams. A random sample of 16 packets yields a mean weight of 80 grams with standard deviation of 17.10 grams. Test the hypothesis that the mean of the whole universe is less than 90, use level of significance of (a) 0.05(b) 0.01. | 5 |
| (b) | What are the steps involved in Zero-base budgeting? | 5 |
| (c) | G Ltd. produces and sells 95000 units of 'X' in a year at its 80% production capacity. The selling price of product is ₹8 per unit. The variable cost is 75% of sales price per unit. The fixed cost is ₹3,50,000. The company is continuously incurring losses and management plans to shut-down the plant. The fixed cost is expected to be reduced to ₹1,30,000. Additional costs of plant shut-down are expected at ₹15,000. | 5 |
| Should the plant be shut-down? What is the capacity level of production of shut-down point? | | |
| (d) | H Ltd. manufactures three products. The material cost, selling price and bottleneck resource details per unit area s follows : | 5 |

	Product X	Product Y	Product Z
Selling price (₹)	66	75	90
Material and other variable cost (₹)	24	30	40
Bottleneck resource time (minutes)	15	15	20

Budgeted factory costs for the period are ₹2,21,600. The bottleneck resources time available is 75120 minutes per period.

Required:

- (i) Company adopted throughput accounting and products are ranked according to 'product return per minute'. Select the highest rank product.
- (ii) Calculate throughput accounting ratio and comment on it.

- | | | |
|------|---|----|
| 2(a) | E Ltd. manufactures and sells four types of products under the brand names A, B, C and D. On a turnover of ₹30 crores in 2009, company earned a profit of 10% before interest and depreciation which are fixed. The details of product mix and other information are as follows : | 12 |
|------|---|----|

Products	Mix % to total sales	P/V ratio (%)	Raw Material as % on sales value
A	30	20	35
B	10	30	40
C	20	40	50
D	40	10	60

Interest and depreciation amounted to ₹225 lakhs and ₹115.50 lakhs respectively. Due to increase in prices in the international market, the company anticipates that the cost of raw materials which are imported will increase by 10% during 2010. The company has been able to secure a license for the import of raw materials of a value of ₹1,535 lakhs at 2010 prices. In order to counteract the increase in costs of raw materials, the company is contemplating to revise its product mix. The market survey report indicates that the sales potential of each of the products: 'A', 'B' and 'C' can be increased upto 30% of total sales value of 2009. There was no inventory of finished goods or work in progress in both the year.

You are required to :

Set an optimal product mix for 2010 and find the profitability.

- (b) List out the remedies available for difficulties experienced during implementation of PRAISE. 4
- 3(a) A company is engaged in manufacturing of several products. The following data have been obtained from the record of a machine shop for an average month: 10

Budgeted

No. of working days	24
Working hours per day	8
No. of direct workers	150
Efficiency	One standard hour per clock hour
Down time	10%
Overheads	Fixed ₹75,400 Variable ₹90,720

The actual data for the month of August 2010 are as follows :

Overhead	Fixed ₹78,800 Variable ₹70,870
Net operator hours worked	20500
Standard hours produced	22550

There was a special holiday in August 2010.

Required:

- (i) Calculate efficiency, activity, calendar and standard capacity usages ratio.
- (ii) Calculate all the relevant fixed overhead variances.
- (iii) Calculate variable overheads expenditure and efficiency variance.

- (b) A firm makes two products X and Y, and has a total production capacity of 16 tonnes per day. 6
X and Y are requiring the same production capacity. The firm has a permanent contract to supply at least 3 tonnes of X and 6 tonnes of Y per day to another company. Each tonne of X require 14 machine hours of production time and each tonne of Y requires 20 machine hours of production time. The daily maximum possible number of machine hours is 280. All the firm's output can be sold, and the profit made is ₹20 per tonne of X and ₹25 per tonne of Y.

Required:

Formulate a linear programme to determine the production schedule for maximum profit by using graphical approach and calculate the optimal product mix and profit.

- 4 Attempt any four : 4

- (a) The following information is given by Z Ltd.:

Margin of safety	₹1,87,500
Total cost	₹1,93,750
Margin of safety	7500 units
Break-even sales	2500 units

Required:

Calculate Profit, P/V Ratio, BEP Sales (in ₹) and Fixed Cost.

- (b) Explain the major components of balanced score card. 4
- (c) List the 5 steps involved in the methodology of critical path analysis. 4
- (d) Calculate the selling price per unit to earn a return of 12% net on capital employed (net of tax @ 40%). The cost of production and sales of 80000 units are : 4
Variable cost including material cost ₹9,60,000
Fixed overheads ₹5,00,000

The fixed portion of capital employed is ₹12 lakhs and the varying portion is 50% of sales turnover.

(e) What are the steps involved in carrying out Monte Carlo Simulation model? 4

5(a) 11

Fruitolay has decided to increase the size of the store. It wants the information about the probability of the individual product lines : Lemon, grapes and papaya. It provides the following data for the 2009 for each product line :

	Lemon	Grapes	Papaya
Revenues	₹79,350.00	₹2,10,060.00	₹1,20,990.00
Cost of goods sold	₹60,000.00	₹1,50,000.00	₹ 90,000.00
Cost of bottles returned	₹ 1,200.00	₹0.00	₹0.00
Number of purchase orders placed	36	84	36
Number of deliveries received	30	219	66
Hours of shelf stocking time	54	540	270
Items sold	12600	110400	30600

Fruitlay also provides the following information for the year 2009:

S.No.	Activity	Description of Activity	Total Costs (₹)	Cost allocation basis
1.	Bottle returns	Returning of empty bottles to the store	1,200.00	Direct tracing to product line
2.	Ordering	Placing of orders of purchases	15,600.00	156 purchase orders
3.	Delivery	Physical delivery and the receipts of merchandise	25,200.00	315 deliveries
4.	Self stocking	Stocking of merchandise on store shelves and ongoing restocking	17,280.00	864 hours of time
5.	Customer Support	Assistance provided to customers including bagging and checkout	30,720.00	153600 items sold

Required :

- (i) Fruitolay currently allocates store support costs (all costs other than the cost of goods sold) to the product line on the basis of the cost of goods sold of each product line. Calculate the operating income and operating income as the percentage of revenue of each product line.
- (ii) If Fruitolay allocates stores support costs (all costs other than the cost of goods sold) to the product lines on the basis of ABC system, calculate the operating income and operating income as the percentage of revenue of each product line.
- (iii) Compare both the systems.

(b) Discuss various forecasting methods using time series. 5

6 (a) A company has three plants located at A, B and C. The production of these plants is absorbed by four distribution centres located at X, Y, W and Z. The transportation cost per unit has been shown in small cells in the following table: 8

Distribution Centers Factories \	X	Y	W	Z	Supply (Units)
A	6	9	13	7	6000
B	6	10	11	5	6000
C	4	7	14	8	6000
Demand (Units)	4000	4000	4500	5000	18000
					17500

Find the optimum solution of the transportation problem by applying Vogel's Approximation

Method.

- (b) Mention the data required to operate the material requirement planning system. 4
- (c) "Customer profile is important in charging cost." Explain this statement in the light of customer costing in service sector. 4
- 7(a) A company has two divisions: Division A and Division B. Both divisions of the Company manufacture the same product but located at two different places. The annual output of division A is 6000 tons (at 80% capacity) and that of division B is 7500 tons (at 60 % capacity). The basic raw material required for production is available locally at both the places, but at division A, it is limited to 4000 tons per annum at the rate of ₹100 per ton, at division B, it is limited to 8000 tons per annum at the rate of ₹110 per ton. Any additional requirement of material will have to be purchased at the rate of ₹125 per ton from other markets at either of division. Variable costs per ton at each division remain constant. For every 1000 tons of output, 800 tons raw material is required. The details of other costs of the divisions are as follows :

	Division A	Division B
Other Variable costs of output	122 per ton	120 per ton
Fixed Cost per annum	3,80,000	6,00,000

Required:

- (i) Calculate variable cost per ton for each division's product and decide ranking in order of preference.
- (ii) The company desires to fully utilize the available local supplies of raw material to save the overall variable cost of production; keeping the total production of both the divisions putting together is the same as at present level. Calculate the quantity of production (output) that could be transferred between the two divisions and overall saving in variable cost.
- (iii) After considering the option (ii), how the balance capacity should be utilized if company is working at 100% capacity, and also calculate selling price per ton if company mark up 10% on full cost of each division's product.

- (b) Explain distinctive features of learning curve theory in manufacturing environment. 4

Nov. 2010 -Old Course Question Paper

Question No.1 is compulsory.

Answer any **five** from the remaining **six** questions.

Working notes should form part of the answer

- | | |
|---|------------|
| 1(a) The standard cost for producing 180 kgs of a product whose raw material inputs are A and B is given below: | Marks
5 |
|---|------------|

	Standard Cost (₹)
Material A 60 kgs @ ₹10 per kg	600
Material B 140 kgs @ ₹2 per kg	280
	880

The actual prices of A and B were ₹12 and ₹8 per kg respectively. Consumption of B was 108 kg. The actual output at 80% yield was 144 kg.

Calculate the following direct material variances:

- (i) Mix variance
- (ii) Yield variance
- (iii) Price variance
- (iv) Usage variance

- | | |
|--|---|
| (b) Sportswear Ltd. manufactures sportswear shirts and shorts. The production budget for these two products has to be prepared for the next three months, November 2010, December 2010 and January 2010. | 5 |
|--|---|

The following information is given :

- (i) Sales volume every month will be 2% more than the previous month's volume for each product.
- (ii) The company carries stock of finished garments sufficient to meet 40% of the next month's sale.
- (iii) Closing stock for October 2010 was 6000 shirts and 8000 shorts.

You are required to prepare the production budget for each product for November, December 2010 and January 2011.

- | | |
|---|---|
| (c) A factory has a special offer to produce 4 units of a labour intensive product by using its existing facilities after the regular shift timings. The product can be produced by using only overtime hours which entails normal rate plus 25%, so that usual production is not affected. Two workers are interested in taking up this additional job every evening after their usual shift is over. One is an experienced man who has been working on a similar product. His normal wages are ₹48 per hour. The other worker is a new person who earns ₹42 an hour as normal wages. He can be safely considered to have a learning curve ratio of 90% for this work. The company wants to minimize labour cost for the order and only one person is to be chosen for the job. The experienced man will take 20 hours for the first unit while the new worker will take 30 hours for the first unit. Evaluate who should be chosen for the job. | 5 |
|---|---|

- | | |
|---|---|
| (d) You are given the following linear program. Introduce appropriate variables and restate the problem to set up the simplex tableau. (Do not attempt further solution.) | 5 |
|---|---|

Maximise:

$$8x_1 + 4x_2 - 3x_3 + 10x_4$$

s.t.

$$2x_1 - x_2 + x_3 + 2x_4 \geq 40$$

$$3x_1 - x_2 + x_4 \leq 90$$

$$2x_1 + x_2 + x_4 = 60$$

$$x_1, x_2, x_3, x_4 \geq 0$$

- | | |
|--|---|
| 2(a) M Ltd. makes two products, X and Y, in their respective divisions. Each unit of Y needs one | 9 |
|--|---|

unit of X. Divisions X and Y are profit centres and can function according to their divisional interests.

In the external domestic market, X can sell either 6000 units at ₹1,000 per unit or 5000 units at ₹1,120 per unit.

X has a production capacity of 7000 units, with each unit requiring 2 hours. Y also has a production and demand of 7000 units.

Y can buy product X from outside as follows:

Order Quantity (Units)	Price for the entire order (Rs/u)
6001-7000	900
4001-6000	920
2001-4000	1,000
0-2000	1,120

Y resorts to bulk purchase to avail maximum possible discount.

- (i) There is an export order (that may either be fully accepted or fully rejected) for X to supply 800 units @ ₹900 per unit.
- (ii) There is an offer to hire out X's capacity of 1600 hours at ₹130 per hour. The hiring offer may either be fully accepted or fully rejected.
- (iii) Y will not buy from X at any price more than it will incur in the outside market. Y does not place restrictions on quantities to be supplied by X, provided its pricing condition is not violated.

Given that any one or more of the offers may be accepted, what will be X's best strategy?

What will be the corresponding transfer price?

[A detailed cost statement is not essential. Only figures relevant for decision making are required to be considered under each analysis.]

- (b) State the pricing strategy that you would advise in the following situations which are independent of each other : 7

- (i) A new product is to be launched. It has had high promotional expenditure and its demand in the market is not known.
- (ii) A new product is to be launched. It is to be mass manufactured.
- (iii) A product which has an external market demand is to be transferred to another division of the same company. For the external market, variable selling costs of ₹10 per unit and fixed selling costs amounting to ₹10 lacs p.a. are incurred. These costs are not applicable to divisional transfers. The divisional transfer can take up only 20% of the output produced.
- (iv) A special one-time order for the use of idle capacity is offered. This order will not impact the existing sales of the company. The product has competition in the market.
- (v) There is stock of a discontinued product. It has severe competition and the product is perishable.

- 3(a) ABC Ltd. Manufactures four products A, B, C & D in the same factory. The following information is given for a certain period : 9

Product	A	B	C	D
Good output (No. of units)	720	600	480	504
Average yield (%)	80	80	96	90
Machine hours per unit of input	4	3	2	1

The plant works such that after machining, the defectives in each run are automatically segregated and dumped separately in a container. The good units pass through the process and are further checked for quality by the inspectors of quality control who charge by the number of batches inspected.

The total production and selling overheads of the company are the following for the period :

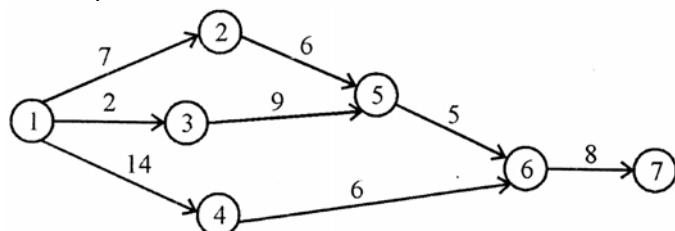
	₹
Machine operation and maintenance	66,375
Set up costs	19,200
Stores receiving	21,400
Inspection	24,000
Finished goods - packing / dispatch	14,400

The following additional information is given :

- (i) A material requisition is made for every 25 units of input.
 - (ii) Machines need to be set up and tuned after each production run.
 - (iii) Production is in batches of 24 good units for all the products.
 - (iv) Units of A and B are packed in boxes that have 24 units capacity each and C & D are packed in smaller boxes of 12 units capacity. The smaller box costs half the price of the bigger box.
- Each box contains only one type of product. There is no product mix up in packing.

Choose appropriate activity cost drivers for each overhead cost and calculate the overhead cost per unit of good output for each of the products under the ABC system.

- (b) At the end of activity 6-7, a product is to be launched and the date has been announced for the inaugural function, based on the normal duration of activities as given in the network below. Activities have been subcontracted by the project manager to contractors A, B, C, D, E, F, G and H as indicated in the table below. Each subcontractor offers a discount on his contract price for each day given to him in addition to the normal days indicated in the network. What will be the maximum discount that the project manager may earn for the company without delaying the launch of the product? 7



Activity	Contractor	Discount (₹)/ Day
1 – 2	A	300
1 – 3	B	200
1 – 4	C	1,200
2 – 5	D	500
3 – 5	E	400
4 – 6	F	1,000
5 – 6	G	600
6 – 7	H	500

- 4(a) The manager of a hotel providing lodging facilities wants to expand his services to include manual booking (reservation or cancellation) of railway tickets for his clients. He does not want to have electronic booking due to operational difficulty. He has the following information:- 7

	(₹)/ month
Proportion of rent allocated for office space	4,000
General Telephone expenses allocated to this service	2,400

Proportion of security charges/ maintenance expenses allocated	1,600
Salary to person exclusively doing the booking of tickets	20,000
Mobile phone charges exclusive to person booking ticket	3,000
Share of general miscellaneous fixed expenses allocated	1,000
Conveyance incurred to book tickets (to and fro charges to the nearest booking station)[fixed per month]	4,000

The manager estimates that there will be 2,500 bookings per month for 3 months of peak season, 1,000 bookings per month for 2 months of moderate business and 700 bookings per month during the remaining period. He cannot charge more than the prevailing rate of ₹30 per booking charged by other agents.

Calculate the total cost per booking.

What is the estimated profit the manager hopes to achieve for the full year?

What should be the average minimum volume to justify the setting up of the new service ?
(Detailed break-up of monthly revenues or costs is not essential.)

- (b) A manufacturing company makes 4 products that are sold through 8 regional offices countrywide. The products pass through 3 production processes in a factory. A separate market research division monitors outside competition. This division is outside the sales management hierarchy. 9

As a management accountant, suggest some routine reports for performance measurement to be made to :

- (a) The Sales Management
- (b) The Works Manager

- 5(a) A company has 3 factories F_1 , F_2 and F_3 , which supply the same product to 5 agencies A_1 , A_2 , A_3 , A_4 and A_5 . Unit production costs, shipping costs and selling prices differ among the different sources and destinations and are given below: 10

	F_1	F_2	F_3
Production Cost (₹/ unit)	28	35	29
Production Capacity (No. of units)	110	240	125

Agencies	A_1	A_2	A_3	A_4	A_5
Selling Price ₹/u.	40	48	42	45	41
Demand (No. of units)	80	100	75	45	125

Shipping Costs ₹/u.

	A_1	A_2	A_3	A_4	A_5
F_1	3	9	8	12	8
F_2	6	10	6	2	5
F_3	3	10	3	6	8

- (i) Set up the initial transportation matrix for minimisation.
- (ii) After doing (i) above, you are given the following additional information:
 - (a) 40 units must be transported from F_2 to A_2 as per an earlier agreement made by F_2 with A_2 's customer. This quality is included in the figures given for total production and demand at these locations.
 - (b) Not more than 30 units may be sent from F_1 to A_1 , since the transporter's vehicle lacks space in this route.

Incorporating conditions (a) and (b) above, obtain the initial solution by Vogel's Approximation Method. (Do not attempt to continue for the full and final solution)

- (iii) After doing the initial solution as in (ii) above, you are informed that the route from F_2 to A_1 is blocked by sudden flooding of the roads.

Without actual re-calculation, briefly explain how your solution is likely to be affected.

- (b) The selling price per unit of a product is ₹14. For the forthcoming period, the demand will be 6

only 5,000 units. The fixed expenses at 50% activity (5,000 units) will be ₹30,000. The company is thinking of shutting down operations, in which case an additional amount of ₹2,000 will have to be incurred for shutting down and only ₹20,000 of the above fixed costs can be avoided.

What should be the variable cost per unit to recommend a shut down?

- 6 (a) Aero Ltd. has hired an aircraft to specially operate between cities A and B. All the seats of the aircraft are economy class. 12

The following information is available :

Seating capacity of the aircraft	=320 passengers
Average number of passengers per flight	=240 passengers
Average one way fare from A to B	=₹5,000 per passenger
Variable fuel costs per flight from A to B	₹90,000
Food Cost (no charge to passenger)	₹300 per passenger
Commission to travel agents (All tickets are through agents)	10% of the fare
Annual lease costs allocated to each flight	₹2,00,000
Ground services, baggage handling / check- in services costs per flight A to B	₹40,000
Flight crew salaries per flight A to B	₹48,000

There is an offer from another airlines operator, Mid Air Ltd. for a stop-over at destination D, which is on the way from A to B. Due to this, the flight will operate from A to D, then D to B. The following terms are to be considered for the stop-over:

50 seats will be booked by Mid Air at ₹2,500 per ticket, whether or not Mid Air is able to sell them to its customers. No agent's commission is payable on these tickets.

60 new passengers will be booked by Aero's travel agents for travel from A to D at a fare of ₹2,000 per passenger.

Since the stop-over wastes more time, 25 of Aero's original passengers from A to B will drop out and seek other airlines which fly directly from A to B.

Due to the stop-over, fuel costs will increase from ₹90,000 to ₹1,35,000, Additional airport landing/ baggage handling charges of ₹19,000 per stop-over will have to be incurred by Aero Ltd.

Aero Ltd. will have to serve snacks to all passengers in the D to B sector at no charge to passenger. Each snack will cost Aero Ltd. ₹200. This will be in addition to the original food at ₹300 served in the A to D sector.

You may assume that fuel costs are not affected by the actual number of passengers in a flight. You may ignore non-financial considerations, additional wear and tear to aircraft due to extra landing / take-off.

Without considering Mid Air's offer,

- (i) What is the profit earned by Aero Ltd. per flight from A to B?
- (ii) What is the break-even number of passengers for each flight from A to B?

Considering the effects of Mid Air's offer,

- (iii) Evaluate whether Aero should accept the offer.

(A detailed profitability statement is not essential, a relevant cost-revenue analysis would suffice)

- (b) How can simulation be applied in practical situations? 4

- 7 Answer any **four** of the following : 4

each

- (a) Discuss the impact of JIT systems on overhead costs.

- (b) What are benefits of Enterprise Resource Planning?

- (c) A company's four products M, N, O and P are in the market. Identify the phase of life cycle for each product with a brief reason.

M : There is a lot of competition. Quantity sold has been increasing at 10%, 8% and 7% in the last 3 years.

N : Until last year, N had no competition. Suddenly the company finds 4 new products very similar to N in the market. However, N continues to have good sales.

O : There is intense competition. Achieving targeted sales is becoming increasingly difficult. Hence the company is introducing slightly modified features in the fresh production.

P : Huge inventory of P is available. P is being sold, but there are many products in the market which are priced lesser than P, but have the same utility as P.

- (d) Three different salesmen X, Y and Z are to be assigned three different regions A, B and C so that the company's revenue is maximised. The following matrix gives the sales revenue :

	X	Y	Z
A	10	60	30
B	20	30	15
C	60	40	10

You are required to use the assignment technique to maximize revenue.

- (e) TP Ltd. produces a product which passes through two processes - cutting and finishing. The following information is provided :

	Cutting	Finishing
Hours available per annum	50,000	60,000
Hours needed per unit of product	5	12
Fixed operating costs per annum excluding direct material	10,00,000	10,00,000

The selling price of the product is ₹1,000 per unit and the only variable cost per unit is direct material, which costs ₹400 per unit. There is demand for all units produced.

Evaluate each of the following proposals independent of each other:

- (i) An outside agency is willing to do the finished operation of any number of units between 5,000 and 7,000 at ₹400 per unit.
- (ii) An outside agency is willing to do the cutting operation of 2,000 units at ₹200 per unit.
- (iii) Additional equipment for cutting can be bought for ₹10,00,000 to increase the cutting facility by 50,000 hours, with annual fixed cost increased by ₹2 lacs.

1



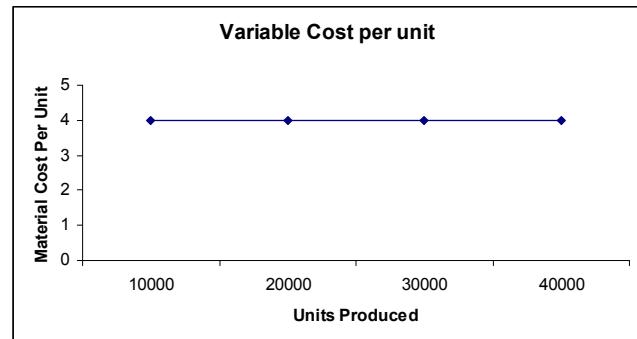
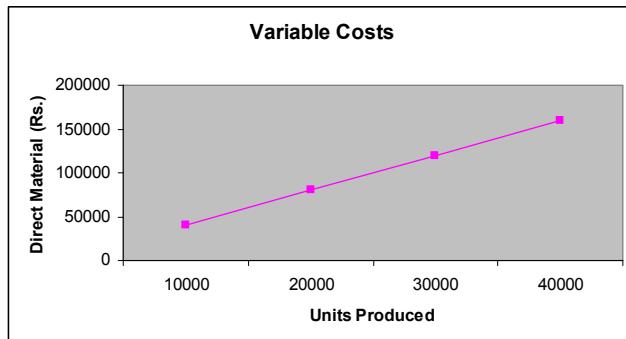
CVP Analysis

COST BEHAVIOR

THE NATURE OF COSTS: Before one can begin to understand how a business is going to perform over time and with shifts in volume, it is imperative to first consider the cost structure of the business. This requires drilling down into the specific types of costs that are to be incurred and trying to understand their unique attributes.

VARIABLE COSTS: Variable costs will vary in direct proportion to changes in the level of an activity. For example, direct material, direct labor, sales commissions, fuel cost for a trucking company, and so on, may be expected to increase with each additional unit of output.

Units	Direct Material (₹)	Cost per unit(₹)
10000	40000	4
20000	80000	4
30000	120000	4
40000	160000	4



FIXED COSTS: The opposite of variable costs are fixed costs. Fixed costs do not fluctuate with changes in the level of activity. Examples include administrative salaries, rents, property taxes, security, networking infrastructure support, and so forth. Observe that the fixed cost *per unit* will decline with increases in production. This attribute of fixed costs is important to consider in assessing the scalability of a business proposition.

Types of fixed costs: For planning purposes, fixed costs can be viewed as either committed or discretionary.

Committed fixed costs - Relate the investment in facilities, equipment & basic organizational structure. Examples of such costs include depreciation of buildings and equipment, taxes on real estate, insurance and salaries of top management and operating personnel. They have two key characteristics:

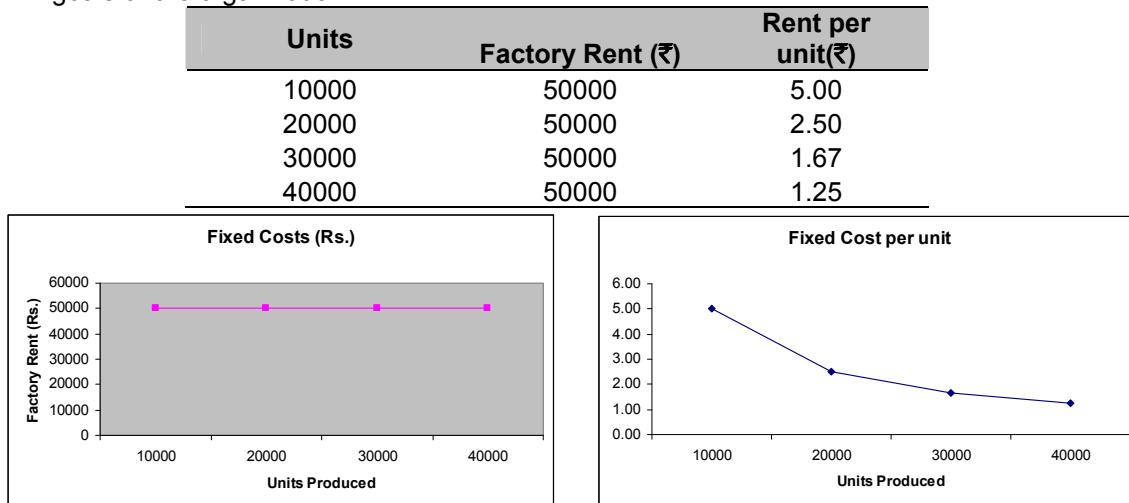
- They are long term
- They can't be significantly reduced even for short periods of time without seriously impairing the profitability or long run goals of the organization. Even if operations are interrupted or cut back, the committed fixed costs will still continue largely unchanged. During a recession, for example, a firm shall not usually discharge key executives or sell off key facilities.

Discretionary fixed costs - Usually arise from annual decisions by management to spend in certain fixed cost

areas. The most important characteristics of discretionary cost is that management is not locked into a decision regarding such costs. They can be adjusted from year to year or even perhaps during the course of a year if circumstances may demand such a modification. Examples are: Advertising, R & D, Public relations, Management development programs, Internships for students.

Two key differences exist between discretionary & committed fixed costs:

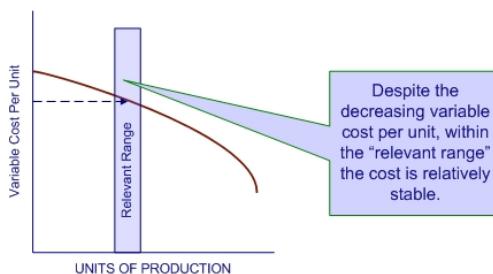
- The planning horizon for discretionary fixed costs is short term.
- Discretionary fixed costs can be cut for short periods of time with minimal damage to the long run goals or the organization.



During a long period of time, virtually all costs tend to behave like variable costs. Within a shorter time periods, costs will be fixed or variable in relation to changes in activity. The shorter the time period, the greater the probability that a particular cost will be fixed. Consider a time period of one year, the costs of providing the firm's operating capacity such as depreciation and salaries of senior plant managers are likely to be fixed in relation to changes in activity. Plant investment and abandonment decisions should not be based on short-term fluctuations in demand within a particular year. *Capacity costs will tend to be fixed in relation to changes of activity within short-term periods such as one year. However, over long-term periods of several years, significant changes in demand will cause capacity costs to change.*

RELEVANT RANGE

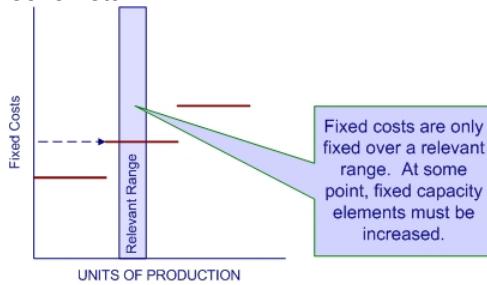
The "relevant range" is the anticipated activity level at which you will perform. Any pricing data outside of this range is irrelevant and need not be considered. This enhanced concept of variable cost is portrayed in the following graphic:



Cost behavior often changes outside of the relevant range of activity due to a change in the fixed costs. When volume increases to a certain point, more fixed costs will have to be added. When volume shrinks significantly, some fixed costs could be eliminated. Fixed costs that behave in this fashion are also called **semi-fixed or step fixed costs**.

For example, you are buying frozen pizza in a box from the grocery store. One pizza can feed 3 guys. Step-fixed cost is the cost of the pizza, it is sold by the box, and there is no partial pizza to be sold. The relevant range is the 3 guys, once it's more than 3; it goes up to the next level->need another box of pizza. When you have 4 guys waiting to eat pizza, you need to buy 2 pizzas, not 1. Similarly, If housekeeping staff can clean

no more than 10 rooms each, a count of 51 guests would require six staff. If nine more guests arrive to bring the total count to 60, the number of housekeeping staff needed is still only six. The next guest after that will require going to the next "step", or seven staff.

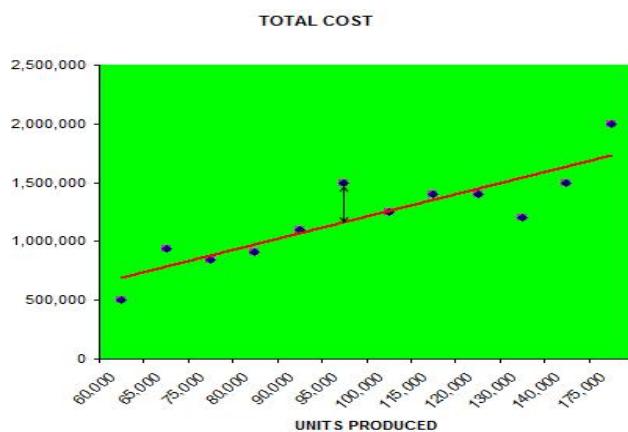


Note: Difference between Step fixed-cost function and Step variable-cost function is that the cost remains the same in step fixed-cost function over *wide* ranges of the activity in each relevant range though in step variable-cost function it remains same over *narrow* ranges of the level of activity in each relevant range.

MIXED COSTS: Many costs contain both variable and fixed components. These costs are called **mixed or semi-variable costs**. If you have a phone, you probably know more than you wish about such items. Phone agreements usually provide for a monthly fee plus usage charges for excess minutes, internet expense and so forth. With a mixed cost, there is some fixed amount plus a variable component tied to an activity. Mixed costs are harder to evaluate, because they change in response to fluctuations in volume. But, the fixed cost element means the overall change is not directly proportional to the change in activity.

Methods for segregation of Mixed Cost:

1. Graphical Method (Scattered Graph) - The visual fit method or scatter-graph method requires that all recent, normal data observations be plotted on a cost (Y-axis) versus activity (X-axis) graph. A line is then drawn that is a best fit for the data points. When the line is extended to cross the Y-axis (at zero units of activity), there is a "fairly accurate estimate of fixed costs for the period". The slope can also be calculated to give another reasonably accurate estimate of the variable cost per product. To compute the variable cost per unit, the slope of the line is determined by choosing two points and dividing the change in their cost by the change in the units of activity for the two points selected.



2. High-Low Method (Range Method) - uses the total costs incurred at the high and low levels of activity to classify mixed costs into fixed and variable components. The difference in costs between the high and low levels represents variable costs.

$$\text{Variable Cost per unit} = \frac{\text{Changes in Total Costs}}{\text{High Minus Low Activity Level}} -$$

The fixed cost can be found by subtracting the total variable cost at either the high or the low activity level from the total cost at that activity level.

3. Comparison by period (Level of Activity Method) – This method is same as Range Method except high & low activities we arbitrarily choose any two activity levels.
4. Least Squares Method – This method uses mathematical approach to determine the components of variable & fixed expenses. The following regression equation for a straight line can be used to express the relationship between a mixed cost & the level of activity:

$$Y = a + bX$$

We will solve following equations to yield the values of parameters a and b of the above equation.

$$\begin{aligned} \Sigma Y &= Na + b \Sigma X \\ \Sigma XY &= a \Sigma X + b \Sigma X^2 \end{aligned}$$

- Y = the total mixed cost
- a = the total fixed cost
- b = the variable cost per unit of activity
- X = the level of activity
- N = No. of activities

This equation makes it very easy to calculate what the total mixed cost would be for any level of activity within the relevant range.

5. Analytical Method (Accounting Method): Each account under consideration is classified as either variable or fixed based on the analyst's prior knowledge of how the cost behaves.

Question 1: Briefly explain the methods of separating semi-variable costs into their fixed and variable elements. (6 Marks) May/00

Question 2: Distinguish between 'committed fixed costs' and 'discretionary fixed cost' (5 Marks) May/96

Question 3: From the following information in respect of the semi - variable expenses obtain the fixed and variable elements using the following methods.

- | | |
|------------------------------|-------------------------|
| a. Level of activity method. | b. High low method. |
| d. Scatter Graph method | e. Least squares method |

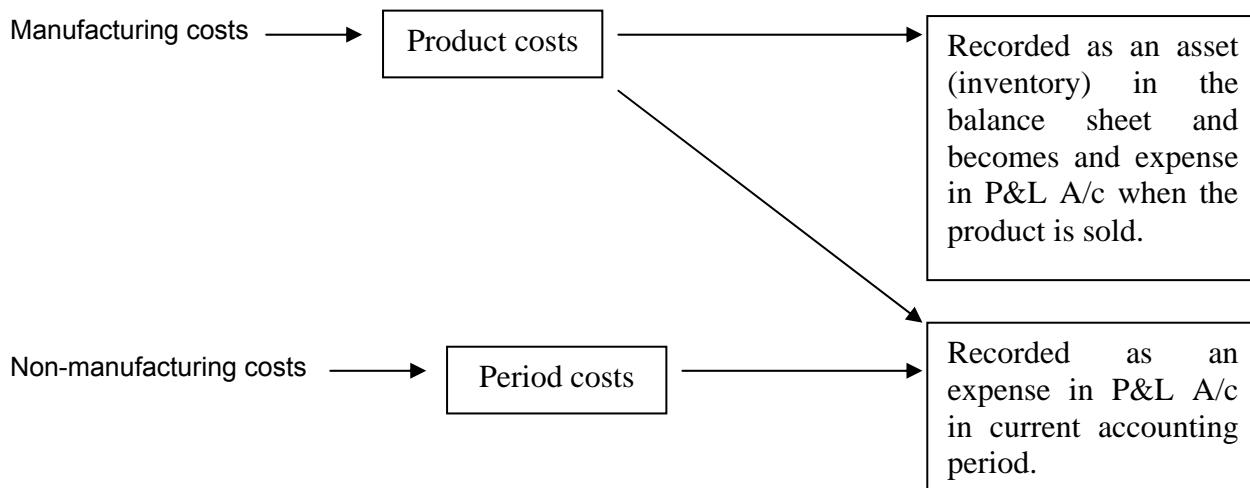
Month	Machine Hours	Semi-variable maintenance expense (₹)
January	400	2800
February	300	2600
March	200	2400
April	600	3200
May	500	3000
June	800	3600

Marginal Costing: The accounting system in which variable cost are charged to cost units and fixed costs of the period are written off in full against the aggregate contribution. (CIMA's Official Terminology). Variable costing & Contribution Approach are other names of marginal costing.

It may be defined as the technique of presenting cost data wherein variable costs and fixed costs are shown separately for managerial decision-making. It should be clearly understood that marginal costing is not a method of costing like process costing or job costing. Rather it is simply a method or technique of the analysis of cost information for the guidance of management which tries to find out an effect on profit due to changes in the volume of output.

Product Cost : A product cost is the sum of the costs assigned to a product for a specific purpose. In Financial accounting courses, it is a concept used in applying the cost plus approach to product pricing in which only

the costs of manufacturing the product are included in the cost amount to which the markup is added. The three components of manufacturing costs: direct materials, direct labor, and factory overhead costs. Generally, *inventoriable(manufacturing) costs* are called product costs.



Period Costs: These are all costs in the income statement other than cost of goods sold. Period costs are treated as expense of the A/cing period in which they are incurred because they are expected to benefit revenues in that period and are not expected to benefit revenues in future periods (or because there is not sufficient evidence to conclude that such benefits exists). In manufacturing organization all manufacturing costs are regarded as product costs & all non-manufacturing costs are regarded as period costs. In Merchandising sector, such as retailing, the cost of goods purchased is regarded as product costs & all other costs such as administration & selling and distribution expenses are considered as period costs. R&D cost, Design costs, Marketing costs, distribution costs, customer-service costs are some other examples of period costs.

Marginal Cost: The cost of one unit of product or service which would be avoided if that unit were not produced or provided. (CIMA's Official Terminology)

Note: In this context, a unit is usually either a single article or a standard measure such as the liter or kilogram, but in certain circumstances is an operation, process or part of an organization.

The marginal cost of a product –“is its variable cost”. This is normally taken to be; direct labour, direct material, direct expenses and the variable part of overheads.

Presentation of Cost Data under Marginal Costing and Absorption Costing

Following presentation of two Performa shows the difference between the presentation of information according to absorption and marginal costing techniques:

Absorption Costing

	ABC Ltd. Income Statement For the year ended	(₹'000)
Sales		yyy
Cost of Goods Sold:		
Direct material consumed	xxxx	
Direct labour cost	xxxx	
Variable manufacturing overhead	xxxx	
Fixed manufacturing overhead	xxxx	
<i>Manufacturing Cost incurred during the year (a.k.a. Gross Factory Cost)</i>	<i>xxx</i>	

Opening Work-in-Progress	xxxx	
Less: Closing Work-in-Progress	xxxx	
Total cost of goods manufactured	xxxxxx	
Add: Op. stock of finished goods (valued at total cost of previous year)	xxxx	
Less: Cl. stock of finished goods (valued at total cost of current year)	xxxx	<u>yyyy</u>
Gross profit/Margin (i.e. Sales-Cost of goods sold)		yyyyy
Less: Operating Costs:		
These are period costs		
Selling and distribution costs (Both Fixed & Variable)	xxxx	
Administration costs, etc. (Both Fixed & Variable)	xxxx	<u>yyyy</u>
Operating Income		<u>zzzz</u>
Less: Under-absorption of Fixed factory overhead		yyyy
Add: Over-absorption of Fixed factory overhead		<u>yyyy</u>
Operating Income		<u>zzzzz</u>

Marginal Costing

ABC Ltd. Income Statement (a.k.a. Contribution Income Statement) For the year ended		
	(₹'000)	
Sales	yyy	
Total variable cost:	xxxx	
Direct material consumed	xxxx	
Direct labour cost	xxxx	
Variable manufacturing overhead	xxxx	
Variable cost of goods produced	xxxxxx	
Add: Op. stock of finished goods (valued at Total Var. Cost of previous year)	xxxx	
Less: Cl. stock of finished goods (valued at Total Var. Cost of current year)	xxxx	
Variable Cost of Goods Sold	xxxx	
Add: Variable administration, selling and dist. overhead	xxxxx	
Total variable cost	yyyy	
Contribution Margin (Sales - Total variable cost)	yyyyy	
Less: Fixed operating costs (Production, administration, selling and distribution)	yyyy	
Operating Income	<u>zzzz</u>	

1. Net Income/Profit = Operating Income – Non Operating Expenses (e.g. Income Taxes, Interest, etc.)
2. As Non Operating Expenses are generally not given in question, we take Operating Income as Net Profit

Question 4: State the distinction between Marginal Costing and Absorption Costing. (7 Marks) Nov/01

Absorption Costing	Marginal Costing
1. It is a total cost technique i.e. both variable and fixed costs are charged to products, processes or operations.	Here only variable costs are charged to product, processes or operations. Fixed costs are charged as period costs to the profit statement of the same period in which they are incurred.
2. Fixed factory overheads are absorbed by the production units on the basis of a predetermined fixed factory overhead recovery rate based on normal capacity. Under/over absorbed overheads are adjusted before arriving at the figure of profit for a particular period.	The cost of production under this method does not include fixed factory overheads and therefore, the value of closing stock comprises of only variable costs. No part of the fixed expenses is included in the value of closing stock and carried over to the next period.
3. Inspire of best possible forecast and equitable basis of apportionment/allocation of fixed costs, under or over recovery of fixed overheads generally arises.	Since fixed overheads are not included in the cost of production, therefore the question of their under/ over recovery does not arise.
4. Managerial decisions under this costing technique	Here decisions are made on the basis of contribution

are based on profit i.e. excess of sales value over total costs, which may at times lead to erroneous decisions.	i.e. excess of sales price over variable costs. This basis of decision making results in optimum profitability.
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Cost-Volume-Profit Analysis

Cost-volume-profit (CVP) analysis is used to determine how changes in costs and volume affect a company's operating income and net income. In performing this analysis, there are several assumptions made, including:

- Sales price per unit, Variable costs per unit & total fixed costs are known & constant (Within relevant range & time period) & if represented graphically they are linear in behavior (representing straight lines).
- Other variables like production efficiency, production methods, and price levels remain constant.
- Everything produced is sold.
- All the company's costs, including manufacturing, selling, and administrative costs, be identified as variable or fixed
- Revenue & Costs are only affected because activity changes.
- If a company sells more than one product, they are sold in the same mix (i.e. **constant sales mix**).
- All revenues & costs can be added, subtracted & compared without taking into account time value of money.

Contribution margin and contribution margin ratio

Key calculations when using CVP analysis are the **contribution margin** and the **contribution margin ratio**. The contribution margin represents the amount of income or profit the company made before deducting its fixed costs. Said another way, it is the amount of sales available to cover (or contribute to) fixed costs. When calculated as a ratio, it is the percent of sales available to cover fixed costs. Once fixed costs are covered, the next rupee of sales results in the company having income. The contribution margin (a.k.a. contribution) is sales revenue minus all variable costs. To calculate the contribution margin ratio, the contribution margin is divided by the sales or revenues amount. **Contribution Margin Ratio is also popularly known as Profit Volume Ratio (P/V Ratio) & Contribution Sales Ratio (C/S Ratio).**

Single product contribution income statement

Units	XXXX
	(₹'000)
Sales	XXX
Less: Variable cost	XXX
Contribution	XXX
Less: Fixed cost	XXX
Profit	XXX

Multi-product contribution income statement

Particulars	A	B	C	Total
Sales	XXX	XXX	XXX	XXX
Less: Variable cost	XXX	XXX	XXX	XXX
Contribution	XXX	XXX	XXX	XXX
Less: Specific Fixed cost	XXX	XXX	XXX	XXX
Total	XXX	XXX	XXX	XXX
Less: General/Common fixed cost				XXX
<i>Profit</i>				XXX

Formulae for Calculation:

- Profit (Operating Income) = Sales – Variable Costs – Fixed Costs
- Contribution = Sales – Variable costs
- Contribution = Fixed Cost + Profit
- Sales – Variable cost = Fixed cost + Profit
- P/V ratio (or C/S ratio) = Contribution ÷ Sales

- = Contribution per unit ÷ Selling price per unit
- = Change in Contribution ÷ Change in Sales
- = Change in Profit ÷ Change in Sales
- = Profit ÷ Margin of Safety Sales
- = 1 – Variable Cost Ratio
- Profit = (Sales × P/V ratio) - Fixed Cost = P/V ratio × Margin of Safety sales(₹)
= Contribution p.u. × Margin of safety (in units)

Break-even point

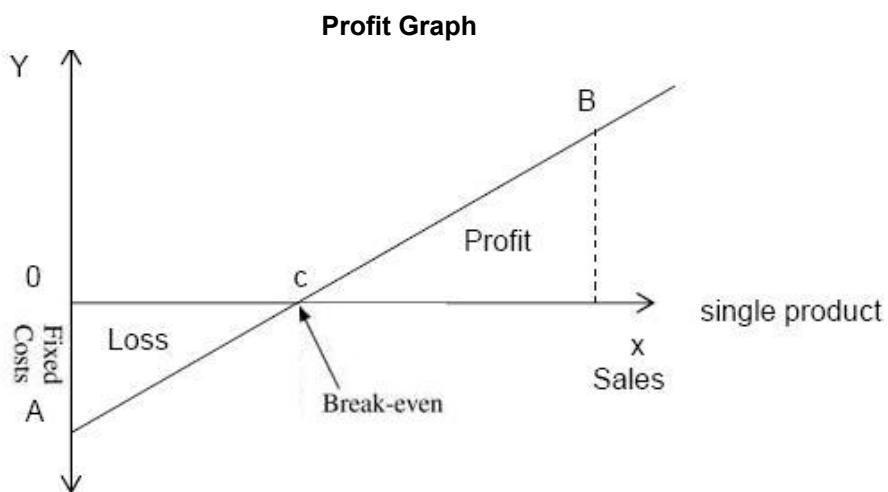
The break-even point represents the level of sales where net income equals zero. In other words, the point where sales revenue equals total variable costs plus total fixed costs, and contribution margin equals fixed costs. Variable costs represent all variable costs including costs classified as manufacturing costs, selling expenses, and administrative expenses. Similarly, the fixed costs represent total manufacturing, selling, and administrative fixed costs.

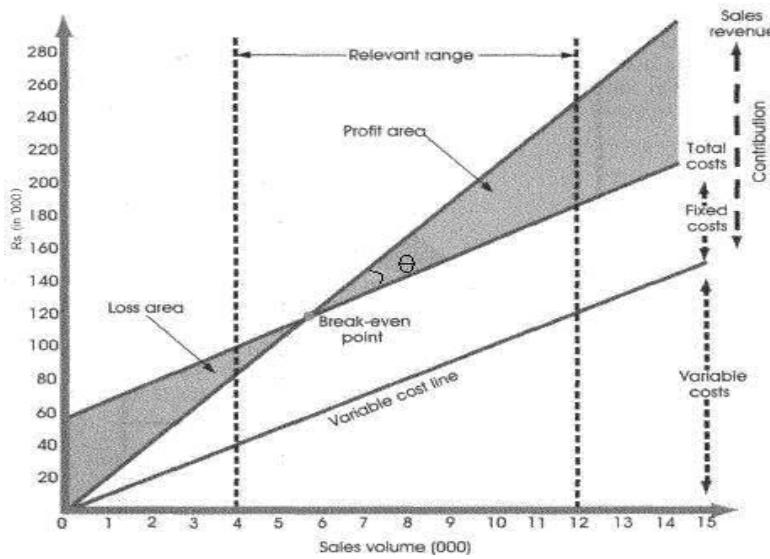
- Break Even point (in units) = Fixed Cost ÷ Contribution per unit

Break-even point (in rupees): The break-even point in sales rupees is calculated by dividing total fixed costs by the contribution margin ratio.

- Break Even Sales (in sales value) = Fixed Cost ÷ P/V ratio
- Break Even Sales (in sales value) = Variable Costs + Fixed Costs

Once the break-even point in units has been calculated, the break-even point in sales rupees may be calculated by multiplying the number of break-even units by the selling price per unit. This also works in reverse. If the break-even point in sales rupees is known, it can be divided by the selling price per unit to determine the break-even point in units.



Contribution Break Even Chart

Question 5: A company manufactures a single product having a marginal cost of ₹0.75 per unit. Fixed Cost is ₹15000 per annum. The market is such that up to 40000 units can be sold at a price of ₹1.50 per unit, but any additional sale must be made at Re. 1 per unit. Company has a planned profit of ₹25000. How many units must be made and sold.

[Ans.: 80000]

Question 6 (Sensitivity analysis): The Super co. owns and operates six outlets in and around Kansas City. You are given the following corporate budget data for next year:

	(₹)
Revenue	1,00,00,000
Fixed Costs	17,00,000
Variable Costs	82,00,000

Variable costs change with respect to the number of units sold.

Required:

Compute the budget operating income for each of the following deviations from the original budget data. (Consider each case independently.)

- A 10% increase in contribution margin, holding revenues constant.
- A 10% decrease in contribution margin, holding revenues constant.
- A 5% increase in fixed costs.
- A 5% decrease in fixed costs.
- An 8% increase in units sold.
- An 8% decrease in units sold.
- A 10% increase in fixed costs and 10% increase in units sold.
- A 5% increase in fixed costs and 5% decrease in variable costs.

[Ans.: 280000, (80000), 15000, 185000, 244000, (44000), 110000, 425000]

Question 7 (Sensitivity analysis): If labour costs and material cost are likely to go up by 10% and 5% respectively per unit, what is the percentage increase necessary in selling price to keep the P/V of 20% as before, assuming that the ratio between material and labour is 3:2, and variable overheads is nil.

[Ans.: 7%]

Question 8: H Ltd. produces Pens and Pencils. The company's budget for 2008 includes the following data:

	Pens	Pencils
Unit Selling Price (₹)	10	5
Contribution Margin ratio (%)	40	60

The budget is designed to show a figure of profit or loss for each product, after apportioning joint fixed costs of ₹100000 in proportion to the number of units of each product sold.

For 2008, Pens are budgeted to show a profit of ₹14000, and pencils a loss of ₹2000. The number of units of each product sold is expected to be equal.

You are required to write a report to the managing director of H Ltd. advising him on the basis of the information given whether to implement any of the following three proposals:

- (i) to increase the price of the pencil by 25%, in the expectation that the price elasticity of demand over this range of prices will be unity;
- (ii) to make changes to the production process that would reduce the joint fixed costs by 12.5% and increase the variable costs of each product by 10%;
- (iii) to introduce both the above changes.

[Ans.: (i) Increase in contribution = ₹6400; (ii) Decline in profit = ₹300; (iii) Increase in profit = ₹6740]

Targeted income

CVP analysis is also used when a company is trying to determine what level of sales is necessary to reach a specific level of income, also called **targeted income**. To calculate the required sales level, the targeted income is added to fixed costs, and the total is divided by the P/V Ratio to determine required sales rupees, or the total is divided by contribution per unit to determine the required sales level in units.

$$\text{Required Sales Revenue in Rupees} = \frac{\text{Fixed Costs} + \text{Target Operating Income}}{\text{P/V Ratio}}$$

$$\text{Required Sales in Units} = \frac{\text{Fixed Costs} + \text{Target Operating Income}}{\text{Contribution Margin per unit}}$$

This calculation of targeted income assumes it is being calculated for a division as it ignores income taxes. If a targeted net income (income after taxes) is being calculated, then income taxes would also be added to fixed costs along with targeted net income.

$$\text{Required Sales Revenue in Rupees} = \frac{\text{Fixed Costs} + \text{Target Net Income} + \text{Income Tax}}{\text{Tax} / \text{P/V Ratio}}$$

$$\text{Required Sales in Units} = \frac{\text{Fixed Costs} + \text{Target Net Income} + \text{Income Tax}}{\text{Contribution Margin per unit}}$$

Where, **Target Operating Income = Target Net Income + Income Taxes**

If Rate of Income Tax is known & Value of Income Tax not known then,

$$\text{Target Operating Income} = \frac{\text{Target Net Income}}{1 - \text{Tax Rate}}$$

Question 9: X Ltd. is a recently formed company, manufacturing vehicles. Its cost structure is such that on sale of every ₹2,000, it spends ₹1400/- In 2002, when the total sales revenue was ₹10,00,000/-, it sustained loss of ₹2,00,000/- You are required to compute the break even point. If the minimum net profit to be earned is ₹2,00,000/- in order to justify the survival, what must be sales revenue?

[Ans.:1666667 & 2333333]

Question 10(Volume analysis): The following figures for profit & sales are obtained from the accounts of X Co. Ltd.

Year	Sales	Profit
	₹	₹
2002	20,000	2,000
2003	30,000	4,000

- (i) Find out Contribution Sales Ratio.
- (ii) What is Break Even Sales
- (iii) Find out the sales to earn a profit of ₹6000 in 2004.
- (iv) What is the profit when sales are ₹12000 in 2004?

[Ans.: 0.2, 10000, 40000, 400]

Margin of Safety:

Margin of safety is the difference between the sales or productions at a particular level of activity and the break even sales a production. A large margin of safety indicates the soundness of the business and correspondingly a small margin of business indicates a not too-sound position.

Margin of safety can be improved by lowering the fixed cost and variable costs, increasing the volumes of sales and production, increasing the selling prices or changing the product mix resulting into a better overall Profit/Volume ratio.

- Margin of safety Sales = Sales at selected activity – BEP Sales
- Margin of safety Sales = Profit at selected activity ÷ P/V ratio
- Margin of safety (%) = Margin of Safety Sales X 100 ÷ Sales at selected activity
- Margin of safety (%) = 1 – BEP (%)

Question 11(Single product marginal cost sheet): A company producing a single article sells it at ₹10 each. The marginal cost of production is ₹6 each and fixed cost is ₹400 per annum.

Calculate

- (a) The P/V ratio;
- (b) The break-even sales;
- (c) The sales to earn a profit ₹500;
- (d) Profit at sales ₹3,000;
- (e) New break-even point if sales price is reduced by 10%.
- (f) MOS when the profit earned is ₹200 and PVR – 40%.

[Ans.: 0.4, 1000, 2250, 800, 1200, 500]

Question 12: From the following particulars, you are required to calculate:

- (i) P/V Ratio
- (ii) BEP for sales;
- (iii) Margin of Safety;
- (iv) Profit when sales are ₹2,00,000/-
- (v) Sales required to earn a profit of ₹40,000/-

Year	Sales	Profit
I	₹2,40,000	18,000
II	₹2,80,000	26,000

You may make plausible assumptions. Also evaluate the effect on II year's profit of

- (a) 20% decrease in sales quantity.
- (b) 20% decrease in sales quantity accompanied by 10% increase in sales price and reduction of ₹3,500/- in fixed costs.

[Ans.: 0.20, 150000, 130000, 10000, 350000, (a) Reduction in profit 11200; (c) Increase in profit 14700]

Question 13: The following information is given by Z Ltd.:

Margin of safety	₹1,87,500
Total cost	₹1,93,750

Margin of safety	7500 units
Break-even sales	2500 units

Required:

Calculate Profit, P/V Ratio, BEP Sales (in ₹) and Fixed Cost.

(4 Marks) Nov./10-N.C.

[Ans.: ₹56250, 0.30, ₹62500, ₹18750]

Question 14: A single product company furnishes the following data:

	Year 2007	Year 2008
Sales	24,00,000	?
P/V Ratio	33-1/3 %	30%
Margin of Safety	25%	40%

While there was no change in volume of sales in year 2008, the selling price was reduced. Calculate sales, fixed cost and profit for year 2008.

[Ans.: Sales: 2285714, Fixed Cost: 411429, Profit: 274285]

Angle of Incidence:

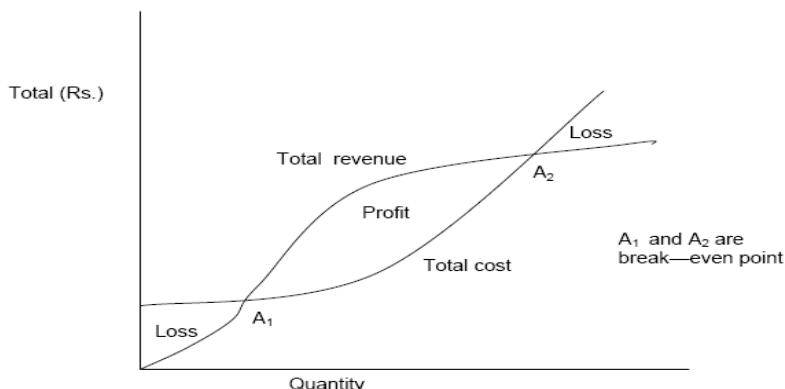
It is the angle of intersection (θ) between the sales & the total cost lines. It indicates the profit earning capacity of the concern at a certain level of sales production. The larger the angle of incidence the more is the profit earning capacity & vice versa. It also provides an indication as to what extent the output & sales price may be varied to attain a desire level of profit. It gives an easy & clear idea to the profitability under different levels of activities & also for different product mix & is a simple visual aid to find out profit earning capacity without going in for any calculation.

Curvilinear CVP analysis

In CVP analysis, the usual assumption is that the total sales line and variable cost line will have linear relationship, i.e. these lines will be straight lines, and however, in actual practice it is unlikely to have a linear relationship for two reasons, namely:

- After the saturation point of existing demand the sales value may show a downward trend.
- The average unit variable cost declines initially, reflecting the fact that, as output increases the firm will be able to obtain bulk discounts on the purchase of raw materials and can also benefit from division of labour. When the plant is operated at further higher levels of output, due to bottlenecks and breakdowns the variable costs per unit will tend to increase. Thus the law of increasing costs may operate and the variable cost per unit may increase after reaching a particular level of output.

In such cases, the contribution will not increase in linear proportion on the phenomenon of diminishing marginal productivity; the total cost line will not be straight, as assumed but will be of curvilinear shape. This situation will give rise to two break even points. The optimum profit is earned at the point where the distance between sales and total cost is the greatest.



Since Marginal Costing has been shifted from Final to (I)PCC, this book only basic concepts of CVP & doesn't contains certain important topics like Marginal vs Absorption, Composite BEP, BEP with semi-variable cost, BEP with limiting factor, Cash BEP, Multiple BEP, etc. Students are expected to have a comprehensive knowledge of concepts of these topics before they initiate themselves towards advance studies for the final examination.

Practice Questions on BEP

Composite BEP i.e. more than one product with common fixed costs

(i) Without limiting factor (Multi Products)

BEP (in units) = Fixed cost ÷ Weighted Average contribution p.u.

Where, Weighted Av. Contribution p.u. = $\sum [\text{Sales Mix}(\%) \times \text{Contribution p.u.}]$

Also, BEP (in ₹) = Fixed cost ÷ composite P/V ratio

Where, composite P/V ratio = Cumulative Contribution ÷ Cumulative Revenue

But, when sales mix in rupee is given

BEP (in ₹) = Fixed cost ÷ composite P/V ratio

Where, composite P/V ratio = $\sum [\text{Sales Mix} \times \text{P/V Ratio}]$

(ii) With limiting factor:

Find contribution per limiting factor & give rank. Find total contribution from 1st rank product. Calculate the amount of fixed cost still to recover. Whether it can be recovered by 2nd rank product or not?

Question 1(Sales mix and BEP): Aravind Ltd. manufactures and sells four products under the brand names A, B, C & D. the following details are provided in respect of the products.

Product	A	B	C	D
% in Sales Value	30	40	20	10
% of Variable cost to selling price	60	70	80	30

The total budgetary sales (100%) are ₹10, 00,000 p.m. fixed costs are ₹2, 50,000 p.m.

The company's new sales manager, Aravind has suggested a change in sales mix keeping the total sales at ₹10, 00,000 per month. His suggestion is as under:

Product	A	B	C	D
% in Sales Value	25	40	30	5

- (1) Calculate the break-even point for the Company, under the existing sales mix.
- (2) Compute the effect of implementing the suggested change in sales mix.
- (3) Explain the reasons for the effect of change in sales mix despite total sales and fixed cost being the same.

[Ans.: 714286, BEP will change to 793651]

Question 2(Sales mix and BEP): The budgeted results of A Co. Ltd. include:

Product	Sales value (₹)	P/V ratio
A	50,000	50%
C	80,000	40%
O	1,20,000	30%

Fixed overhead for the period ₹1,00,000.

The directors are worried about the results of the company. They have requested you to prepare a statement showing the amount of loss expected and recommend a change in the sales of each product or in total mix which will eliminate the expected loss.

[Ans.: 7000, New BEP Sales 85000, 80000, 85000]

Question 3: A multi-product company has the following costs and output data for the last year

	Product		
	X	Y	Z
Sales mix (in value)	40%	35%	25%
Selling price	₹20	₹25	₹30
Variable cost per unit	₹10	₹15	₹18
Total fixed costs	₹1,50,000		
Total sales	₹5,00,000		

The company proposes to replace product Z with product S.

Estimated cost and output data are:

	Product		
	X	Y	Z
Sales mix (in value)	50 %	30%	20%
Selling price	₹20	₹25	₹28
Variable cost per unit	₹10	₹15	₹14
Total fixed costs	₹1,60,000		
Total sales	₹4,50,000		

Analyze the proposed change and suggest what decision the company should take.
Also state the break even point for the company as a whole in the two situations.

[Ans.: Continue Product Z; 340909 & 340426]

Question 4: XYZ Ltd. sells three Products A,B & C. The following information is provided:

Particulars	A	B	C
Sales Volume (units)	7000	5000	6000
Selling Price per unit (₹)	10	8	5
Variable Cost per unit (₹)	5	6	2.50

Fixed Cost p.a. ₹40000. State the break even point for the company as a whole.

[Ans.: BES 93334]

Break-even point in case of step cost: In some cases, some costs tend to behave as fixed for production within batches though are variable with quantity of batches, in such cases we will calculate Break-even level of units on batches of production.

Question 5(Multiple break even points): A firm sells its product at ₹25 per unit. Its Cost behavior for various production ranges is:

Units of production	Cumulative fixed Cost	Variable Cost per Unit
0 – 16,000	2,50,000	16.00
16,001 – 60,000	3,50,000	17.00
60,001 and above	5,00,000	20.00

Identify the break-even point(s) in units.

[Ans.: 43750 & 100000]

Question 6(Multiple Break even points): Kalyan University conducts a special course on 'Computer Applications' during summer. For this purpose, it invites applications from graduates. An entrance test is given to the candidates and based on the same, a final selection of a hundred candidates is made. The entrance test consists of four objective type of Examination and is spread over four days, one examination per day. Each candidate is charged a fee of ₹50 for taking up the entrance test. The following data was gathered for the past two years:

Statement of Net Revenue from the Entrance Test for the course on "Computer Application"		
	Year 1 ₹	Year 2 ₹
Gross Revenue (Fees collected)	1,00,000	1,50,000
Costs		
Valuation	40,000	60,000
Question booklets	20,000	30,000
Hall rent at ₹2,000 per day	8,000	8,000
Honorarium to Chief Administrator	6,000	6,000
Supervision charges (1 supervisor for every 100 candidates at ₹50/- per day)	4,000	6,000
General Administration Expenses	6,000	6,000
Total Cost	84,000	1,16,000
Net revenue	16,000	34,000

Required to compute:

- (a) The budgeted net revenue if 4,000 candidates take up the entrance test in Year 3.
- (b) The break even number of candidates.
- (c) The number of candidates to be enrolled if the net income desired is ₹20,000/-.

[Ans.: 52000, 1120, 2230]

Question 7: A hospital operates a 40 bed capacity special health care April 7, 2003 department. The said department levies a charge of ₹425 per bed day from the patient using its services. The data relating to fees collected and costs for the year 2001 are as under:

	₹
Fees collected during the year	3495625
Variable costs based on patient days	1357125
Departmental fixed costs	622500
Apportioned costs of the hospital administration charges	1000000

Based the above, nursing staff were employed as per the following scale at ₹48000 per annum per nurse.

Annual Patient days	No. of Nurses required
Less than 5000	3
5000-7000	4
7000-9000	6
Above 9000	8

The projections for the year 2002 are as under:

- The costs other than apportioned overheads will go up to 10%.
- The apportioned overheads will increase by ₹250000 per annum.
- The salary of the nursing staff will increase to ₹54000 per annum per nurse.

The occupancy of the bed capacity is not likely to increase in 2002 and consequently the management is actively considering a proposal to close down the department. In that event, the departmental fixed costs can be avoided.

Required:

- (i) Present situation to show the profitability of the department for the years 2001 and 2002.
(ii) Calculate the:
- Break even bed capacity for the year 2002.
- Increase in fee per bed day required to justify continuance of the department. (12 Marks) Nov/02

[Ans.: (i) Profit for 2001 is ₹2,28,000, For 2002 loss is ₹255962; (ii) BEP is 9720 bed days, Increase in fee per bed days ₹31.12]

Question 8: PQ Ltd has been offered a choice to buy a machine between A and B

You are required to compute:

- (a) Break even point for each of the machines
(b) The level of sales at which both machines earn equal profits
(c) The range of sales at which one is more profitable than the other

The other relevant data is as given below:

	Machine A	Machine B
Annual output in units	10,000	10,000
Fixed cost	30,000	16,000
Profit at above level of production	30,000	24,000

The market price of the product is expected to be ₹10 per unit.

[Ans.: 5000 & 4000; 7000]

Question 9: Satish Enterprises are leading exporters of Kid's Toys. J Ltd. of USA have approached Satish Enterprises for exporting a special toy named "Jumping Monkey". The order will be valid for next three years at 3000 toys per month. The export price of the toy will be \$4.

Cost data per toy is as follows:	₹
Material	60
Labour	25
Variable Overheads	20
Primary packing per toy	15

The toys will be packed in lots of 50 each. For this purpose a special box, which contain the 50 toys will have to be purchased, cost being ₹400 per box.

Satish Enterprises will also have to import a special machine for making the toys. The cost of the machine is ₹2400000 and duty thereon will be at 12%. The machine will have an effective life of 3 years and depreciation is to be charged on straight line method. Apart from depreciation, annual fixed overheads are estimated at ₹400000 for the first year with 6% increase in the second year. Fixed overheads are incurred uniformly over the year.

Assuming the average conversion rate to be ₹50 per \$, you are required to:

- (i) Prepare monthly and yearly profitability statements for the first year and second year assuming the production at 3000 toys per month.
(ii) Compute monthly and yearly break-even units in respect of the first year.
(iii) In what contingency can there be a second break-even point for the month and for the year as a whole?
(iv) Have you any comments to offer on the above? (16 Marks) Nov./99

[Ans.: (i) 108000, 1296000, 106000, 1272000 (ii) 1500 & 18000 (iii) 1505 & 18005]

Question 10: Navbharat Commerce College, Bombay has six sections of B.Com and two sections of M.Com with 40 and 30 students per sections respectively. The college plans one day pleasure trip around the city for the students once in an academic session during break to visit park, zoo, planetarium and aquarium.

A transporter used to provide the required number of buses at a flat rate of ₹700 per bus for the aforesaid purpose. In addition, a special permit fee of ₹50 per bus is required to be deposited with city Municipal Corporation. Each bus is 52 seater. Two seats are reserved for teachers who accompany each bus. Each

teacher is paid daily allowance of ₹100 for the day. No other costs in respect of teachers are relevant to the trip.

The approved caterers of the college supply breakfast, lunch and afternoon tea respectively at ₹7, ₹30 and ₹3 per student.

No entrance fee is charged at the park. Entrance fees come to ₹5 per student both for the zoo and the aquarium. As regards planetarium, the authorities charges block entrance fees as under for group of students of educational institutions depending upon the number of students in a group:

Number of students in a group	Block Entrance Fee
Upto 100	₹200
101-200	₹300
201 & above	₹450

Cost of prizes to be awarded to the winners in different games being arranged in the park depend upon the strength of students in a trip. Cost of prizes to be distributed are;

Number of students in a Trip	Cost of Prizes
Upto 50	₹900
51 – 125	₹1050
126 – 150	₹1200
151 – 200	₹1300
201 – 250	₹1400
251 and above	₹1500

To meet the above costs the college collects ₹65 from each student who wish to join the trip. The college releases subsidy of ₹10 per student in the trip towards it.

You are required to :

- (a) Prepare a tabulated statement showing total costs at the levels of 60, 120, 180, 240, and 300 students indicating each item of cost.
- (b) Compute average cost per student at each of the above levels.
- (c) Calculate the number of students to break even for the trip as the college suffered loss during the previous year despite 72% of the total students having joined the trip. (19 Marks) May/97

[Ans.: (a) 5850, 9600, 13500, 17400, 21150 (b) 97.50, 80, 75, 72.50, 70.50 (c) BEPs :145, 180, 220, 255]

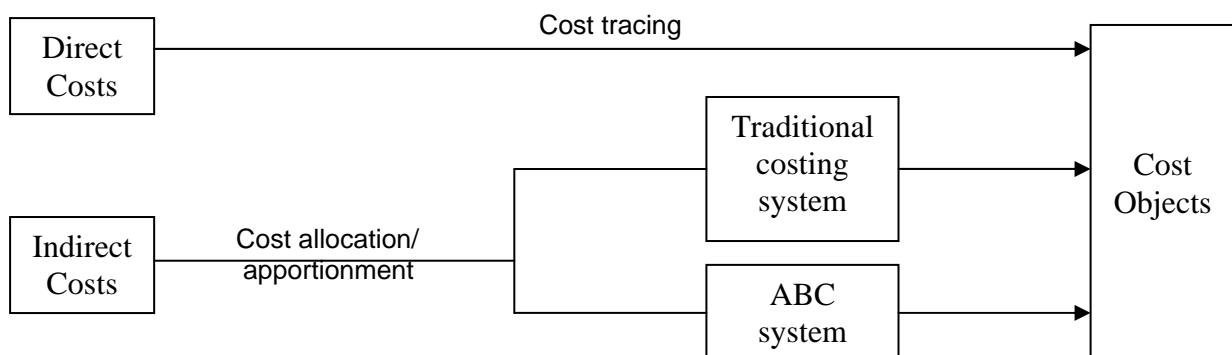
2



Activity-based cost management

Cost Object: It is an item for which cost measurement is required e.g. a product, a job or a customer.

Direct Costs: Those costs that can be specifically & exclusively identified with a particular cost object. Direct costs can be accurately traced because they can be physically identified with a particular object whereas indirect costs cannot. Prime cost refers to the direct costs of the product and consists of direct material costs + Direct labour costs + Direct expenses. Direct costs are different from Variable costs & may include fixed costs. Cost of hiring machine for producing a specific product is an example of a direct expense although it is fixed in nature.



Indirect Costs: They can't be identified specifically and exclusively with a given cost object. The salaries of a factory supervisors can't be specifically identified with a particular product hence these are classified as indirect.

Activities: Activities comprise of units of work or tasks. For example, purchase of materials is an activity consisting a series of tasks like purchase requisition, advertisement inviting quotations, identification of suppliers, placement of purchase order, follow-up etc.

Types of Activities: Activities basically fall into four different categories, known as the manufacturing cost hierarchy. These categories were first identified by Cooper in 1990 and help to determine the type of activity cost driver required. The categories are:

(i) Unit level activities (a.k.a. Volume related activities): These are activities for which the consumption of resources can be identified with the number of units produced. E.g. Use of indirect materials, Inspection or testing of every item produced or say every 100th item produced, Indirect consumables, etc.

(ii) Batch level activities: The costs of some activities (mainly manufacturing support activities) are driven by the number of batches of units produced. These are activities related to setting up of a batch or a production run. The costs of such activities vary with the number of batches made, but is fixed for all units within that batch. E.g. Production scheduling, Material movement, Machine set up costs, Inspection of products – like first item of every batch, etc.

(iii) Product-sustaining activities or service sustaining activities: The costs of some activities (often once only activities) are driven by the creation of a new product line and its maintenance. These are activities performed to support different products in the product line. E.g. Designing the product, Producing parts to a certain specification, Advertising costs, if advertisement is for individual products, etc.

(iv) Facility-sustaining or business-sustaining activities: These are activities necessary for sustaining the manufacturing process and cannot be directly attributed to individual products. E.g. Maintenance of buildings, Plant security, Production manager's salaries, Advertising campaigns promoting the co., etc.

Value Added and Non-value Added activities

Value Added Activities(VA)	Non Value Added Activities (NVA)
These are activities necessary for the performance of the process.	These are additional and extraneous activities, not fully necessary for the performance of the process.
These represent work that is valued by the external or internal customer.	These represent work that is not valued by the external or internal customer.
They improve the quality or function of a product. Hence, the customers are usually willing to pay for the service. VA activities result in "Cost" and not in losses.	NVA activities do not improve the quality or function of a product or service but they can adversely affect costs and prices. NVA activities create waste, result in delay of some sort, add cost to the products or services for which the customer is not willing to pay.
Example: Making product more versatile for certain other uses.	Examples: Moving materials and machine set up for a production run.

Cost Driver: It is the factor that causes a change in the cost of an activity. Instead of using the term 'allocation bases' or 'overhead allocation rates' the term cost driver is used in ABC system. They are classified into:

- **Resource Cost Driver:** It is a measure of the quantity of resource consumed by activity. It is used to assign the cost of a resource to an activity or cost pool. An example of a resource cost driver is the percentage of total square feet occupied by an activity. This factor is used to allocate a portion of the cost of operating the facilities to the activity.
- **Activity Cost Driver:** It is a measure of the frequency and intensity of demand, placed on activities by cost objects. It is used to assign activity costs to cost objects. Activity cost drivers can be transaction drivers (e.g. No. of purchase orders processed, no. of customer orders processed, etc.) as well as duration drivers (it represent amount of time required to perform an activity e.g. Setup hours, inspection hours, etc.).

Common activities and associated cost drivers:

Major Activities	Associated Costs	Cost Driver
Processing purchase orders for materials and parts	Labour cost for workers determining order quantities, contracting vendors, and preparing purchase orders	Number of purchase orders processed
Handling material and parts	Labour cost for workers handling material and parts, depreciations of equipment used to move material and parts (e.g. depreciation of fork lift trucks), etc.	Number of material requisitions
Inspecting incoming material and parts	Labour cost for workers performing inspections, depreciation of equipment used to test strength of materials, tolerances, etc.	Number of receipts
Inspecting finished goods	Labour cost for finished goods inspectors, depreciation of equipment used to test whether finished goods meet customer specifications, etc.	Number of assembly labour hours
Setting up equipment	Labour cost for workers involved in setups, depreciation of equipment used to adjust equipment	Number of setups
Producing goods using manufacturing equipment	Depreciation of manufacturing equipment	Number of machine hours
Supervising assembly workers	Salary of assembly supervisors	Number of assembly labour hours
Packing customer orders	Labour cost for packing workers, cost of packing materials, etc.	Number of boxes shipped

Traditional Cost Accounting

It arbitrarily allocates overheads to the cost objects. Total Company's overhead is allocated based on volume based measure (taking time as base factor) i.e. labour hours or machine hours. Here the main assumption is that there is a relationship between overhead & volume based measure.

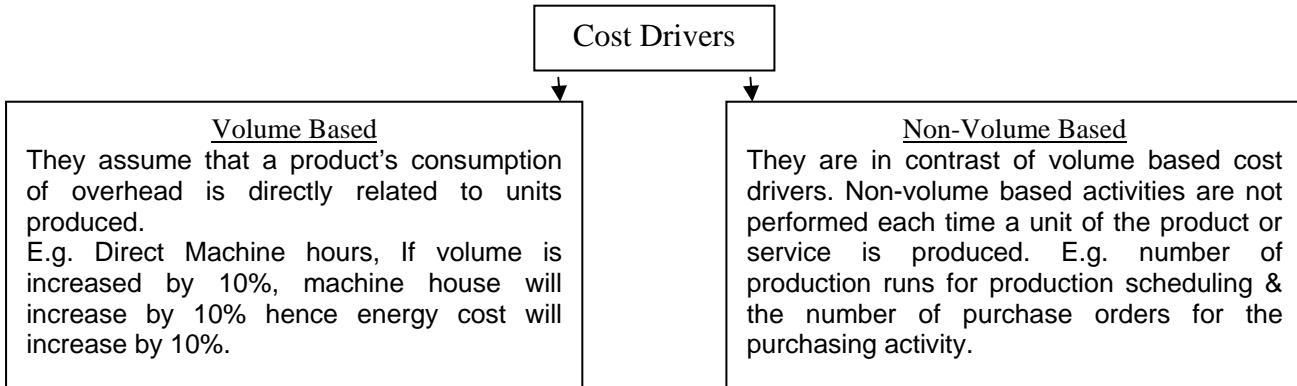
Activity Based Costing

ABC is not a method of costing, but a technique for managing the organization better. It is a one-off exercise which measures the cost and performance of activities, resources and the objects which consume them in order to generate more accurate and meaningful information for decision-making. ABM draws on ABC to provide management reporting and decision making.

It is more accurate cost management methodology. It focuses on indirect costs (overhead). It traces rather than allocates each expense category to the particular cost object. It converts "indirect" expenses to "direct".

ABC Basic Premise

- o Cost objects consume activities.
- o Activities consume resources.
- o This consumption of resources is what derives costs.
- o Understanding this relationship is critical to successfully managing overhead.



Remember, Using only volume-based cost drivers to assign non-volume related overhead costs can result in the reporting of distorted product costs.

Product Diversity - Difference in product size, product complexity, size of batches and set-up times cause product diversity.

Product cost distortion occurs when both of these conditions occur:

- a) Non-Volume based overhead costs are a large proportion of total overhead costs.
- b) Product diversity applies.

When & Why to use ABC

- o Overhead is high-New production techniques have resulted in the increase of the proportion of support service costs in the total cost of delivering value to customers. ABC improves the accuracy of accounting for support service costs.
- o Products are diverse-There is product and customer proliferation. Demand on resources by products / customers differ among product / customers. Therefore, product / customer profitability can be measured reasonably accurately, only if consumption of resources can be traced to each individual product / customer
- o Costs of errors are high-The costs associated with bad decisions have increased substantially.
- o Competition is stiff-Fierce competitive pressure has resulted in shrinking profit margin. ABC helps to estimate cost of individual product or service more accurately. This helps to formulate appropriate marketing / corporate strategy.

Steps involved in Activity Based Costing:

Step 1: Identify the various Activities within the organization.

Only significant activities shall be considered for decision-making purposes.

Step 2: Relate the Overheads to the Activities using Resources Cost Drivers

- Overheads will be related to Support and Primary Activities
- Resources Cost Drivers, i.e. the quantity of resources used by an activity is used for this purpose.
- All costs will be identified under the activities, thus creating Activity Cost Pools/Cost Buckets.

Step 3: Determine the Activity Cost Drivers for each Activity Cost Pool

- Activity cost drivers used to relate the overheads collected in the cost pools to cost objects (products) should be determined.
- This is based on the factor that drives the consumption of the activity, i.e. the answer to the question: what causes the activity to incur costs? For example in production scheduling, the driver will be number of batches ordered.

Step 4: Calculate Activity Cost Driver Rate (i.e. $\frac{\text{Activity Cost Pool}}{\text{Activity Cost Driver}}$) & relate costs to products.

- Activity Cost Driver Rates are computed for each activity, just like overhead absorption rates.
- The rates will be multiplied by the different amounts of each activity that each product/other cost object consumes, so as to ascertain its cost.

A comparison of traditional & ABC systems

Traditional Absorption Costing	Activity Based Costing
Overheads are first related to departments cost centres (Production and Service Cost Centres)	Overheads are first related to activities or grouped into Cost Pools (<i>rather than departments</i>).
Only two types of activities viz. Unit Level Activities and Facility Level Activities are identified.	All levels of activities in the manufacturing cost hierarchy viz. Unit Level, Batch Level, Product Level and Facility Level are identified.
Direct labour & machine hours are the allocation bases that are normally used.	Many different types of second stage cost drivers are used, including non-volume-based drivers.
This method relates overheads to cost centres i.e. locations. It is not realistic of the behaviour of costs.	This method relates overheads to the causal factor i.e. driver. Thus, it is more realistic of cost behaviour.
Overhead Rates can be used to ascertain cost of products only.	Activity Cost Driver Rates can be used to ascertain cost of products and also cost of other cost objects such as customer segments, distribution channels. etc.

Activity-based Management

Activity-based management (ABM) is a method of identifying and evaluating activities that a business performs using activity-based costing to carry out a value chain analysis or a re-engineering initiative to improve strategic and operational decisions in an organization. Activity-based costing establishes relationships between overhead costs and activities so that overhead costs can be more precisely allocated to products, services, or customer segments. Activity-based management focuses on managing activities to reduce costs and improve customer value. To implement ABM only 1st three of the four stages for designing an activity-based product costing system are required. They are:

- Identify the various Activities within the organization.
- Relate the Overheads to the Activities using Resources Cost Drivers
- Determine the Activity Cost Drivers for each Activity Cost Pool

Thus final stage of assigning activity costs to products can be omitted & ABC can solely be adopted for cost management without activity-based product costing. Alternative, organizations can design an activity based system that incorporates both ABM & ABC.

Activity Based Costing	Activity Based Cost Management
ABC refers to the technique of determining the costs of activities and the cost of output that	It refers to the management philosophy that focuses on the planning, execution and

those activities produce.	measurement of activities as the key to competitive advantage.
The aim of ABC is to generate improved cost data for use in managing a company's activities.	The ABM is a much broader concept. Its aim is to use information generated by ABC, for effective business processes and profitability.

Question 1: Explain the concept of cost drivers indicate what you will consider as cost drivers for the following business function:

Research & development; and Customer service.

(4 Marks) Nov./98

Question 2: What is activity based costing?

(4 Marks) May/00

Question 3: Explain the concept of activity based costing. How ABC system supports corporate strategy?

(4 Marks) Nov./05

Question 4: Differentiate between 'Value-added' and 'Non-value-added' activities in the context of Activity-based costing. Give examples of Value-added and Non-value-added activities. (4 Marks) May/06

Question 5: What are the areas in which activity based information is used for decision making?

(4 Marks) Nov./00

Question 6: What is the fundamental difference between Activity Based Costing System (ABC) and Traditional Costing System? Why more and more organizations in both the manufacturing and non-manufacturing industries are adopting ABC? (10 Marks) Nov./07

Question 7: Give two examples for each of the following categories in activity based costing:

- (i) Unit Level activities
- (ii) Batch Level activities
- (iii) Product Level activities
- (iv) Facility Level activities

(3 Marks) Nov./02[Adapted] & (4 Marks) Nov/06

Question 8: Why are conventional product costing systems more likely to distort product costs in highly automated plants? How do activity based costing deal with such a situation? (4 Marks) May/06

Question 9: Traditional Ltd. is a manufacturer of a range of goods. The cost structure of its different products is as follows:

Particulars	Product A	Product B	Product C
Direct materials	50	40	40 ₹/u
Direct labour @ ₹10 ₹/hour	30	40	50 ₹/u
Production overheads	30	40	50 ₹/u
Total Cost	110	120	140 ₹/u
Quantity produced	10,000	20,000	30,000 Units

Traditional Ltd. was absorbing overheads on the basis of direct labour hours. A newly appointed management accountant has suggested that the company should introduce ABC system and has identified cost drivers and cost pools as follows:

Activity Cost Pool	Cost Driver	Associated Cost
Stores Receiving	Purchase Requisitions	2,96,000
Inspection	Number of Production runs	8,94,000
Despatch	Orders Executed	2,10,000
Machine Setup	Number of setups	12,00,000

The following information is also supplied:

Details	Product A	Product B	Product C
No. of Setups	360	390	450
No. of Orders Executed	180	270	300
No. of Production runs	750	1,050	1,200
No. of Purchase Requisitions	300	450	500

You are required to calculate activity based production cost of all the three products.

[Ans.: A - ₹1504940; B – ₹2485060; C – ₹3710000]

(5 Marks)-June/09-N.C.

Question 10: A company manufactures three types of products namely P, Q & R. The data relating to a period are as under:

	P	Q	R
Machine hour per unit	10	18	14
Direct labour hour per unit @ ₹20	4	12	8
Direct material per unit ₹	90	80	120
Production (units)	3000	5000	20000

Currently the company uses traditional costing method and absorbs all production overheads on the basis of machine hours. The machine hour rate of overhead is ₹6 per hour.

The company proposes to use activity based costing system and the activity analysis is as under:

	P	Q	R
Batch size (units)	150	500	1000
Number of purchase orders per batch	3	10	8
Number of inspections per batch	5	4	3

The total production overheads are analyzed as under:

Machine set up costs	20%
Machine operation costs	30%
Inspection costs	40%
Material procurement related costs	10%

Required:

- i. Calculate the cost per unit of each product using traditional method of absorbing all production overheads on the basis of machine hours.
- ii. Calculate the cost per unit of product using activity based costing principles.

[Ans.: (i) 230, 428, 364 (ii) 427, 425, 335.20]

(7 Marks) Nov./08-O.C.

Question 11: The following are Product Nova Shaft's data for next year budget:

Activity	Cost Driver	Cost Driver volume/year	Cost pool
Purchasing	Purchase orders	1500	₹75000
Setting	Batches produced	2800	₹112000
Materials handling	Materials movements	8000	₹96000
Inspection	Batches produced	2800	₹70000
Machining costs	Machine hours	50000	₹150000
Purchase orders	25		
Output	15000 units		
Production batch size	100 units		
Materials movement per batch	6		
Machine hours per unit	0.1		

Required:

- (i) Calculate the budgeted overhead costs using activity based costing principles.
- (ii) Calculate the budgeted overhead Costs using absorption costing (absorb overhead using machine hours).
- (iii) How can the company reduce the ABC for Product Nova Shaft? (9 Marks) June/09-O.C.

[Ans.: (i) ₹26300; (ii) ₹15090

(iii) Ways in which the company can reduce the ABC for product Nova Shaft:

- Reduce the number of batches by increasing the batch size which will then reduce the setting up overhead, materials handling and inspection costs.
 - Reduce the number of purchase orders
 - Innovate ways of speeding up production so that the machining hours are reduced.]

Question 12: Biscuit Ltd. Manufactures 3 types of biscuits, A, B and C, in a fully mechanised factory. The company has been following conventional method of costing and wishes to shift to Activity Based Costing System and therefore wishes to have the following data presented under both the systems for the month.

Inspection cost	₹p.m.	73,000	
Machine – Repairs & Maintenance	₹p.m.	1,42,000	
Dye cost	₹p.m.	10,250	
Selling overheads	₹p.m.	1,62,000	
	Product A	B	C
Prime cost (₹per unit)	12	9	8
Selling price (₹Per unit)	18	14	12
Gross production (units/production run)	2,520	2,810	3,010
No. of defective (units / production run)	20	10	10
		C	
Inspection (No. of hours / production run)	3	4	4
Dye cost / production run (₹)	200	300	250
No. of machine hours / production run	20	12	30
Sales – No. of units / month	25,000	56,000	27,000

The following additional information is given:

- (i) No accumulation of inventory is considered. All good units produced are sold.
 - (ii) All manufacturing and selling overheads are conventionally allocated on the basis of units sold.
 - (iii) Product A needs no advertisement. Due to its nutritive value, it is readily consumed by diabetic patients of a hospital. Advertisement costs included in the total selling overhead is ₹83,000.
 - (iv) Product B needs to be specially packed before being sold, so that it meets competition. ₹54,000 was the amount spent for the month in specially packing B, and this has been included in the total selling overhead cost given.

You are required to present product-wise profitability of statements under the conventional system and the ABC system and accordingly rank the products. (11 Marks) May/08

[Ans.: Conventional : Net profit(Rank) is A-57959(II), B- 77403(I) & C- 10467(III), ABC : Net profit(Rank) is A- 84813 (I), B-61237 (II) & C- (220)(III)]

Question 13: Bombay steel Ltd. manufacture four products, namely A,B,C and D, using the same plant and process. The following information relates to a production period:

Product	Volume	Material cost per unit (₹)	Direct labour per unit	Machine time per unit	Labour cost per unit
A	500	5	½hours	¼hours	3
B	5,000	5	½hours	¼hours	3
C	600	16	2 hours	1 hours	12
D	7,000	17	1½hours	1½hours	9

Total production overhead recovered by the cost accounting system is analysed under the following heading:

Set-up costs are	4,355
Cost of ordering materials	1,920
Handling materials	7,580
Administration for spare parts	8,600

These overhead costs are absorbed products on a machine hour rate of ₹4.80 per hour giving an overhead cost per product of:

$$A = ₹1.20 \quad B = ₹1.20 \quad C = ₹4.80 \quad D = ₹7.20$$

However, investigation into the production overhead activities for the period reveals the following totals:

Product	Number of set-ups	Number of material orders	Number of times material was handled	Number of spare parts
A	1	1	2	2
B	6	4	10	5
C	2	1	3	1
D	8	4	12	4

You are required:

- (I) to compute an overhead cost per unit per product using activity based costing, tracing overheads to production units by means of cost drive.
- (II) to comment briefly on the difference disclosed between overheads traced by the present system and those traced by activity based costing.

[Ans.: Value of overhead in Traditional: 1.2, 1.2, 4.8, 7.2; Value of overhead in ABC: 5.63, 2.49, 6.76, 5.79]

Question 14: Family Store wants information about the profitability of individual product lines: Soft drinks, Fresh produce and Packaged food. Family store provides the following data for the year 2002-03 for each product line:

	Soft drinks	Fresh produce	Packaged food
Revenues	₹7,93,500	₹21,00,600	₹12,09,900
Cost of goods sold	₹6,00,000	₹15,00,000	₹9,00,000
Cost of bottles returned	₹12,000	₹0	₹0
Number of purchase orders placed	360	840	360
Number of deliveries received	300	2,190	660
Hours of shelf-stocking time	540	5,400	2,700
Items sold	1,26,000	11,04,000	3,06,000

Family store also provides the following information for the year 2002-03:

Activity	Description of Activity	Total cost	Cost-allocation Base
Bottles returns	Returning of empty bottles	₹12,000	Direct tracing to soft drink line
Ordering	Placing of orders for purchases	₹1,56,000	1,560 purchase orders
Delivery	Physical delivery and receipt of goods	₹2,52,000	3,150 deliveries
Shelf stocking	Stocking of goods on store shelves and ongoing restocking	₹1,72,800	8,640 hours of shelf-stocking time
Customer Support	Assistance provided to customers including check-out	₹3,07,200	15,36,000 items sold

Required:

- i) Family store currently allocates support cost (all cost other than cost of goods sold) to product lines on the basis of cost of goods sold of each product line. Calculate the operating income and operating income as a % of revenues for each product line.
- ii) If Family Store allocates support costs (all costs other than cost of goods sold) to product lines using and activity based costing system, calculate the operating income and operating income as a % of revenues for each product line.
- iii) Comment on your answers in requirements (i) and (ii).

[Ans.: (i) ₹13500, ₹150600, ₹39900; 1.70%, 7.17%, 3.30% (ii) ₹85500, ₹12600, ₹105900; 10.78%, 0.60%, 8.75%]

(12 Marks) May/03-PEII, (11 Marks) Nov./10-N.C.[Adapted]

Question 15: Having attached a CIMA course on activity based costing (ABC) you decide to experiment by applying the principles of ABC to the four products currently made and sold by your company. Details of the four products and relevant information are giving below for one period:

Product	A	B	C	D
Output in units	120	100	80	120
Cost per unit:	₹	₹	₹	₹
Directs material	40	50	30	60
Direct labour	28	21	14	21
Machine hours (per unit)	4	3	2	3

The four products are similar and are usually produced in production runs of 20 units and sold in batches of 10 units. The production overhead is currently absorbed by using a machine hour rate, and the production overhead for the period has been analysed as follows:

	(₹)
Machine department costs(rent, business, rates, depreciation and supervision)	10,430
Set-up costs	5,250
Stores receiving	3,600
Inspection / Quality control	2,100
Materials handling and dispatch	4,620

You have ascertained that the "cost drivers" to be used are as listed below for overhead drivers" to costs Shown:

Cost	Cost Driver
Set-up costs	Number of production runs
Store receiving	Requisitions raised
Inspection / quality control	Number of production runs
Materials handling and dispatch	Orders executed

The number of requisitions raised on the stores was 20 for each product and the number of orders executed was 42, each order being for a batch of 10 of a product.

You are required:

- a) to calculate the total cost for product if all overhead costs are on machine hour basis;
- b) to calculate the total costs for product, using activity based costing ;
- c) to calculate and list the unit product costs from your figures in (a) and (b) above, to show the differences and to comment briefly on any conclusions which may be drawn which could have pricing and profit implications.

(CIMA London Nov/91) & (12 Marks) CA PEII May/05-Adapted

[Ans.: (a) Machine hour basis: 17760, 13100, 6720, 16920; (b) ABC: 16331, 13257, 7984, 16928; (c) Machine hour basis: 148, 131, 84, 141; ABC:136.09, 132.57, 99.80,141.07,]

Question 16: XYZ Ltd. manufactures four products, namely A, B, C and D using the same plant and process. The following information relates to a production period:

Product	A	B	C	D
Output in units	720	600	480	504
Cost per unit:	₹	₹	₹	₹
Direct Material	42	45	40	48
Direct labour	10	9	7	8
Machine hours per unit	4 hrs.	3 hrs.	2 hrs.	1 hr

The four products are similar and are usually produced in production runs of 24 units and sold in batches of 12 units. Using machine hour rate currently absorbs the production overheads. The total overheads incurred by the company for the period is as follows:

	₹
Machine operation and Maintenance cost	63,000
Setup costs	20,000
Store receiving	15,000
Inspection	10,000
Material handling and dispatch	2,592

During the period the following cost drivers are to be used for the overhead cost:

Cost	Cost driver
Setup cost	No. of production runs
Store receiving	Requisition raised
Inspection	No. of production runs
Material handling and dispatch	Orders executed

It is also determined that:

- Machine operation and maintenance cost should be apportioned between setup cost, store receiving and inspection activity in 4:3:2.
- Number of requisition raised on store is 50 for each product and the no. of order executed is 192, each order being for a batch of 12 of a product.

Required:

- Calculate the total cost of each product, if all overhead costs are absorbed on machine hour rate basis.
- Calculate the total cost of each product using activity base costing.
- Comment briefly on differences disclosed between overheads traced by present system and those traced by activity base costing. (11 Marks) Nov/04

[Ans.: (a) A – ₹89280, B – ₹64800, C – ₹39840, D – ₹37296, (b) A – ₹69750, B – ₹60825, C - ₹47100, D – ₹53541]

Question 17 [Activity Based Budgeting]: A bank offers three products, viz., deposits, Loans and Credit Cards. The bank has selected 4 activities for a detailed budgeting exercise, following activity based costing methods.

The bank wants to know the productwise total cost per unit for the selected activities, so that prices may be fixed accordingly.

The following information is made available to formulate the budget

	Activity	Present Cost (₹)	Estimation for the budget period
(i)	ATM Services:		
	(a) Machine Maintenance	4,00,000	(all fixed; no change)
	(b) Rents	2,00,000	(fully fixed; no change)
	(c) Currency Replenishment Cost	1,00,000	(expected to double during budget period) (This activity is driven by no. of ATM)

(ii) Computer Processing	5,00,000	transactions) (Half this amount is fixed and no change is expected) (The Variable portion is expected to increase to three times the current level). This activity is driven by the number of computer transactions.
(iii) Issuing Statements	18,00,000	Presently, 3 lac statements are made. In the budget period, 5 lac statements are expected; For every increase of one lac statements, one lac rupees is the budgeted increase (this activity is driven by the number of Statements)
(iv) Customer Inquiries	2,00,000	Estimated to increase by 80% during the budget period. (This activity is driven by telephone minutes.)

The activity drivers and their budgeted quantities are given below:

	Deposits	Loans	Credit Cards
No. of ATM Transactions	1,50,000	-	50,000
No of Computer Processing	15,00,000	2,00,000	3,00,000
No. of Statements to be issued	3,50,000	50,000	1,00,000
Telephone Minutes	3,60,000	1,80,000	1,80,000

The bank budgets a volume of 58,600 deposit accounts, 13,000 loan accounts, and 14,000 Credit Card accounts.

You are required to:

- i) Calculate the budgeted rate for each activity.
- ii) Prepare the budgeted cost statement activity wise.

Find the budgeted product cost per account for each product using (i) and (ii) above. (12 Marks) Nov./09-N.C.

[Ans.: (a) 4, 0.50, 4, 0.50; (b) 800000, 1000000, 2000000, 360000 (c) 50, 30, 60]

Question 18: XYZ Ltd. produces and sells sophisticated glass items – ‘A’ and ‘B’. In connection with both the products the following informations are revealed from the cost records for the month February, 2008:

Product	A	B
Output (in units)	60,000	15,000
Sales (₹)	37,80,000	20,55,000
Cost structure:		
Direct material (₹per unit)	18.75	45.00
Direct Wages (₹per unit)	10.00	13.00
Direct labour hours	30,000 hours	9,750 hours
No. of quantity produced per batch	240	50
Setup time per batch	2 hours	5 hours

The Indirect costs for the month are as under:

	₹
Cleaning and maintenance wages	2,70,000
Designing Costs	4,50,000
Set up costs	3,00,000
Manufacturing operation's costs	6,37,500
Shipment costs	81,000
Distribution costs	3,91,500
Factory administration costs	2,55,000

At present the company adopts the policy to absorb indirect costs applying direct labour hour basis and enjoying a good position in the market with regard to Product B, but facing a stiff price competition with regard to Product A. The cost Accountant of the company, after making a rigorous analysis of the data, decided to shift from the absorption technique based on direct labour hours to activity cost driver basis and also to treat cleaning and maintenance wages as direct cost.

The cost accountant identified ₹1,20,000 for product A and the balance of cleaning and maintenance wages for Product B.

The data relevant to activities and products are as follows:

Activity	Cost driver	Product A	Product B
Designing:	Square feet	30 sq. ft.	70 sq. ft.
Manufacturing operation's:	Moulding machine hours	9,000 hrs.	3,750 hrs.
Shipment:	Number of Shipments	100	100
Distribution:	Cubic feet	45,000 cu. ft.	22,500 cu. ft.
Setup of moulding machine:	Setup hours		
Factory administration:	Direct labour hours		

You are required:

- (i) to compute the total manufacturing cost and profits of both the products by applying direct labour basis of absorption, assuming cleaning and maintenance cost as indirect,
- (ii) to compute the total manufacturing cost and profits of both the products by applying activity based costing, assuming cleaning and maintenance cost as indirect
- (iii) to compare the results obtained from (i) and (ii) and give your opinion on the decision of cost accountant.

[Ans.: Cost per unit: Traditional- 58.75, 97; ABC- 51.38, 126.48; Profit per unit: Traditional- 4.25, 40; ABC- 11.62, 10.52] **(10 Marks)** May/08-PEII

[Hint: Cleaning and maintenance cost is to be apportioned treating labour hours as cost drivers.]

Question 19: During the last 20 years, KL Ltd's manufacturing operation has become increasingly automated with Computer-controlled robots replacing operators. KL currently manufactures over 100 products of varying levels of design complexity. A single, plant-wide overhead absorption rate, based on direct labour hours, is used to absorb overhead costs.

In the quarter ended March, KL's manufacturing overhead costs were:

	(₹'000)
Equipment operation expenses	125
Equipment maintenance expense	25
Wages paid to technicians	85
Wages paid to Store men	35
Wages paid to despatch staff	40
	310

During the quarter, the company reviewed the Cost Accounting System and concluded that absorbing overhead costs to individual products on a labour hour absorption basis is meaningless. Overhead costs should be attributed to products using an Activity Based Costing (ABC) system and the following was identified as the most significant activities:

- (i) Receiving component consignments from suppliers
- (ii) Setting up equipment for production runs
- (iii) Quality inspections
- (iv) Dispatching goods as per customer's orders.

It was further observed that, in the short-term, KL's overheads are 40% fixed and 60% variable. Approximately, half the variable overheads vary in relating to direct labour hours worked and half vary in relation to the number of quality inspections. Note

Equipment operation and maintenance expenses are apportioned as:
Component stores 15%, manufacturing 70% and goods dispatch 15%

Technician's wages are apportioned as :

Equipment maintenance 30%, set up equipment for production runs 40% and quality inspections 30%.

During the quarter :

- (i) a total of 2000 direct labour hours were worked (paid at ₹12 per hr.)
- (ii) 980 components consignments were received from suppliers
- (iii) 1020 production runs were set up
- (iv) 640 quality inspections were carried out
- (v) 420 orders were dispatched to customers.

KL's production during the quarter included components R, S and T. The following information is available:

	Component	Component	Component
	R	S	T
Direct labour Hrs worked	25	480	50
Direct Material	₹1,200	₹2,900	₹1,800
Component Consignments Recd.	42	24	28
Production runs	16	18	12
Quality Inspections	10	8	18
Orders (goods) dispatched	22	85	46
Quantity produced	560	12,800	2,400

Required:

- (1) Calculate the unit cost of R, S and T components, using KL's existing cost accounting system.
- (2) Explain how an ABC system would be developed using the information given. Calculate the unit cost of components R, S and T using ABC system. (11 Marks) May/05 & CIMA Stage 3 [Adapted]

[Ans.: (1) Cost per unit (Under existing cost system)

R	S	T
9.60	6.49	4.23

(2) Cost per unit (Under ABC cost system)

R	S	T
18.682	2.08	5.82

[Note.: Since this question is only a part question of question asked in CIMA, this paragraph is of no use.]

Question 20: A company manufactures several products of varying levels of designs and models. It uses a single overhead recovery rate based on direct labour hours. The overheads incurred by the company in the half of the year are as under:

	₹
Machine operation expenses	10,12,500
Machine maintenance expenses	1,87,500
Salaries of technical staff	6,37,500
Wages and salaries of stores staff	2,62,500

During this period, the company introduced activity based costing system and the following significant activities were identified:

- receiving materials and components
- set up of machines for production runs
- quality inspection.

It is determined that:

- The machine operation and machine maintenance expenses should be apportioned between stores and production activity in 20:80 ratio.
- The technical staff salaries should be apportioned between machine maintenance, set up and quality inspection in 30:40:30 ratio.

The consumption of activities during the period under review are as under:

Direct labour hours worked	40,000
Direct wage rate ₹6 per hour	
Production set-ups	2,040
Material and component consignments received from suppliers	1,960
Number of quality inspections carried out	1,280

The data relating to two products manufactured by the company during the period are as under:

	Products	
	P	Q
Direct materials costs	₹6,000	4,000
Direct labour hours	960	100
Direct material consignments received	48	52
Production runs	36	24
Number of quality inspections done	30	10
Quantity produced (units)	15,000	5,000

A potential customer has approached the company for the supply of 24,000 units of a component K to be delivered in lots of 3,000 units per quarter. The job will involve an initial design cost of ₹60,000 and the manufacture will involve the following per quarter:

Direct materials costs	₹12,000
Direct labour hours	300
Production runs	6
Inspections	24
Number of consignments of direct materials to be received	20

The company desires a mark up of 25% on cost.

Required:

- (i) Calculate the cost of product P and Q based on the existing system of single overhead recovery rate.
- (ii) Determine the cost of product P and Q using activity based costing system.
- (iii) Compute the sales value per quarter of component K using activity based costing system.

[Ans.:

- (i) Cost per unit (₹)
- (ii) Cost per unit (₹)
- (iii) Selling price per unit of K is ₹14.34]

	Product P	Product Q
4.144	1.97	
3.58	7.31	
	(12 Marks)	May/03 & May/07-RTP

Question 21: Amar and Naveen architects, have been using a simplified costing system in which all professional labour costs are included in a single direct cost category, professional labour and all overhead costs are included in a single indirect cost category, professional support, and allocated to jobs by using professional labour hours as the allocation base. Consider two clients: Host Restaurant, which required 25 hours of design work for a new addition, and Pizza Hut, which required plans for a new floor that took 40 hours to draw. The firm has two partners, who each earn a salary of ₹1,50,000 a year, and four associates, who each earn ₹60,000 per year. Each professional has 1,500 billable hours per year. The professional support is ₹10,80,000, which consists of ₹7,00,000 of design support and ₹3,80,000 of staff support. Host

Restaurant job required five hours of partner time and 20 hours of associate time. Pizza Hut job required 30 hours of partner time and 10 hours of associate time.

Required:

- Prepare job cost sheets for Host Restaurant and Pizza Hut using a simplified costing system with one direct and one indirect cost pool.
- Prepare job cost sheets for the two clients, using an activity based costing system with two direct cost categories – partner labour and associate labour – and two indirect cost categories – design support and staff support. Use professional labour in Rupees as the cost allocation base for design support and professional labour hours for staff support.
- Determine the amount by which each job was under – or overcosted, using the simplified costing system.

[Ans.: (i) Host Restaurant – ₹4500 & Pizza Hut – ₹7200; (ii) Host Restaurant – ₹4041 & Pizza Hut – ₹9496; (iii) The simplified costing system overcosted Host Restaurant job by ₹459 and undercosted Pizza Hut job by ₹2,296.]

RTP-May/05

Question 22: ABC electronics makes audio player model ‘AB 100’. It has 80 components. ABC sells 10,000 units each month at ₹3,000 per unit. The cost of manufacturing is ₹2,000 per unit or ₹200 lakhs per month for the production of 10,000 units. Monthly manufacturing costs incurred are as follows:

	(₹Lakhs)
Direct material costs	100.00
Direct manufacturing labour costs	20.00
Machining costs	20.00
Testing costs	25.00
Rework costs	15.00
Ordering costs	0.20
Engineering costs	19.80
	200.00

Labour is paid on piece rate basis, therefore, ABC considers direct manufacturing labour cost as variable cost.

The following additional information is available for ‘AB 100’

- Testing and inspection time per unit is 2 hours.
 - 10 per cent of ‘AB 100’ manufactured are reworked.
 - It currently takes 1 hour to manufacture each unit of ‘AB 100’
 - ABC places two orders per month for each component. A different supplier supplies each component.
- ABC has identified activity cost pools and cost drivers for each activity. The cost per unit of the cost driver for each activity cost pool is follows:

Manufacturing Activity	Description of activity	Cost driver	Cost per unit of cost driver
1. Machine costs	Machining components	Machine hours of capacity	₹200
2. Testing costs	Testing components and finished products. (Each unit of ‘AB 100’ is tested individually)	Testing hours	₹125
3. Rework costs	Correcting and fixing errors and defects	Units of ‘AB 100’ reworked	₹1,500 per unit
4. Ordering costs	Ordering of components	Number of orders	₹125 per order
5. Engineering costs	Designing and managing of products and processes	Engineering hours	₹1,980 per engineering hour

Over a long-run horizon, each of the overhead costs described above vary with chosen cost drivers. In response to competitive pressure ABC must reduce the price of its product to ₹2600 and to reduce the cost by at least ₹400 per unit. ABC does not anticipate increase in sales due to price reduction. However, if it does not reduce price it will not be able to maintain the current sales level.

Cost reduction on the existing model is almost impossible. Therefore, ABC has decided to replace 'AB 100' by a new model 'AB 200', which is a modified version of 'AB 100'. The expected effect of design modifications are as follows:

- (i) The number of components will be reduced to 50.
- (ii) Direct material costs to be lower by ₹200 per unit.
- (iii) Direct manufacturing labour costs to be lower by ₹20 per unit.
- (iv) Machining time required to be lower by 20 per cent.
- (v) Testing time required to be lower by 20 per cent.
- (vi) Rework to decline to 5 per cent.
- (vii) Machining capacity and engineering hours capacity to remain the same.

ABC currently outsource the rework on defective units.

Required:

- (i) Compare the manufacturing cost per unit of 'AB 100' and 'AB 200'.
- (ii) Determine the immediate effect of design change and pricing decision on the operating to apply to 'AB 200'.

Ignore income tax, Assume that the cost per unit of each cost driver for 'AB 100' continues to apply to 'AB 200'.
(15 Marks) May/02

[Ans.: (i) Total manufacturing cost per unit of 'AB 100' ₹2000 and 'AB 200' is ₹1614.25; (ii) Operating income per month will be reduced by ₹1050000]

[Hint: It is to be assumed that the total available engineering hours is used for manufacturing 'AB 200' model of audio player]

3



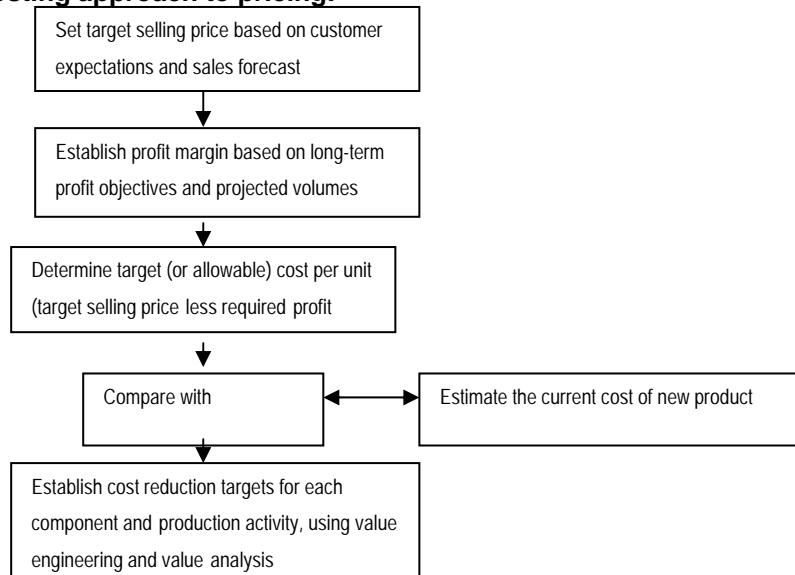
Target Costing, Value analysis & LCC

TARGET COSTING

Meaning

Target Costing is defined as “a structured approach to determine the cost at which a proposed product with specified functionality and quality must be produced, to generate a desired level of profitability at its anticipated-selling-price”

Steps in Target Costing approach to pricing:



1. **Setting of target selling price:** The setting of target selling price of a product which customers are prepared to pay, depend on many factors like design specifications of the product, competitive conditions, customer's demand for increased functionality and higher quality projected production volume, sales forecasts etc. A concern can set its target selling price after taking into account all of the aforesaid factors.
2. **Determination of target costs:** Target profit margin may be established after taking into account long-term profit objectives and projected volume of sales. On deducing target profit margin from target selling price, target cost is determined.
3. **Estimate the actual cost of the product:** Actual cost of the product may be determined after taking into account the design specifications, material cost and other costs required to produce the product.
4. **Comparison of estimated cost with actual cost:** In case the estimated cost of the product is higher than that of the target cost of the product then the concern should resort to cost reduction methods involving the use of Value Engineering / Value Analysis tools.

VALUE ENGINEERING (VE)

Value Analysis entails studying the activities that are involved in producing the product to detect non-value adding activities that may be eliminated or minimized to save costs, but without reducing the functionality or quality of the product. Value Analysis is used to analyze and understand the detail of specific situations. It is used to find a focus on key areas for innovation.

Value Engineering involves searching for opportunities to modify the design of each component or part of a product to reduce cost, but without reducing the functionality or quality of the product. It is used in reverse (called Value Engineering) to identify specific solutions to detail problems. It is particularly suited to physical and mechanical problems, but can also be used in other areas.

Value Analysis	Value Engineering
Indicates application on the product that is into manufacturing.	Indicates application on the product at its design stage.
All factors come together Including workers, subcontractors, engineers to make a team with total experience and knowledge.	It is always done by a specific product design (engineers) team.
It may change the present stage of the product or operation.	The changes are executed at the initial stages only.

Scope

Value Engineering and Value Analysis help identify costs into

- a) Value-Added Cost and
- b) Non Value-Added Cost. The objective is to retain (if possible, reduce) value-added cost, while totally avoiding or eliminating non-value added costs.

Value-added cost: A value-added cost is a cost that, if eliminated, would reduce the value or utility (usefulness) customers obtain from using the product or service.

Non value-added cost: A non value-added cost is a cost that, if eliminated would not reduce the value or utility customers obtain from using the product or service. It is a cost that the customer is unwilling to pay to the company.

Some issues analyzed during VE review are:

1. Elimination of unnecessary functions from the production process:

- This involves a detailed review of the entire manufacturing process to see if there are any steps that add no value to the product, e.g. interim quality review before further processing and final quality check.
- By eliminating unnecessary or duplicate functions, the firm can reduce their associated direct or overhead costs from the total product cost.
- The possible repercussions of elimination of any intermediate production function should be carefully analyzed. The engineering team must be careful to develop work-around steps that eliminate the need for the original functions.

2. Elimination of unnecessary product qualities:

- The product quality should be studied with reference to the nature of its use, longevity of product's useful life.
- If some unnecessary quality e.g. excessive degree of sturdiness in consumable item (as opposed to a durable item) can be eliminated, it should be done in order to save significant material and other product costs.
- However, visible reduction in durability or reliability cannot be stretched too far. Hence any designs that have had their structural integrity reduced must be thoroughly tested to ensure that they meet all design standards.

3. Design Minimization:

- This involves the creation of a design that uses fewer parts or has fewer features.
- This approach is based on the assumption that a minimal design is easier to manufacture and assemble. Also, with fewer parts to purchase, less procurement expenses is associated with the product.
- However, sometimes it would be less expensive to settle for a few extra standard parts that are more easily and cheaply obtained, rather than customized pre-fabricated parts, which complicate the assembly process.

4. Better product Design to suit manufacturing process:

- This is also known as **Design For Manufacture and Assembly (DFMA)** and involves the creation of a product design that can be created in only a specific manner. For example, a toner cartridge for a laser printer is designed so that it can be successfully inserted into the printer only when the sides of the cartridge are correctly aligned with the printer opening; all other attempts to insert the cartridge will fail.

- When used for the assembly of an entire product, this approach ensures that a product is not incorrectly manufactured or assembled, which would call for a costly disassembly or product recalls from customers who have received defective goods.

5. Substitution of Parts:

- This is also called as Component Parts Analysis. This approach encourages the search for less expensive components or materials that can replace more expensive parts currently used in a product design.
- Substitution of new parts is encouraged since new materials are being developed every year.
- However parts substitution must be accompanied by a review of related changes elsewhere in the design and the consequent impact on total costs.
- This also involves allied analysis on tracking the intentions of suppliers to continue production of parts in the future. If parts are not available, they must be eliminated from the product design.

6. Combination of Steps:

- Sometimes, a careful review of all processes associated with a product reveals that some steps can be eliminated, other steps can be consolidated, or that several can be accomplished by one person, rather than having people in widely disparate parts of the production process to perform them. This is also known as Process Centering.
- By combining steps, transfer and queue time can be eliminated from the production process, which in turn reduces the chances of damage during transfers.

7. Search for better way of doing things:

- This seeks to answer a basic question – is there a better way?
- It strikes at the core of the cost reduction issue. It is a more general attempt to start from scratch and build a new product or process that is not based in any way on pre-existing ideas.
- Improvements resulting from this technique tend to have the largest favorable impact on cost reductions but can also be the most difficult for the organization to adopt, especially if it has used other designs or systems for production.

Role of a firm's Suppliers in its Value Engineering or Cost Reduction drive

Value Engineering also involves calling on the services of a company's suppliers to assist in the cost reduction effort. Suppliers of materials can have significant role in value engineering due to the following reason:

1. Suppliers can contribute information on enhanced types of technology of materials.
2. Suppliers specialize in areas that a company has no information about and can share product expertise.
 - They may have also conducted extensive value engineering for the components they manufacture, resulting in advanced designs that a Company may be able to incorporate into its new products.
 - Suppliers may have also redesigned their production processes, or can be assisted by a company's engineers in doing so, producing cost reductions or decreased production waste that can be translated into lower components costs for the company.

KAIZEN COSTING

Kaizen Costing refers to the ongoing continuous improvement program that focuses on the reduction of waste in the production process, thereby further lowering costs below the initial targets specified during the design phase. It is a Japanese term for a number of cost reduction steps that can be used subsequent to issuing a new product design to the factory floor.

The initial VE review may not be complete and perfect in all costs aspects. There may be further chances of waste reduction, cost and time reduction and product improvement. Such continuous cost reduction technique is call as kaizen costing.

The review of product costs under the target costing methodology is not reserved just for the period up to the completion of design work on a new product. On the contrary, there are always opportunities to control costs after the design phase is completed, though these opportunities are fewer than during the design phase.

Kaizen Costing Process: Activities in kaizen costing include elimination of waste in production, assembly and distribution processes, as well as the elimination of work steps in any of these areas. Thus kaizen costing is really designed to repeat many of the value engineering steps for as long as a product is produced, constantly refining the process and thereby stripping out extra costs at each stage.

Savings from Kaizen Costing: The cost reductions resulting from kaizen costing are much smaller than those achieved with value engineering. But these are still significant since competitive pressures are likely to force down the price of a product over time, and any possible cost savings allow a company to still attain its targeted profit margins while continuing to reduce cost.

Multiple Versions of Products - Continuous Kaizen Costing: Multiple improved versions of products can be introduced to meet the challenge of gradually reducing costs and prices. The market price of products continues to drop over time, which forces a company to use both target and kaizen costing to reduce costs and retain its profit margin.

However, prices eventually drop to the point where margins are reduced, which forces the company to develop a new product with lower initial cost and for which kaizen costing can again be used to further reduce costs. This pattern may be repeated many times as a company forces its costs down through successive generations of products.

The exact timing to switch to a new product is easy to determine well in advance since the returns from kaizen costing follow a trend line of gradually shrinking savings. Since prices also follow a predictable downward track, plotting these two trend lines into the future reveals when a new product version must be ready for production.

Advantages of Target Costing:

1. **Innovation:** It reinforces top-to-bottom commitment to process and product innovation and is aimed at identifying issues to be resolved.
2. **Competitive Advantage:** It enables a firm to achieve competitive advantage over other firms in the industry. The firm, which achieves cost reduction targets realistically, stands to gain in the long run.
3. **Market Driven Management:** It helps to create a company's competitive future with market-driven management for designing and manufacturing products that meet the price required for market success.
4. **Real Cost Reduction:** It uses management control systems to support and reinforce manufacturing strategies and to identify market opportunities that can be converted into real savings to achieve the best value rather than simply the lowest cost.

Limitations of Target Costing:

1. **Time Factor:** The development process can be lengthened to a considerable extent since the design team may require a number of design iterations before it can devise a sufficiently low-cost product that meets the target cost and margin criteria.
2. **Responsibility for Cost Reduction:** A large amount of mandatory cost cutting can result in finger-pointing in various parts of the company, especially if the cost reduction targets are not equitably shared. For example the industrial engineering staff will not be happy if it is required to completely alter the production layout in order to generate cost savings, while the purchase staff is not required to make any cost reductions through supplier negotiations. Strong inter-personal and negotiation skills are required on the part of the project manager, to avoid this problem.
3. **Co-ordination:** Having representatives from a number of departments on the design team can sometimes make decision-making difficult, as there are too many opinions regarding design issues. Resolving this difficulty requires a strong team manager, as well as a long-term commitment on the part of a company to weed out those who are not willing to act in the best interests of the team.

Cost Accountant's role in a Target Costing Environment:

1. **Cost Estimation:** To provide other members of the design team a running series of cost estimates based on initial design sketch, activities based costing reviews of production processes, and "best guess" costing information from suppliers based on estimated production volumes.
2. **Permissible Cost Ranges:** To provide estimates within a high-low range costs, since preliminary data will necessarily be vague. However, this estimated cost range should be tightened as more information becomes available.
3. **Capital Budgeting Analysis:** To cater to capital budgeting requests generated by the design team based on types of equipment needed for the anticipated product design, product revenues and costs, rates of return etc. The Cost Accountant should also be able to answer questions regarding uncertainties and risk analysis.

4. **Cost Principles Explanation:** To work with the design team to help it understand the nature of various costs (such as cost allocations based on an activity-based costing system), as well as the cost-benefit trade-offs of using different design or cost operations in the new product.
5. **Review of Cost Reduction Targets:** To track the gap between the current cost and the target cost that is the design team's goal providing an itemization of where cost savings have already been achieved and where there has not been a sufficient degree of progress.
6. **Final Review and Feedback:** To compare a product's actual cost to the target cost after the design is completed, and for as long as the company sells the products is a necessary step because management must know immediately if costs are increasing beyond budgeted levels and why these increases are occurring.

Impact of target costing on profitability

Assured Profit by constant review: Target Costing places detailed continuing emphasis on product costs throughout the life cycle of every product that it is unlikely that a company will experience runaway costs. Also the management is completely aware of costing issues since it receives regular reports from the cost accounting members of all design teams.

Price Determination and Consequent Cost Control: Target Costing improves profitability through precise targeting of the correct prices at which the company feels it can field a profitable product in the marketplace that will sell in a robust manner. The traditional cost-plus approach revolves around designing a product, determining its cost, adding a profit margin and failing to understand why its resoundingly high price does not attract buyers. Thus, target costing results not only in better cost control but also in better price control.

Target costing can have positive impact on profitability, depending on the commitment of management to its use, the constant involvement of cost accountants in all phases of a product's life cycle, and the type of strategy a company follows. Target costing is really part of a larger concept called concurrent engineering, which requires participants from many departments to work together on project teams. It is indeed one of the most proactive systems found in the entire range of accounting knowledge.

Features of Target Costing Data:

1. **Non-Traditional:** The traditional sources of cost data is a central accounting data base consisting of accounts payable, billings, bills of material, and inventory records. These do not provide information required for Target Costing.
2. **Futuristic:** Target Costing Data is essentially futuristic, as it is associated with new and improved products, new designs and manufacturing processes.
3. **Poorly defined:** The data for Target Costing project is more poorly defined information. The Cost Accountant has to start from scratch in order to estimate costs. In earlier stages of product designs, "best possible guesses" may have to be used.

Steps involved in implementing a Target Costing System:

1. **Create a Project Charter:** Project Charter is a document, approved by top management that describes its goals and what it is authorized to do. This Charter is based on the corporate mission statement and related goals. Written approval of Project Charter by the top management provides the target costing effort with a strong basis of support and direction in all subsequent efforts.
2. **Obtain a Management Sponsor:** Management Sponsor is an individual belonging to top management. His role will be to support the initiative in all respects, to obtain funding, to co-ordinate with other members of top management, to eliminate problems in a timely manner.
3. **Obtain a Budget:** The funding should be based on a formal allocation of money through the corporate budget. The fund should be given unreservedly to the target costing effort.
4. **Assign a Strong Team Manager:** The Target Costing Team involves the active participation of many members with diverse backgrounds. A strong Team Manager is required to bring the group together as a smooth functioning team focused on key objectives. He should be skilled in dealing with management, the use of project tools and working with a diverse group of people. This manager should be a full-time employee, so that his or her complete attention can be directed towards the welfare of the project.
5. **Enroll Full-time Participants:** It is essential that the members of the team be devoted to it full-time rather than trying to fulfill other commitment elsewhere in the company at the same time. They should have a single focus on ensuring the success of the target-costing program.
6. **Use Project Management Tools:** Target costing can be a highly complex effort especially for high-cost products with many features and components. The team should use all available project management

tools, such as Microsoft Project (for tracking the completion of specific tasks) a company database containing various types of costing information and a variety of product design tools.

Question 1: List the steps involved in target costing process with the help of a block diagram.

(6 Marks) Nov./06

Question 2: What is Target Costing? It is said that implementation of the target costing technique requires intensive marketing research. Explain why intensive marketing research is required to implement target costing technique

(9 Marks) Nov./07

Question 3: How can value analysis achieve cost reduction?

(5 Marks) Nov./09-N.C.

Ans.: Value analysis can do cost reduction in the following manner:

- By identifying and removing unnecessary components in a product which had utility earlier.
- By introducing component substitution at a lesser cost without affecting the quality of the product.
- By simplifying the product design.
- By introducing alternative methods with less cost but improved efficiency.

Question 4: What are the benefits of a target costing system?

(3 Marks) May/10-O.C.

Question 5: Discuss, how target costing may assist a company in controlling costs and pricing of products.

(4 Marks) Nov./08-O.C.

Answer: Target costing may assist control of costs and pricing of product as under:

1. Target costing considers the price that ought to be charged by a company to achieve a given market share.
2. Target costing should take life cycle costs into consideration.
3. If there is a gap between the target cost and expected cost, ways and means of reducing or eliminating it can be explored.
4. The target cost may be used for controlling costs by comparison

Question 6: What is Target Costing and what are the stages to the methodology? (4 Marks) Nov./00

Answer: Target Costing: It is a management tool used for reducing a product cost over its entire life cycle. It is driven by external Market factors. Marketing management prior to designing and introducing a new product determines a target market price. This target price is set at a level that will permit the company to achieve a desired market share and sales volume. A desired profit margin is then deducted to determine the target maximum allowable product cost. Target costing also develops methods for achieving those targets and means to test the cost effectiveness of different cost-cutting scenarios.

Stages to the methodology.

1. **Conception (planning) Phase:** Under this stage of life cycle, competitors products are to be analysed, with regard to price, quality, service and support, delivery and technology. The features which consumers would like to have like consumer value etc. established. After preliminary testing, the company may be asked to pinpoint a market niche, it believes, is under supplied and which might have some competitive advantage.
2. **Development phase:** The design department should select the most competitive product in the market and study in detail the requirement of material, manufacturing process along with competitors cost structure. The firm should also develop estimates of internal cost structure based on internal cost of similar products being produced by the company. If possible the company should develop both the cost structures (competitors and own) in terms of cost drivers for better analysis and cost reduction.
3. **Production phase:** This phase concentrates its search for better and less expensive products, cost benefit analysis in different features of a product priority wise, more towards less expensive means of production, as well as production techniques etc.

Question 7: A company has the capacity of production of 80,000 units and presently sells 20,000 units at ₹100 each. The demand is sensitive to selling price and it has been observed that every reduction of ₹10 in selling price the demand is doubled. What should be the target cost at full capacity if profit margin on sale is taken as 25%?

What should be the cost reduction scheme if at present 40% of cost is variable with same % of profit? If Rate of Return is 15%, what will be maximum investment at full capacity?

[Ans.: ₹60 p.u.; Cost Reduction is ₹12 lakhs; Investment: ₹10666667]

[Hint: Whenever there is a scope of increase in capacity & fixed cost is provided on p.u. basis, we assume fixed cost p.u. is on full capacity]

Question 8: Sterling Enterprises has prepared a draft budget for the next year as follows:

Quantity	10000 units
Sales price per unit	30
Variable costs per unit: Direct Materials	8
Direct Labour	6
Variable overhead (2 hrs x Re. 0.50)	1
Contribution per unit	15
Budgeted Contribution	1,50,000
Budgeted Fixed costs	1,40,000
Budgeted Profit	10,000

The Board of Directors is dissatisfied with this budget, and asks a working party to come up with an alternate budget with higher target profit figures.

The working party reports back with the following suggestions that will lead to a budgeted profit of ₹25,000. The company should spend ₹28,500 on advertising, & put the target sales price up to ₹32 per unit. It is expected that the sales volume will also rise, inspite of the price rise, to 12,000 units.

In order to achieve the extra production capacity, however, the work force must be able to reduce the time taken to make each unit of the product. It is proposed to offer a pay and productivity deal in which the wage rate per hour increased to ₹4. The hourly rate for variable overhead will be unaffected. Ascertain the target labour time required to achieve the target profit.

[Ans.: Time reduction p.u. 0.25 per hour]

Question 9: AML Ltd. Is engaged in production of three types of ice-cream products: Coco, Strawberry and Vanilla. The company presently sells 50,000 units of Coco @ ₹25 per unit, Strawberry 20,000 @ ₹20 per unit and Vanilla 60,000 units @ ₹15 per unit. The demand is sensitive to selling price and it has been observed that every reduction of ₹1 per unit in selling price, increases the demand for each product by 10% to the previous level. The company has the production capacity of 60,500 units of coco, 24,200 units of strawberry and 72,600 units of vanilla. The company marks up 25% of the cost of product.

The company management decides to apply ABC analysis. For this purpose it identifies four activities and the rates as follows:

Activity	Cost rate
Ordering	₹800 per purchase order
Delivery	₹700 per delivery
Shelf stocking	₹199 per hour
Customer Support and assistance	₹1.10 p.u. sold.

The other relevant information for the products are as follows:

	Coco	Strawberry	Vanilla
Direct Materials p.u. (₹)	8	6	5
Direct wages p.u. (₹)	5	4	3
No. of purchase order	35	30	15
No. of deliveries	112	66	48
Shelf stocking hours	130	150	160

Under the traditional costing system, store support costs are charged @ 30% of prime cost. In ABC these costs are coming under customer support and assistance.^{Note}

Required

- (i) Calculate target cost for each product after a reduction of selling price required to achieve the sales equal to the production capacity.
(ii) Calculate the total cost and unit cost of each product at the maximum level using traditional costing.
(iii) Calculate the total cost and unit cost of each product at the maximum level using activity based costing.
(iv) Compare the cost of each product calculated in (i) and (ii) with (iii) and comment on it.

[Ans.: (i) 18.4, 14.4, 10.4 (ii) 1022450, 314600, 755040; 16.90, 13.00, 10.40 (iii) 985320, 368670, 738100; 16.286, 15.24, 10.16] (12 Marks) May/10-N.C.

[Note: On calculation of total overhead costs under traditional & ABC system, costs are same i.e. ₹4,82,790, hence we will ignore the line "In ABC these costs are coming under customer support and assistance." written in question.-Also clarified in examiner comment's by ICAI]

Question 10 [Target Costing]: X Ltd. is engaged in the production of four products: A, B, C and D. The price charged for the four products are ₹180, ₹175, ₹130 and ₹180 respectively. Market research has indicated that if X Ltd can reduce the selling prices of its products by ₹5, it will be successful in getting bulk orders and gain a significant share of market of those products. The company's profit markup is 25 per cent on cost of the product. The relevant information of products are as follows:

Products	A	B	C	D
Output in units	600	500	400	600
Cost per unit:				
Direct material (in ₹)	40	50	30	60
Direct labour (in ₹)	28	21	14	21
Machine hours (per unit)	4	3	2	3

The four products are usually produced in production runs of 20 units and sold in batches of 10 units. The production overhead is currently absorbed by using a machine hour rate, and the total of the production overheads for the period has been analysed as follows:

	(₹)
Machine department costs	52,130
Setup costs	26,250
Stores receiving	18,000
Inspection/Quality control	10,500
Material handling and dispatch	23,100

The cost drivers to be used for the overhead costs are as follows:

<u>Cost</u>	<u>Cost drivers</u>
Setup costs	Number of production runs
Store receiving	Requisitions raised
Inspection/Quality control	Number of production runs
Materials handling and dispatch	Order executed

The number of requisitions raised in the stores was 100 for each product and the number of orders executed was 210, each order being for a batch of 10 units of a product.

You are required :

- i) To compute the target cost for each product.
- ii) To compute total cost of each product using activity based costing.

Compare target cost and activity based cost of each product and comment whether the price reduction is profitable or not. (12 Marks) Nov.'09-O.C.

[Ans.: (a) Target Cost: 140, 136, 100, 140; (b) Total Cost as per ABC: 81648, 66280, 39904, 84636]

[Hint: This question is exactly same as Question 15 of "Activity based cost management"]

Question 11 [ABC + Target Costing]: Computo Ltd. manufactures two parts 'P' and 'Q' for Computer Industry.

P : annual production and sales of 1, 00,000 units at a selling price of ₹100.05 per unit.

Q : annual production and sales of 50,000 units at a selling price of ₹150 per unit.

Direct and Indirect costs incurred on these two parts are as follows:

	(₹ in thousand)		
	P	Q	Total
Direct Material cost (variable)	4,200	3,000	7,200
Labour cost (variable)	1,500	1,000	2,500
Direct Machining cost (See Note)*	700	550	1,250
Indirect Costs:			
Machine set up cost			462
Testing cost			2,375
Engineering cost			2,250
			16,037

Note: Direct machining costs represent the cost of machine capacity dedicated to the production of each product. These costs are fixed and are not expected to vary over the long-run horizon.

Additional information is as follows:

	P	Q
Production Batch Size	1,000 units	500 units
Set up time per batch	30 hours	36 hours
Testing time per unit	5 hours	9 hours
Engineering cost incurred on each product	8.40 lacs	14.10 lacs

A foreign competitor has introduced product very similar to 'P'. To maintain the company's share and profit, Computo Ltd. has to reduce the price to ₹86.25. The company calls for a meeting and comes up with a proposal to change design of product 'P'. The expected effect of new design is as follows:

- Direct Material cost is expected to decrease by ₹5 per unit.
- Labour cost is expected to decrease by ₹2 per unit.
- Machine time is expected to decrease by 15 minutes; previously it took 3 hours to produce 1 unit of 'P'. The machine will be dedicated to the production of new design.
- Set up time will be 28 hours for each set up.
- Time required for testing each unit will be reduced by 1 hour.
- Engineering cost and batch size will be unchanged.

Required:

- (a) Company management identifies that cost driver for Machine set-up costs is 'set up hours used in batch setting' and for testing costs is 'testing time'. Engineering costs are assigned to products by special study. Calculate the full cost per unit for 'P' and 'Q' using Activity-based costing.
- (b) What is the Mark-up on full cost per unit of P?
- (c) What is the Target cost per unit for new design to maintain the same mark up percentage on full cost per unit as it had earlier? Assume cost per unit of cost drivers for the new design remains unchanged.
- (d) Will the new design achieve the cost reduction target?
- (e) List four possible management actions that the Computo Ltd. should take regarding new design.

(16 Marks) May/06

[Ans.: (a) P – ₹87, Q- ₹146.74; (b) 15%; (c) ₹75; (d) No, as the cost of new design is ₹77.36 per unit.

(e) (i) Value engineering and value analysis to reduce the direct material costs.

(ii) Time and motion study in order to redefine the direct labour time and related costs.

(iii) Exploring possibility of cost reduction in direct machining cost by using appropriate techniques.

(iv) Identification of non-value added activities and eliminating them in order to reduce overheads.]

Question 12 [ABC + Target Costing]: IBM Ltd. Manufactures and sells computers peripherals to several retail outlets throughout the country. Amar is the manager of the printer division. Its two largest selling printers are P1 & P2. The manufacturing cost of each printer is calculated using IBM's activity based costing system. IBM has one direct manufacturing cost category (direct materials) and the following five indirect manufacturing cost pools.

<i>Indirect manufacturing cost pool</i>	<i>Allocation Base</i>	<i>Allocation Rate (₹)</i>
1. Materials handling	No. of parts	₹1.20 per part
2. Assembly management assembly	Hours of assembly time	₹40 per hour of time
3. Machine insertion of parts	No. of machine inserted parts	₹0.70 per machine inserted part
4. Manual insertion of parts manually	No. of manually inserted parts	₹2.10 per inserted part
5. Quality testing hour.	Hours of quality testing time	₹25 per testing

Product characteristics of P1 and P2 are as follows:

<i>Product</i>	<i>P1</i>	<i>P2</i>
Direct materials costs	₹407.50	₹292.10
Number of parts	85	46
Hours of assembly time	3.2	1.9
Number of machine – inserted parts	48	31
Number of manually inserted parts	36	15
Hours of quality testing time	1.4	1.1

A foreign competitor has introduced products very similar to P1 and P2. Given their announced selling prices and to maintain his company's market share and profits, Amar estimates the P1 to have manufacturing cost of approximately ₹680 and P2 to have a manufacturing cost of approximately ₹390. He calls a meeting of product designers and manufacturing personnel at the printer division. They all agree to have the ₹680 and ₹390 figures become target costs for designed version of P1 and P2 respectively. Product designers examine alternative ways of designing printer with comparable performance but lower costs. They come up with the following revised designs for P1 and P2 (termed P1 – REV and P2 – REV, respectively)

<i>Particulars</i>	<i>P1 – REV</i>	<i>P2 – REV</i>
Direct materials cost	₹381.20	₹263.10
Number of parts	71	39
Hours of assembly time	2.1	1.6
Number of machine – inserted parts	59	29
Number of manually – inserted parts	12	10
Hours of quality testing time	1.2	0.9

Required:

- Compute the present costs of products P1 and P2 using ABC system.
 - Compute the manufacturing costs of P1 – REV and P2 – REV. How do they compare with the ₹680 and ₹390 target costs?
- (RTP-May/05, May/07, Nov./07 & Nov./08-O.C.)

[Ans.: P1: Present Cost-₹781.70, Estimated Cost-₹646.90 & Target Cost-₹680; P2: Present Cost-₹504.00, Estimated Cost-₹437.70 & Target Cost-₹390]

VALUE CHAIN ANALYSIS

Competitive advantage for a company means not just matching or surpassing their competitors, but discovering what the customers want and then profitably satisfying and even exceeding their expectations. As barriers to global trade are diminishing, customers can acquire the best of what they want, at an acceptable price, from anywhere in the world.

A strategic tool to measure the importance of the customer's perceived value is value chain analysis.

Classification of business activities for VCA purpose:

Porter classified business activities into (a) Primary or Line activities and (b) Support activities

- a) **Primary activities** are directly involved in transforming inputs into outputs and delivery and after sales support to output. They are handled by line functions in an organisation. They include:

- Material handling and warehousing
 - Transforming inputs into final product
 - Order processing and distribution Communication, pricing and channel management, and
 - Installation, Repair and parts replacement
- b) **Support activities** are activities that support primary activities. They are handled by the organisation's staff functions and include:
1. **Procurement** – purchasing of raw materials, supplies and other consumable items as well as assets.
 2. **Technology Development** – know-how, procedures and technological inputs needed in every value chain activity.
 3. **Human resource management** – Selection, promotion and placement, appraisal, rewards; management development and labour / employee relations.
 4. **Firm Infrastructure** – general management, planning, finance, accounting, legal government affairs and quality management.

Industry Value Chain.

Industry Value Chain refers to the series of activities, which add value to the product supplied to the industry. It starts with the value-creating processes of suppliers, who provide the basic raw materials and components. It continues with the value creating processes of different classes of buyers or end-use consumers and culminates in the disposal and recycling of materials.

Firm's competitive advantage

1. To survive and prosper in an industry, a firm must meet two criteria
 - Supply what customers want to buy, and
 - Survive competition
2. A firm's overall Competitive Advantage is derived from the difference between Value Offered to Customers and Cost of creating that customer value.
3. This Competitive advantage takes two possible forms
 - Differentiation Advantage and
 - Low-Cost Advantage.

A comparative analysis of these forms is given below:

Differentiation Advantage	Low - Cost Advantage
It occurs when customers perceive that a firm's product offering is of higher quality, involves less risk and/or outperforms competing products offered by competitors. Customers are thus willing to pay a premium price for this product.	A firm enjoys a relative low-cost advantage if its total costs are lower than the market average.
Gained by: <ul style="list-style-type: none"> • Ability to deliver goods & services in timely manner • Producing better quality • Provision of after-sales support services • Offering a wider range of goods and services etc. 	Gained by: <ul style="list-style-type: none"> • Access to low cost raw material • Innovative process technology • Access to distribution channels • Economies of scale • Superior operating management etc.
Advantage can be exploited by: <ul style="list-style-type: none"> • Increasing prices to offsets the improvement in customer benefits thus maintaining current market share; or • Pricing below the 'full-premium' level in order to build market share. 	Advantage can be exploited by: <ul style="list-style-type: none"> • Pricing the products lower than it's competitor's so as to gain market share and maintain current profitability or, • Matching with the price of competing products and increase its profitability
Superior relative differentiation position offers the customers better value for an equivalent price.	Superior relative cost position offers customers equivalent value for a lower price.

Use of VCA to assess competitive advantage

A company can gain competitive advantage not just by matching or surpassing its competitors, but discovering what the customers want and then profitably satisfying and even exceeding, customer expectations. This is done by a concept called Value Chain analysis (VCA).

VCA can be used to better understand which segment, distribution channels, price points, product differentiation, selling propositions and value chain configurations will yield the firms the greatest competitive advantage.

Use of VCA to assess competitive advantage involves the following analyses:

1. **Internal Cost analysis** – to determine the sources of differentiation (including the cost) within internal value-creating processes
2. **Internal Differentiation analysis** – to understand the sources of differentiation (including the cost) within internal value-creating processes; and
3. **Vertical Linkage analysis** – to understand the relationships and associated costs among external suppliers and customers in order to maximize the value delivered to customers and to minimize cost.

The following actions and steps are involved in the above analyses:

Stage	Description
1.	Internal Cost Analysis: <ul style="list-style-type: none"> • Identify the firm's value creating processes • Determine the portion of the total cost of the product or services attributable to each value-creating process. • Identify the cost drivers for each process. • Identify the links between processes • Evaluate the opportunities for achieving relative cost advantage.
2.	Internal Differentiation Analysis: <ul style="list-style-type: none"> • Identify the industry's value creating processes • Evaluate differentiation strategies for enhancing customer value • Determine the best sustainable differentiation strategies
3.	Vertical Linkage Analysis <ul style="list-style-type: none"> • Identify the industry's value chain and assign costs, revenues and assets to value-creating processes. • Diagnose the cost drivers for each value-creating process; and • Evaluate the opportunities for sustainable competitive advantage

Features of this analysis:

1. **Not mutually exclusive** – Firms begin by focusing on their internal operations and gradually widening their focus to consider their competitive position within their industry.
2. **Continuous** – VCA is a continuous process of gaining competitive advantage not a one- time affair.
3. **Part of Strategic Planning:** VCA is a process of gathering, evaluating and communicating information for business decision-making.

Steps involved in Internal Cost Analysis (Stage 1)

1. **Identify the firm's value-creating processes**
 - Traditionally, the firm organizes itself into departments based on cost, revenue profit and investment centers. These centers are useful for control but are not very useful for identifying value-creating processes.
 - Adopting a process perspective requires a horizontal view of the organization beginning with product inputs and ending with outputs and customers.
 - Processes are structured and measured sets of activities designed to produce a specified output for a particular customer or market.
 - Emphasising process means focusing not on what work is done but on how work is done within the organization.
 - Process Structure differs from traditional hierarchical structure and shows how the organization delivers customer value. While it is not possible to measure or improve hierarchical structure in any absolute sense, processes lend themselves to such measures as cost, time, output quality and customer satisfaction.

2. Determine the portion of total cost of the product/service attributable to each value creating process:

- A full-cost approach provides the best estimate of life-cycle costs for evaluating the strategic cost advantage of a firm's value-creating process.
- For estimating the full cost of each value-creating activity, full utilization of the capacity of the activity or its practical capacity is normally used. Facility managers and equipment vendors are useful sources of capacity estimates. When cost vary dramatically, companies should seek more information for a more realistic long-term estimate of capacity.

3. Identify the cost drivers for each process

- By listing cost drivers, a firm can assign priorities among its cost improvement initiatives.
- In order to determine its relative cost advantage, a firm should also know the cost factors of its competitors.
- Multiple cost drivers are identified for each value-creating process. These may be classified into (a) Structural cost drivers (covering aspects such as Scale, Scope, learning, Technology and Complexity etc.) and (b) Executional Cost Drivers (Capacity utilization, plant layout, Product design, Employee participation, Supplier and customer liaison, etc.)

Structural Cost Drivers	Executional Cost Drivers
<ul style="list-style-type: none"> • They consist of organizational factors that determine the economic structure driving the cost of firm's product. • These cost drivers reflect a firm's long-term firm in its decisions, which position the industry and marketplace. • Structural cost drivers may change. • Example: Large Pharmaceutical Companies Economies of scale that lower their unit enjoy costs for expensive R&D. 	<ul style="list-style-type: none"> • They capture a firm's operational decisions on how and best to employ its resources to achieve its goals objectives. • These cost drivers are determined by management policy, style and culture. They are comparatively short term. • Executional cost drivers may improve. • Example:-Worker empowerment and flattened continuous organization help many firms in their improvement efforts.

4. Identify the links between processes

- Activities within a value chain are interdependent and hence firms must identify value chain linkages among interdependent activities that may impact their total cost.
- Cost improvement programs in one value chain process may lower or increase costs and/or revenues in other processes. Transfer of goods and services from one value
- Chain process to another increases cost. Eliminating these transfer or costs has an impact on overall costs in the subsequent chain.
- Such linkage offer sustainable competitive advantage, because of their subtle, complex and inimitable nature.

5. Evaluate the opportunities for achieving relative cost advantage

- Using the value chain approach, a company goes beyond simple across-the-board cuts and attempts to lower cost and improve efficiency within each value-creating process. For instance a company might negotiate lower costs of process inputs such as wages or purchases, or evaluate make-or-buy options.
- Reducing process input costs may consist of measures such as negotiating lower wages, moving production to countries cheaper labour costs, entering into long term contracts with suppliers at reduced prices, etc. Companies also buyer-seller partnerships to gain advantages in cost quality, flexibility, delivery and, technology.
- Using Pareto Analysis company should prioritize its value-creating processes since 20% of value creating processes often account for 80% of total costs.

Steps in Internal Differentiation Analysis (Stage 2)

i. **Identify the customers' value-creating processes:**

To pursue a superior differentiation strategy, a firm's processes must enhance the value of its customers. Therefore, a firm should carefully study the value-creating processes of its customers.

ii. **Evaluate differentiation strategies for enhancing customer value:**

This involves identification of the value-creating processes that distinguishes a firm's products or services from those of its competitors. This can be achieved in the following areas:

- a. **Product Features** - that are aesthetically or functionally superior
- b. **Marketing Channels** – that provide levels of responsiveness, convenience, variety and information.
- c. **Service and Support** – tailored to meet end-user and channel member (sophistication and urgency or need).
- d. **Brand / lineage Positioning** – that lends greater appeal to the company's products on critical selection criteria.
- e. **Price**: including both net purchase price and cost savings available to the customer through the financial services market.

iii. **Determine the best sustainable differentiation strategies:**

In order to prioritize its processes as sources of differentiation, a company must determine what attributes of each process enhance customer value. The more unique a firm's resources and skills, the more sustainable is its differentiation advantage over competitors.

Steps in Vertical Linkage Analysis (Stage 3)

Vertical linkage analysis is a much broader application of internal cost and differentiation analysis that includes all upstream and downstream value-creating processes throughout the industry. It considers all links from the source of raw materials to the disposal and/or recycling of the product. It involves the following steps:

1. **Identify the industry's value chain and assign costs, revenues and assets to value creating processes.**
 - The firm should identify the vertical linkages in the industry value chain, for example, the petroleum industry consist of numerous value creating processes or activities, including exploration, production, refining, marketing and distribution, which define the value chain for this industry.
 - One firm may participate in all parts of this value chain; another firm may participate in only a few.
 - The information systems to identify and analyse these subtle relationship should be developed
 - Costs, Revenues and Assets of each value-creating process may be determined based on relevant cost approach, use of market prices, transfer prices, current replacement cost of assets, etc.
2. **Diagnose the cost drivers for each value-creating process:**
 - Different cost determinants should be identified for each value-creating process.
 - Direct labour-based measures may be suitable for labour-intensive activities while operating hours may be appropriate for machine based activities.
3. **Evaluate the opportunities for sustainable competitive advantage:**
 - Sufficient qualitative information usually exists on a firm's major value-creating processes and the strategies for each. Such information will be difficult to obtain and may also be unreliable.
 - Using benchmarking processes and by understanding how other companies compete in each process of the industry value chain, a firm can use the qualitative analysis to seek out competitive niches even if financial data are unavailable.
 - To evaluate the opportunities for competitive advantage in the global marketplace, firms need to consider such things as a country's values, political climate, environmental concerns, trade relations, tax laws, inflation rates and currency fluctuations.

Strategic frameworks required for value chain analysis

Value chain analysis requires a strategic framework of focus for organizing internal and external information, for analyzing information, and for summarizing findings and recommendations.

Recent concepts from strategists and organization experts lead to three strategic frameworks for VCA.

1. Industry structure analysis:
2. Core competencies analysis and
3. Segmentation analysis

1. Industry Structure Analysis of Michael Porter

It is a five-factor model to organise information about an industry structure to evaluate its potential attractiveness. Under this model, the profitability of an industry or market is measured by the long term return on investment of the average firm depends largely on the following five factors that influence profitability.

a) **Bargaining power of buyers:**

- The degree of buyer power generally depends on:
- Customer concentration (higher concentration of customers means greater negotiation leverage).
- Propensity for customers to integrate backward (higher propensity for backward integration means greater bargaining leverage);
- Costs of switching suppliers (lower switching costs means greater leverage for the buyer) and
- Number of alternative suppliers (higher alternatives indicate greater customer leverage.)

b) **Bargaining power of suppliers:**

Just as powerful buyers can squeeze profits by putting downward pressure on prices, suppliers squeeze profits by increasing input costs. The same factors that determine the power of buyers also determine the power of suppliers. The bargaining power of suppliers and buyers relative to the firm depends on the relationships between their value chains. Identifying the specific activities involved and the nature of their strengths and relationships can give important insights into the power balance between the buyer and seller, and how it may be altered for, the firm's benefit.

c) **Threat of substitute products or services:**

- Profit potential is determined by the maximum price that customers are willing to pay, which in turn depends on the availability of substitutes.
- Products with few substitutes command higher prices than products with many close substitutes since customer will prefer switching in the latter case.
- A thorough understanding of the value chains of buyers as they relate to the firm's product can help in assessing (and combating) the threat of substitution.

d) **Threat of new entrants:**

- When an industry is earning a return on invested capital above the cost of capital, that industry will act as a magnet to firms outside the industry.
- Unless the entry of new firms is barred, the rate of profit must fall to the competitive level.
- Even the mere threat of entry may be sufficient to ensure that established firm's constrain their prices to the competitive level.

e) **Intensity of competition:**

- Markets experiencing rapid growth typically see less intense competition
- Rival companies can usually satisfy profitability and growth without having to take market shares from their competitors.

2. Core Competencies Analysis

Core competencies are created by superior integration of technological, physical and human resources,. They represent distinctive skills as well as intangible, invisible, intellectual assets and cultural capabilities. Cultural capabilities refer to the ability to manage change, the ability to learn and team working. Organisations should be viewed as a bundle of a few core competencies, each supported by several individual skills.

Core competence based diversification reduces risk and investment and increases the opportunities for transferring learning and best practice across business units.

A core competence is identified by the following tests:

- **Leverage test** - Does it provide potential access to a wide variety of markets?
- **Value enhancement test** – Does it make a significant contribution to the customer's perception regarding benefits of the end product?
- **Imitability test** – Can it be imitated? Does it reduce the threat of imitation by competitors?

Applying the VCA approach to core competencies for competitive advantage includes the following steps:

- **Validate core competencies in current businesses:** Core competencies should tie together the portfolio of end products and help the firm excel in dominating its industry. Core competencies need to be continually validated, due to continuous technological development over time.

- **Export or leverage core competencies to the value chains of other existing businesses:** The same set of core competencies can be exploited in multiple businesses by exporting core competencies to the value chains of other existing businesses.
- **Use core competencies to reconfigure the value chains of existing businesses:** While firms may manage their existing value chains better than their competitors, sophisticated firms work harder on using their core competencies to reconfigure the value chain to improve payoffs. Otherwise competitors may, exploit opportunities.
- **Use core competencies to create new value chains:** With strong core competencies in its existing businesses, an organization can seek new customers by developing new value chains.

3. Segmentation Analysis (Stage 3)

Industries are sometimes collections of different market segments. Vertically integrated industries are examples of a string of natural businesses from the source of raw material to end use by the final consumer. Not all firms in an industry participate in all segments.

Segmentation analysis will reveal competitive advantages and disadvantages of different segments. A firm may use this information to decide whether to exit the segment, to enter a segment, reconfigure one or more segments, or embark on cost reduction/differentiation programs.

Using the value chain approach for segmentation analysis, Grant recommended five steps:

1. Identify segmentation variables and categories:

The market may be divided into a number of segments using appropriate bases. Some approaches to define market segments are:

Based on customer characteristics	Based on Product
Geographic	Use-type
Type of organization	Usage
Size of firm	Benefits sought
Life-style customers	Prices sensitivity
Age	Competition
Occupation	Brand Loyalty

2. **Construct a segmentation matrix:** After customer and product-related variables have been selected for identifying different segments, a segmentation matrix can be developed. Two or more dimensions may be used to partition an industry. For example restaurants could be divided into four dimensions; types of cuisine, price range, type of service (e.g. sit-down, buffet, cafeteria, take-out, fast food) and location.
3. **Analyse segment attractiveness:** Competitive assessments using industry structure analysis or core competencies analysis can also be used to evaluate the profitability of different segments. However the competitive focus shifts to an analysis of the different segments. In addition, the interrelationship among segments must be carefully considered.
4. **Identify key success factors for each segment:** Quality, delivery, customer satisfaction market share, profitability and return on investment are common measures of corporate success. In this regard, each segment must be assessed using the most appropriate key success factors. Cost and differentiation advantages should be highlighted by these measures. Examination of differences among segments in buyers' purchase criteria reveal clear differences in key success factors.
5. **Analyse attractiveness of broad versus narrow segment scope:** The competitive advantage of each segment may be identified in terms of low cost and/or differentiation. Sharing costs across different market segments may provide a competitive advantage. Taxing a narrow segment focus may leave a firm vulnerable to competitors. A segment justifying a unique strategy may be of worthwhile size to support a business strategy.

Limitations of Value Chain Analysis

1. **Non-availability of data:** Internal data on costs, revenues and assets used for value chain analysis are derived from financial information of a single period. For long-term strategic decision-making, changes in cost structures, market prices and capital investments etc. may not be readily available.
2. **Identification of stages:** Identifying stages in an industry's value chain, is limited by the ability to locate at least one firm that participates in a specific stage. Breaking a value stage into two or more stages when an outside firm does not compete in these stages is strictly judgment.

3. **Ascertainment of cost, revenues and assets:** Finding the costs revenues and assets for each value chain activity poses/gives rise to serious difficulties. There is no scientific approach and much depends upon trial and error and experimentation methods.
4. **Identification of cost drivers:** Isolating cost drivers for each value-creating activity, identifying value chain linkages across activities, and computing supplier and customer profit margins present serious challenges.
5. **Resistance from employees:** Value chain analysis is not easily understandable to all employees and hence may face resistance from employees as well as managers.
6. **Science Vs. Art:** Value chain analysis is not an exact science. It is more "art" than preparing precise accounting reports. Certain judgments and factors of analysis are purely subjective and differ from person to person.

Impact of VCA on Organisational and Managerial Accounting

Management Accountants should recognize that the traditional, functional, internally oriented information system is inadequate for the firm engaged in global competition. In order to facilitate Value chain analysis, there should be a change in focus for management accounting. The Management Accountant's role will be significant in the following areas:

1. **Need for education, training and awareness:** Management Accountants should bring the importance of customer value to the forefront of management strategic thinking. They should take the initiative to bring the value chain message to major players in the firm through seminars, articles, value chain examples and company-specific applications.
2. **Exploring for information:** VCA requires expertise in internal operators and information and also demands a great deal of external information. Management accountants must seek relevant financial and non-financial information from sources outside the organization.
3. **Creativity:** Management accountants must integrate databases and potential sources of timely information on competitive forces confronting the business. This calls for innovation and creativity in gathering and analyzing information for management decisions.
4. **System design:** Designing internal and external systems to assist managers in planning, monitoring and improving value-creating processes is another challenge facing management accountants.
5. **Cooperation:** Management accountants should solicit support from all senior managers for allocating resources to develop and improve value chain-oriented information systems. The management accountant should ensure that the top management is committed to value chain analysis and the organizational changes necessary for its successful implementation.

Difference between traditional management accounting & value chain analysis.

	Traditional Management Accounting	Value Chain analysis
Focus	Internal	External
Perspective	Seeks cost reduction in Value added process i.e. Sale Price- Cost of Raw materials.	Seeks competitive advantage based on entire set linked activities from suppliers to end-use customers.
Number of Cost Drivers	A single cost driver is adopted. Cost is generally based on volume production and sales.	Multiple cost drivers are adopted i.e: <ul style="list-style-type: none"> • Structural drivers (e.g. scale, scope, experience, technology and complexity) • Executational drivers (e.g., participation management and plant layout).
Use of Cost Driver	Application at the overall firm level (cost-volume-profit analysis)	A set of unique cost drivers is used for each value activity.
Cost Containment Philosophy	Application at the overall firm level (cost-volume-profit analysis)	A set of unique cost drivers is used for each value activity.
Cost Preferences	Seeks adhoc cost reduction solutions by focusing on variance analysis, performance evaluation based on financial and quantitative data	View cost containment as a function of the cost drivers regulating each value activity. <ul style="list-style-type: none"> • Exploit linkages with suppliers • Exploit linkages with customers • Exploit process linkages within the firm • "Spend to save"
Nature of Data	Focus on control of manufacturing	Focus on gaining advantage and not only on cost

	costs	control and reduction.
Benchmarking	Partially present Inter-finance comparison, if any, is generally restricted to financial and operational information.	Focus on full-fledged benchmarking learning from competitors but exploiting one's own strengths gain advantage
Insights for Strategic Decisions.	Limited to some extent	Identify cost drivers at the individual activity level and develop cost/differentiation advantage either by controlling those drivers better than competing by reconfiguring the value chain, Quantify and assess "supplier power" and "buyer power" and exploit linkages with suppliers and buyers.

Question 13: What steps are involved in value chain analysis approach for assessing competitive advantages? (4 Marks) May/05

Question 14: What is the concept of 'Value-chain' and why is it important for Cost Management?

(4 Marks) May/06

Ans.: Value chain is the linked set of value creating activities from the basic raw materials and components sources to the ultimate end use of the product or service delivered to the customer.

The six business functions contained in the value chain are (i) Research and Development, (ii) Design (iii) Production (iv) Marketing (v) Distribution and (vi) Customer service.

The objective of value chain is to serve as means of increasing the customer satisfaction and managing costs effectively. Coordination of the individual parts of the value chain activities creates conditions to improve customer satisfaction in terms of cost efficiency, quality and delivery. A firm which performs value chain activities more efficiently and at a lower cost than its competitors will be able to gain competitive advantage. The following methodology should be adopted.

1. The firm should identify the industry value chain and then assign costs, revenues and assets to value activities.
2. Diagnose the cost drivers regulating each value activity.
3. Develop sustainable cost advantage either by controlling cost drivers better than competitors or by reconfiguring the chain value.

By analyzing costs, revenues and assets in each activity systematically a company can achieve low cost. Thus value chain helps managers in deciding how to apply the organization's valuable physical and human resources to each linked process so as to achieve cost effectiveness.

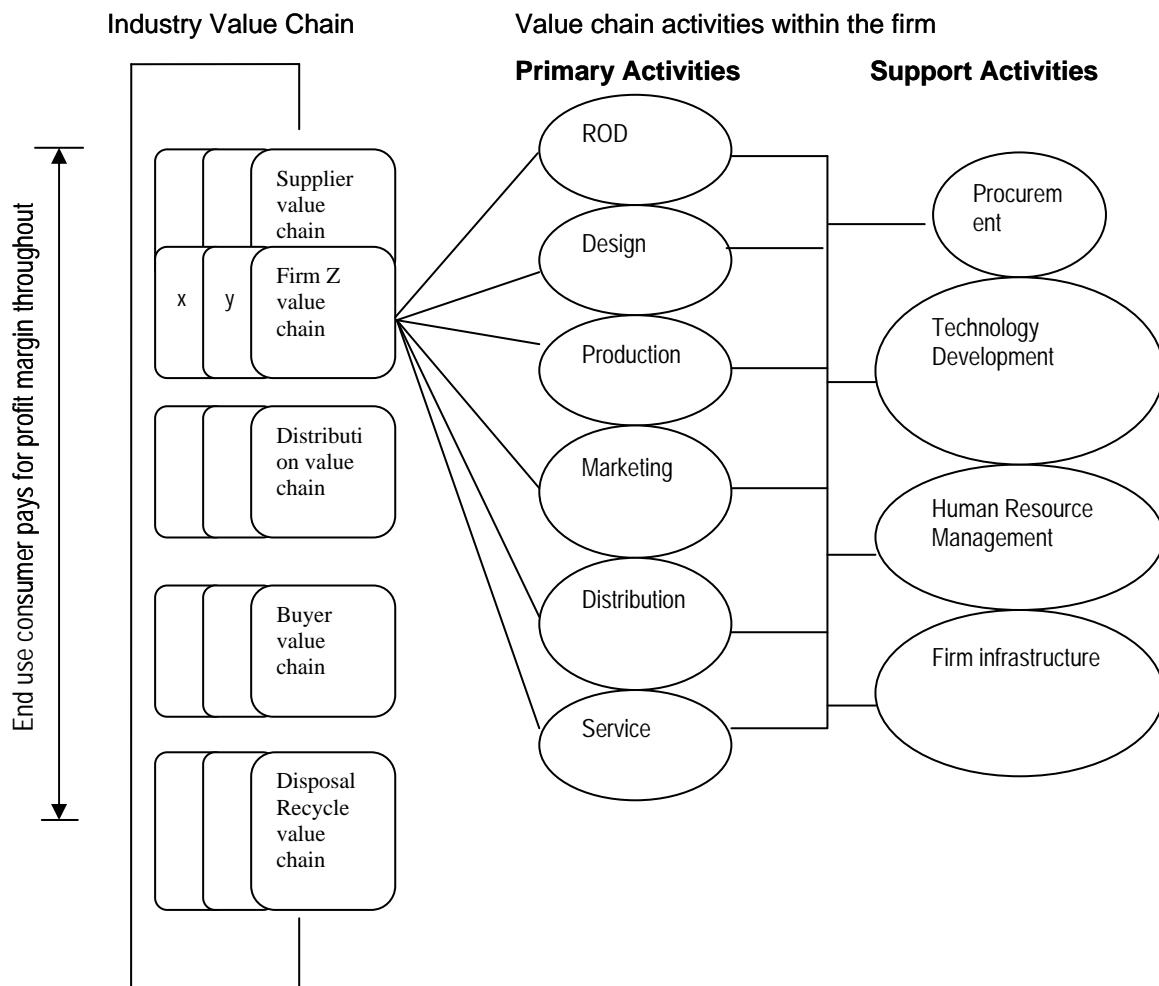
Question 15: "Cost can be managed only at the point of commitment and not at the point of incidence. Therefore it is necessary to manage cost drivers to manage cost." Explain the statement with reference to structural and executional cost drivers. (5 Marks) Nov/07

Question 16: Define the term 'value-chain'. Mention three useful strategic frameworks of the value-chain analysis. (4 Marks) June/09-O.C.

Question 17: Differentiate between 'Traditional Management Accounting' and 'Value Chain Analysis in the strategic framework'. (5 Marks) Nov./08-N.C.

Question 18: Explain with a diagram the value chain activities within the firm with suitable classifications under primary and support activities and also the industry value chain indicating what the end user pays for.

Ans.:



LIFE CYCLE COSTING

As per **CIMA**, Life-Cycle Costing (also known as Whole Life Costing) is the practice of obtaining over their lifetimes, the best use of physical asset at the lowest total cost to the entity.

Life cycle costing (LCC), aims at cost ascertainment of a product, project etc. over its projected life. It is a system that tracks and accumulates the actual costs and revenues attributable to cost object from its inception to its abandonment.

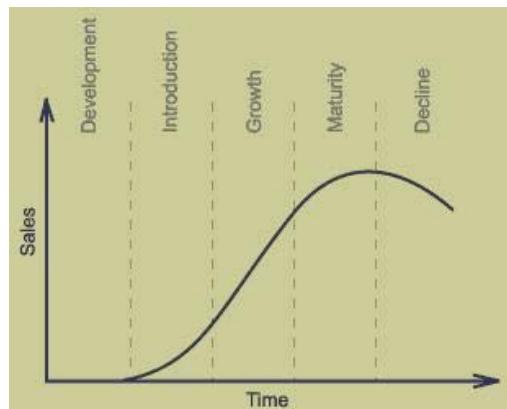
Sometimes the terms, "cradle-to-grave costing" and "womb-to-womb costing" convey the meaning of fully capturing all costs associated with the product from its initial to final stages. It is an approach used to provide a long term picture of product line profitability, feedback on the effectiveness of life cycle planning cost data to clarify the economic impact of alternatives chose in the design, engineering phase etc. It is also considered as a way to enhance the control of manufacturing costs. The thrust of product life cycle costing is on the distribution of costs among categories changes over the life of the product, as does the potential profitability of a product. Hence it is important to track and measure costs during each stage of a product's life cycle.

Product life cycle is a pattern of expenditure, sale level, revenue and profit over the period from new idea generation to the deletion of product from product range.

Each product has a life cycle. Product life cycle spans the time from initial R&D on a product to when customer servicing and support is no longer offered for the product. The life cycle of a product vary from a few months to several years. For products like motor vehicles this time span may range from 5 to 7 years. For

some basic pharmaceuticals, the time span may be 7 to 10 years. In case of cameras, photocopying machines etc. the life is more than 100 years.

Phases in product life cycle



The four identifiable phases in the Product Life Cycle are (a) introduction (b) Growth (c) Maturity and (d) Decline. A comparative analysis of these phases is given below:

Particulars	Introduction	Growth	Maturity	Decline
Phase	I	II	III	IV
Sales Volume	Initial stages, hence low	Rise in sales levels at increasing rates.	Rise in sales levels at decreasing rates.	Sales level off and then start decreasing.
Prices of Products	High levels to cover initial costs and promotional expenses.	Retention of high level prices except in certain cases*	Prices fall closer to cost, due to effect of competition	Gap between price and cost is further reduced.
Ratio of promotion expenses to Sales	Highest, due to effort needed to inform potential customers, launch products, distribute to customers etc.	Total expenses remain the same, while ratio is reduced due to increase in sales.	Ratio reaches a normal % of sales. Such normal % becomes the industry standard.	Reduced sales promotional efforts as the product is no longer in demand.
Completion	Negligible and insignificant	Entry of a large number of competitors	Fierce Competition	Starts disappearing due to withdrawal of products
Profits	NIL due to heavy initial costs.	Increase at a rapid pace.	Normal rate of profits since costs and prices are normalized.	Declining profits due to price competition, entry of new products etc.
Costs	R & D cost/Design cost.	Promotional cost/Capacity costs	Manufacturing cost/Distribution costs/Product support cost.	Plants reused/sold/scrapped/related costs.

* In the growth stage, the firm will maintain the prices at the high levels, in order to realize maximum profits. Price reduction will not be undertaken unless (a) the low prices will lead

The major characteristics of product life-cycle concept are as follows:

1. The products have finite live and pass through the cycle of development, introduction, growth, maturity decline and deletion at varying speeds.

2. Product cost, revenue and profit patterns tend to follow predictable courses through the product life cycle, Profits first appear during the growth phase and after stabilizing during the maturity phase declines at the point of deletion.
3. Profit per unit varies as products move through their life cycles.
4. Each phase of the product life cycle poses different threats and opportunities that give rise to different strategic actions.
5. Products require different functional emphasis in each phase-such as all R&D emphasis in the development phase and a cost control emphasis in the decline phase.
6. Finding new uses or getting the present users to increase their consumption, may extend the life of the product.

Stages in products life cycle

The life cycle of manufactured product will consist of the following stages:

1. Market Research – what customer wants, how much he is prepared to pay for it & how many he will buy.
2. Specification – Conversion of market research into a detailed specification. Max. Permissible manufacturing cost, functionalities, no. required & delivery date is provided to engineering department.
3. Design – Design engineers produce drawings & process schedules in accordance with the specification provided.
4. Prototype Manufacture - Prototypes are produced on the basis of these drawings, which help in developing the product & ascertaining that whether the product meets the specifications.
5. Development – It is the period of testing & changing of initial product manufactured till it meets the laid down specifications.
6. Tooling – If product meets the required specifications & is profitable it is tooled up for production i.e. building of production line, building expensive jigs & buying special purpose tools leading in very large initial investment.
7. Manufacture – Involves purchase of raw material & bought out components, arranging for labour & facilities for manufacture.
8. Selling & Distribution – Money is spent on campaign to sell the product & product is distributed to sales outlets & to customers.
9. After Sales Support – Ensuring availability of spares & expert servicing throughout life of product.
10. Decommissioning & replacement – After the life of the product, the plant used to produce the product is sold/scrapped/or disposed of in a manner, which is suitable.

Features/Characteristics of Product Life Cycle Costing:

Product life cycle costing is important due to the following features:

1. Product life cycle costing involves tracing of costs and revenues of each product over several calendar periods throughout their entire life cycle. Costs and revenues can be analysed by time periods, but the emphasis is on costs and revenue accumulation over the entire life cycle for each product.
2. Product life cycle costing traces research and design and development costs, incurred to individual products over their entire life cycles, so that the total magnitude of these costs for each individual product can be reported and compared with product revenues generated in later periods.

Life cycle costing therefore ensures that costs for each individual product can be reported and compared with product revenues generated in later periods. Hence the costs are made more visible.

Importance of Product Life cycle:

- (i) When non-production costs like costs associated with R & D, design, marketing, distribution and customer service are significant, it is essential to identify them for target pricing, value engineering and cost management. For example, a poorly designed software package may involve higher costs on marketing, distribution and after sales service.
- (ii) There may be instances where the pre-manufacturing costs like R & D and design are expected to constitute a sizeable portion of life cycle costs. When a high percentage of total life cycle costs are likely to be so incurred before the commencement of production, the firm needs an accurate prediction of costs and revenues during the manufacturing stage to decide whether the costly R & D and design activities should be undertaken.

- (iii) Many costs are locked in at R & D and design stages. Locked in or Committed costs are those costs that have not been incurred at the initial stages of R & D and design but that will be incurred in the future on the basis of the decisions that have already been taken. For example, the adoption of a certain design will determine the product's material and labour inputs to be incurred during the manufacturing stage. A complicated design may lead to greater expenditure on material and labour costs every time the product is produced. Life cycle budgeting highlights costs throughout the product life cycle and facilitates value engineering at the design stage before costs are locked in.
- Total life-cycle costing approach accumulates product costs over the value chain. It is a process of managing all costs along the value chain starting from product's design, development, manufacturing, marketing, service and finally disposal.

Benefits of Life cycle costing:

1. The life cycle concept results in earlier actions to generate revenue or to lower costs than otherwise might be considered.
2. Better decisions should follow from a more accurate and realistic assessment of revenues and costs, at least within a particular life cycle stage.
3. Life cycle thinking can promote long-term rewarding in contrast to short-term profitability rewarding.
4. The life cycle concept helps managers to understand acquisition costs vs. operating and support costs, i.e. to find a correct balance between investment costs vs. operating expenses.

Here are some of the most often cited LCC limitations:

1. It is not an exact science, everyone gets different answers and the answers are neither wrong nor right—only reasonable or unreasonable. LCC experts do not exist because the subjects are too broad and too deep.
2. It models operate with limited cost databases and the cost of acquiring data in the operating and support areas is both difficult to obtain and expensive to acquire.
3. It requires a scenario for: how the money expenditure model will be constructed for acquisition of equipment, how damage will occur, etc.—most details require extensive extrapolations and obtaining facts is difficult.
4. Its results are not good budgeting tools. They're effective only as comparison/trade-off tools and producing good LCC results requires a project team approach because specialized expertise is needed.

Product Life Cycle Costing is considered important due to the following reasons:

1. **Time based analysis:** Life cycle costing involves tracing of costs and revenues of each product over several calendar periods throughout their life cycle. Costs and revenues can be analysed by time periods. The total magnitude of costs for each individual product can be reported and compared with product revenues generated in later periods.
2. **Overall Cost Analysis:** Production costs are accounted and recognized by the routine accounting system. However non-production costs like R&D, design, marketing, distribution, customer service etc. are less visible on a product-by-product basis. Product Life Cycle Costing focuses on recognizing both production and non-production cost.
3. **Pre-production Costs analysis:** The development period for R&D and design is long and costly. A high percentage of total product costs may be incurred before commercial production begins. Hence, the company needs accurate information on such costs for deciding whether to continue with the R&D or not.
4. **Effective Pricing Decisions:** Pricing Decisions, in order to be effective, should include market consideration on the one hand and cost considerations on the other. Product Life Cycle Costing and Target Costing help analyse both these considerations and arrive at optimal price decisions.
5. **Better Decision Making:** Better decisions should follow from a more accurate and realistic assessment of revenues and costs, at least within a particular life cycle stage.
6. **Long Run Wholistic view:** Product life cycle thinking can promote long-term rewarding in contrast to short-term profitability rewarding. It provides an overall framework for considering total incremental costs over the entire life span of a product, which in turn facilitates analysis of parts of the whole where cost effectiveness might be improved.
7. **Life Cycle Budgeting:** Life Cycle Budgeting, i.e. Life Cycle Costing with Target Costing principles, facilitates scope for cost reduction at the design stage itself. The Company stands to benefit since costs are avoided before they are committed or locked in.

8. **Review:** Life cycle Costing provides scope for analysis of long term picture of product line profitability, feedback on the effectiveness of life cycle planning and cost data to clarify the economic impact of alternatives chosen in the design, engineering phase etc.

Question 19: What is Product Life-cycle Costing? Describe its characteristics & benefits.

(5 Marks) Nov/04, (5 Marks) June/09-N.C. & (4 Marks) May/10-O.C.

Question 20: What is total-life-cycle costing approach? Why is it important?

(4 Marks) May/06

Question 21: What is product life cycle costing? What are the costs that you would include in product life cycle cost?

(4 Marks) May/07

Question 22: A company's four products M, N, O and P are in the market. Identify the phase of life cycle for each product with a brief reason.

M : There is a lot of competition. Quantity sold has been increasing at 10%, 8% and 7% in the last 3 years.

N : Until last year, N had no competition. Suddenly the company finds 4 new products very similar to N in the market. However, N continues to have good sales.

O : There is intense competition. Achieving targeted sales is becoming increasingly difficult. Hence the company is introducing slightly modified features in the fresh production.

P : Huge inventory of P is available. P is being sold, but there are many products in the market which are priced lesser than P, but have the same utility as P.

(4 Marks) Nov./10-O.C.

[Ans.: M – Maturity; N – Growth; O – Decline; P – Maturity phase but since P's inventory is huge it might be in Decline phase.]

Question 23: Meena is a news reporter and feature writer for an economic daily. Her assignment is to develop a feature article on 'Product Life-cycle Costing', including interviews with the Chief Financial Officers (CFO) and operating managers. Meena has been given a liberal budget for travel so as to research into company's history, operations, and market analysis for the firm she selects for the article.

Required :

Meena has asked you to recommend industries and firms that would be good candidates for the article. What would you advice? Explain your recommendations.

(3 Marks) June/09-O.C.

[Ans.: The product life cycle span the time from the initial R & D on a product to when customer service and support is no longer offered for that product.

Life Cycle Costing technique is particularly important when:

(a) High percentage of total life-cycle costs are incurred before production begins and revenue are earned over several years and

(b) High fraction of the life cycle costs are locked in at the R & D and design stages.

Meena should identify those industries and then companies belonging to those industries where above mentioned feature are prevalent. For example, Automobile and Pharmaceutical Industries companies like Tata Automobile, M&M, Ranbaxy and Dabur will be good candidates for study on product life cycle costing.]

It is advisable to go through Chapter "Capital Budgeting" of Strategic Financial Management, before attempting practical questions of LCC.

Question 24: Indo Gulf Fertilizers Ltd. Supports the concepts of the terotechnology or life cycle costing for new investment decisions covering its engineering activities. The finalized of the philosophy is now well established and its principles extended to all other areas of decision making.

The company is to replace a number of its machines and the Production Manager is to run between the 'X' machine, a more expensive machine with a life of 12 years, and the 'W' machine with a life of 6 years. If the 'W' machines chosen it is likely that it would be replaced at the end of 6 years by another 'W' machine. The

pattern of maintenance and running costs differs between the types of machine and relevant data are shown below:

	(₹)	X	W
Purchase price		19,000	13,000
Trade-in-value		3,000	3,000
Annual repair costs		2,000	2,600
Overhaul costs (p.a)	(at year 8) 4,000		(at year 4) 2,000
Estimated financing costs averaged over machine life (p.a)	10%		10%

You are required to recommend, with supporting figures, which machine to purchase, stating any assumptions made. PVIFA (10,6) = 4.36, PVIFA (10,12) = 6.81

(10 Marks) ICWA Dec./08 & (10 Marks) ICWA June/10

[Ans.: Machine X-Life 12 years: Annualized equivalent is ₹4,925/- & Machine W-Life 12 years: Annualized equivalent is ₹5,508/-; Recommendation: Purchase machine 'X']

[Hint.: Whenever life of two machines, products, etc. are not equal, we are supposed to take decision on the basis of annualized equivalent value of NPV instead of just NPV]

Question 25 [ABC+Life Cycle Costing]: Activities have been identified and the budget quantifies for the three months ended 31 March, 2001 as follows:-

Activities	Cost Driver Unit Basis	Units of Cost Driver	Cost (₹000)
Product Design	Design hours	8000	2000 (see note 1)
Purchasing	Purchase order	4000	200
Production	Machine hours	12000	1500 (See note 2)
Packing	Volume (Cu.m.)	20000	400
Distribution	Weight (Kg.)	120000	600

Note1: This includes all design costs for new products released this period.

Note 2: This includes a depreciation provision of ₹300000 of which ₹8000 applies to 3 months depreciation on a straight-line basis for a new product (NPD). The reminder applies to other products.

New product NPD is included in the above budget. The following additional information applies to NPD.

- (1) Estimated total output over the product life cycle: 5000 units (4 years life cycle)
- (2) Product design requirement: 400 design hours.
- (3) Output in quarter ended 31 March 2001: 250 units.
- (4) Equivalent batch size per purchase order: 50 units.
- (5) Other product unit data: production time 0.75 machine hours: volume 0.4 cu. Meters: weight 3 kg.

Required:-

Prepare a unit overhead cost for product NPD using an activity based approach which includes an appropriate share of life cycle costs using the information provided.

[Ans.: Total cost is ₹144.60]

[Hint: Depreciation of NPD is ₹1,28,000 for total life]

Question 26: A housewife is looking at ways of producing domestic hot water and considers possibility an electric immersion heater having an installation cost of ₹160 and estimated annual electrical charges of ₹200, and a gas boiler with an installation cost of ₹760 with fuel bills of ₹80.

Assuming yourself as a consultant to this cost-conscious-housewife, advise her suitably by comparing two systems, on the basis of (i) total expenditure, and (ii) present value, over a 5-year period. Take interest at 9 per cent.

What will be your recommendation if you consider both the equipments for a 8 years period?

[Ans.: Total cost-5 Years:-> Heater: ₹1160, Boiler: ₹1160; 8 Years:-> Heater: ₹1760, Boiler: ₹1400; Present Value- 5 Years:-> Heater: ₹938, Boiler: ₹1071; 8 Years:-> Heater: ₹1267, Boiler: ₹1203]

Question 27: Gemini enterprises currently makes as many units of part No. X-248 as it needs. Sen, general manager of Gemini enterprises, has received a quotation from another company for making part No. X-248. Zedco will supply 1,000 units of parts No.X-248 per year at ₹50 per units. Zedco can begin supply on 1st July,1998 and continue for 5 year, after which Gemini will not need the part. Zedco can accommodate any change in Gemini's demand for the part and will supply it for ₹50 regardless of quantity.

Shah, the controller of Gemini enterprises, reports the following costs for manufacturing 1,000 units of part No. X-248:

	₹
Direct materials	22,000
Direct labour	11,000
Variable manufacturing overhead	7,000
Depreciation on machine	10,000
Product and process engineering	4,000
Rent	2,000
Allocation of general plants overhead costs	<u>5,000</u>
	Total costs
	<u>61,000</u>

The following additional information is available:

- Part X-248 is made on a machine used exclusively for its manufacture. The machine was acquired on 1st July,1997 at a cost of ₹60,000. The machine has a useful life of six year and a zero terminal disposal price. Depreciation is calculated on straight-line basis.
- The machine could be sold today for ₹15,000.
- Product and process engineering costs are incurred to ensure that the manufacturing process for part No. X-248 works smoothly. Although these costs are fixed in the short run, with respect to units of part No. X-248, they can be saved in the long run if part No.X-248 is no longer produced. If part No.X-248 is outsourced, product and process engineering costs of ₹4,000 will be incurred for 1997-98 but not thereafter.
- Rent costs of 2,000 are allocated to products on the basis of the floor space used for manufacturing the product. If part number X-248 is discontinued, the space currently used to manufacture it would become available. The company could then use the space for storage purpose and saves ₹1,000 currently paid for outside storage.
- General plant overhead costs are allocated to each department on the basis of direct manufacturing labour costs. The costs will not change in total. But no general plant overhead will be allocated to part number X-248 if the part is outsourced.

Assume that Gemini requires a 12% rate of return for this project. The following information may be useful:

Year	Present value factor at 12%
0	1.000
1	0.893
2	0.797
3	0.712
4	0.636
5	0.567

Required:

- Should part No.X-248 be outsourced? Prepare a quantitative analysis.
- State any sensitivity analysis that seems to be advisable. Do not perform any sensitivity calculations.
- Sen is particularly concerned about his bonus for 1997-98. The bonus is based on accounting income of Gemini enterprises. What decision will Sen make if he wants to maximize his bonus for 1997-98?

(16 Marks) May/98

[Ans.: NPV is ₹(3025), so it is desirable to manufacture the part internally]

Question 28: S engineering company is considering to replace or repair a particular a particular machine, which has just broken down. Last year this machine cost ₹20,000 to run and maintain. These costs have been increasing in real terms in recent years with the age of the machine. A further useful life of 5 year is expected, if immediate repair of ₹19,000 are carried out. If the machine is not repaired it can be sold immediately to realize about ₹5,000(ignore loss/gain on such disposal).

Alternatively, the company can buy a new machine for ₹49,000 with an expected life of 10 years with no salvage value after providing depreciation on straight line basis. In this case, running and maintenance cost will reduce to ₹14,000 each year and are not expected to increase much in real term for a few years at least. S engineering company regard a normal rate of 10% p.a. after tax as a minimum requirement on any new investment. Considering capital budgeting techniques, which alternative would you choose? Take corporate tax rate of 50% and assume that depreciation on straight line basis will be accepted for tax purpose also. Given cumulative present value of Re. 1 p.a. at 10% for 5 years ₹3.791, 10 years ₹6.145.

[Ans: Present value of cash outflow: Alt I – ₹12506; Alt II – ₹11710]

4



Service Sector

Services sector companies provide their customers with services or intangible products. The activities of service sector may be used for both: (i) Provision of services to outside customers (ii) Provision of services internally. The types of service that may be provided, by service sector are of diverse nature and they have their own peculiarities, requirements, different cost accounting treatment but the general principles of costing discussed in earlier chapters relating to manufacturing sector will also apply to service sector.

MAIN CHARACTERISTIC OF SERVICE SECTOR:

1. **Activities are labour intensive:** The activities of service sector generally are labour intensive. The direct material cost is either small or non-existent. For example, cost of stationery used by a professional consultant for expressing an opinion in black and white, for a client will be small or even non-existent in case he gives verbal opinion. In the preceding example direct labour cost content of a service is significant.
2. **Cost-unit is usually difficult to define:** The selection of cost unit usually, for service sector is difficult to ascertain as compared to the selection of cost unit for manufacturing sector. The following table provides some examples of the cost units for service sector.

(A)	To External Customer	Cost Unit
i.	Hotel	Bed nights available, Bed night occupied
ii.	School	Student hours, Full time students
iii.	Hospital	Patient per day, Room per day
iv.	Accounting firm	Charged out client hours
v.	Transport	Passenger km., quintal km.
(B)	Internal Services	Cost Unit
i.	Staff canteen	Meals provided, No. of staff
ii.	Machine maintenance	Maintenance hours provided to user department
iii.	Computer department	Computer time provided to user department

3. **Product costs in service sector:** Costs are classified as product or period costs in manufacturing sector for various reasons. These are:
 - To determine the unit manufacturing costs so that inventories can be valued and selling prices created and verified.
 - To report production costs on income statement
 - To analyse costs for control purposes.

Differences between manufacturing and service sector.

1. The difference between manufacturing and service sector is that in service sector there is no physical product that can be stored, assembled and valued. Services are rendered and cannot be stored up or placed in a vault.
2. In service sector the cost of material is insignificant.
3. For computing unit cost of services the most important cost would be professional's labour cost.
4. The direct labour cost is traceable to service rendered.
5. In addition to labour cost the service sector like manufacturing sector incurs various overhead cost. In service sector those overhead costs, which are incurred for offering a service, are classified as service overheads (like factory overhead in manufacturing sector).
6. Examples: Rendering a loan service, representing someone in court of law or selling an insurance policy are typical services performed by professionals.

Collection of costing data in service sector

1. **Classification:** Costs are accumulated under various heads for control purpose and for decision making.
2. **Grouping:** Costs are then grouped under fixed costs and variable costs.
3. **Put in a particular format:** They are then put in a format, which depends upon the nature of industry and the need of the management.
4. **Period:** For preparing a cost sheet under operating costing, costs are usually accumulated for a specified period viz. a month, a quarter or year etc.
5. **Composite cost units:** Often composite cost units such as passenger km, bed, nights etc. are used by these organizations for ascertaining the cost of these services respectively.

Different costing methods used in service sector:

1. **Job Costing method:** In job costing method the cost of a particular service is obtained by assigning costs to a distinct identifiable service. In service sector like Accounting firm, Advertising campaigns etc. job costing method is used.
2. **Process Costing method:** In process costing system the cost of a service is obtained by assigning costs to masses of similar unit and then computing unit cost on an average basis. Retail banking, Postal delivery, Credit card etc. uses process costing method.
3. **Hybrid costing method:** Many companies uses a method of costing which is neither job costing nor process costing method. They in fact uses a hybrid costing method which combines elements of both job costing and process costing methods.

Job costing method in service sector: The two costs, which are incurred in service sectors, are:

- Direct labour
- Service overheads

For ascertaining the price of a service provided by service sector if job-costing method is followed, the costs for each job are to be monitored continuously.

There are two main uses of this job costs information:

1. To guide decisions on job pricing
2. To assist in cost planning and cost control

The five steps, which are generally adopted for assigning costs to individual jobs, are as follows:

1. **Identify the job that is chosen as cost object:** For instance, litigation work for Motorola India Ltd. By Dua & Associates by assuming that work requires 100 budgeted hours of professional labour.
2. **Identify the direct cost categories for the job:** In the above example the professional hours required for doing litigation work is a direct cost.
3. **Identify indirect costs (overheads) associated with the job:** This step requires identifications of indirect costs incurred for providing services. These costs may include the costs of support labour, computer time, travel, telephone/fax machine, photocopying etc.
4. **Select the cost allocation base to be used in assigning each indirect cost to the job:** This step requires the selection of cost allocation base that has a cause and effect relationship between changes in it and changes in the level of indirect costs. The allocation base suitable for allocating indirect cost of law firm is professional labour hours.
5. **Identify the rate per unit of the cost allocation base used to allocate cost to the job:** The budgeted indirect cost allocation rate is computed by using following formula.

$$\frac{\text{Indirect Cost Pool}}{\text{Cost Driver}}$$

Customer Costing in service sector: The customer costing is a new approach to management. The theme of this approach is customer satisfaction. In some service industries such as public relations, the specific output of industry may be difficult to identify and even more difficult to quantify. Customer costing analyses the costs incurred to earn the revenues from customers. A customer cost hierarchy, categorizing the costs relating to the customers into different cost pools on the basis of different types of cost drivers or different degrees of difficulty in determining cause and effect relationship, is used. Further where there are multiple customers, identifying support activities i.e. common costs with particular customer may be more problematic. In such cases, it is important to cost customers. An ABC analysis of customers profitability provides valuable

information to help management in pricing customer. Consider a banking sector A bank's activities for customer will include the following types of activities. These are:

- a) Stopping a cheque
- b) Withdrawal of cash
- c) Updation of pass book
- d) Issue of duplicate pass book
- e) Returning a cheque because of insufficient funds
- f) Clearing of a customer cheque.

Different customers or categories of customers use different amount of these activities and so customer profiles can be build up and customer can be charged according to the cost to serve them.

For example:

1. In Computer Institute the cost of providing a course for enrolled students may be determined by a variety of factors, such as type of course (Oracle or Java) and the level of course (introduction or advanced).
2. A hotel may have activities that are provided for specific types of customers such as well laid gardens, swimming pool and a bar. Older guest may appreciate and use the garden, families the swimming pool and business guests the bar. If the activities are allocated to relevant guest a correct cost per bed occupied can be calculated for each type of category.
3. A courier service where the costs to serve the customers vary with the type of service selected by customers (how fast the package is to be delivered), the destination, weight, size of package and whether the package is to be collected from customer's location or will be dropped at the office of the courier firm. The firm could use an efficient system of internet strategy to accomplish the tasks like preparing labels at the customer's site, arranging for pick up, dropping at the destination and tracking and tracing packages. The system calculates the freight charges, invoices customers daily and produces customized reports.

For customer costing purpose, the costs are divided into following categories. These are

1. **Customer Specific costs:** These are direct and indirect cost of providing service to customer plus customer related cost assigned to each customer. For example cost of express courier service to a client/customer who requests overnight delivery of some agreement.
2. **Customer-line categories:** These are the cost which are broken into the broad categories of customers and not individual customer.
3. **Company costs:** These are those costs which are not allocated to either customer line or individual customers but charge to company. The example is the cost of advertisement to promote sale of service.

Pricing by service sector

1. The service sector follows a different approach for pricing their service. Although a service has no physical existence it must be priced and billed to customers.
2. Most service organizations use a form consisting of time and material pricing to arrive at the price of a service.
3. Service companies such as appliance repair shops, automobile repair business calculate their prices by using two computations, one for labour and other for materials and parts.
4. A mark up percentage is used to add the cost of overhead to the direct cost of labour, materials and parts. If materials and parts are not part of service being performed, then only direct labour costs are used as basis for determining price.
5. For professionals such as accountants and consultants direct labour costs and apportioned overhead and indirect costs are considered for pricing.

Question 1: Give an appropriate cost unit for each of the following service sectors:

- (i) Hotel
- (ii) School
- (iii) Hospital
- (iv) Accounting firm
- (v) Transport
- (vi) Staff Canteen
- (vii) Machine maintenance
- (viii) Computer Department

(4 Marks) June/09-N.C.

Question 2: Explain which features of the Service organization may create problem for the application of activity-based costing. (4 Marks) May/05

[Ans.: The following may create problem for adoption of ABC system in service organization –

(i) Facility sustaining costs (such as property, rents etc.) represent a significant portion of total costs and may only be avoidable if the organization ceases business. It may be impossible to establish appropriate cost drivers.

(ii) It is often difficult to define products where they are of intangible nature. Cost objects can therefore be difficult to specify.

(iii) Many service organizations have not previously had a costing system and much of the information required to set up a ABC system will be non-existent. Therefore introduction of ABC may be expensive.]

Question 3: Write short notes on pricing by service sector. (3 Marks) Nov./03 & (4 Marks) Nov./05

Question 4: How will you apply customer costing in service sector? Explain with the help of a suitable example. (4 Marks) May/06

Question 5: Discuss with examples, the basic costing methods to assign costs to services. (5 Marks) May/07

Question 6: Explain the main characteristics of Service sector costing. (5 Marks) June/09-O.C.

Question 7: "Customer profile is important in charging cost." Explain this statement in the light of customer costing in service sector. (5 Marks) Nov./09-N.C.

Question 8: The Bharat Hotel has annual fixed costs applicable to rooms of ₹7,50,000 for a 300-room hotel with average daily room rates of ₹50 and average variable costs of ₹10 for each room rented.

The hotel operates 365 days per year. It is subject to an Income-tax rate of 40%.

You are required to:

- i) Calculate the number of rooms the Hotel must rent to earn a net Income after tax of ₹6,00,000, and
- ii) Compute the Break-even Point in terms of number of room rented. Dec./99-ICWA

[Ans.: (i) 43750 Room days (ii) 18750 Room days]

Question 9: A hotel operated by a company has 180 single rooms and 60 double rooms. The rent of the double rooms is set at 160% of the rent of the single rooms. The operational costs per day per room are estimated as under :

	Single Rooms	Double Rooms
	₹	₹
Variable costs	300	500
Fixed costs	500	780

The average occupancy of both the single rooms and double rooms is expected to be 85% throughout a year of 365 days. In fixing the room rent, the company desires to earn a margin of safety of 20%. The hotel has to pay a tax of 20% on its tariff.

Required:

(i) Calculate the tariff per day per (1) Single room and (2) Double room.

(ii) The hotel intends to reserve the normal occupancy of 12 single rooms for one of its valued corporate customers at a discount (excluding tax) of 10% of the rent. What increase in the occupancy of the remaining single room days is required to compensate the loss arising from the discount. (7 Marks) May/04

[Ans.: (i) ₹1155 approx. (2) ₹1848 approx.; (ii) 551 room-days approx.]

[Hint.: The margin of safety is 20%, therefore break even point is 80%

At 80% that is at BEP the revenue $(₹2,60,61,000 \times 80\%) + ₹4,24,42,200 = ₹6,32,91,000$

\therefore Total desired revenue $= 6,32,91,000 \div 80\% = ₹7,91,13,750$

[Note.: Suggested answers of ICAI has forgotten to multiply Total Variable cost by 80% & has wrongly calculated, revenue at BEP as $(₹2,60,61,000 + ₹4,24,42,200) = ₹6,85,03,200$]

Question 10: Elegant Hotel has a capacity of 100 single rooms and 20 double rooms. It has a sports centre with a swimming pool, which is also used by persons other than resident of the hotel. The hotel has a shopping arcade at the basement and a specialty restaurant at the roof top. The following information is available:

- (i) Average occupancy: 75% for 365 days of the year.
- (ii) Current costs are:
- (iii)

	Variable cost ₹/per day	Fixed cost ₹/per day
Single Room	400	200
Double Room	500	250

- (iv) Average sales per day of restaurant ₹1,00,000; contribution is at 30%. Fixed cost ₹10,00,000.
- (v) The sports centre/swimming pool is likely to be used by 50 non-residents daily; average contribution per day per non-resident is estimated at ₹50; fixed cost is ₹5,00,000 per annum.
- (vi) Average contribution per month from the shopping arcade is ₹50,000; fixed cost is ₹6,00,000 per annum.

You are required to find out:

- (a) Rent chargeable for single and double room per day, so that there is a margin of safety of 20% on hire of rooms and that the rent for a double room should be kept at 120% of a single room.
- (b) Evaluate the profitability of restaurant, sports centre and shopping arcade separately.

[Ans.: (a) Single Room: ₹655 approx. & Double Room: ₹786 approx. (b) ₹9950000, ₹412500, Nil]

[Hint.: The margin of safety is 20%, therefore break even point is 80%

At 80% that is at BEP the revenue $(₹1,36,87,500 \times 80\%) + ₹68,43,750 = ₹1,77,93,750$

∴ Total desired revenue = $₹1,77,93,750 \div 80\% = ₹2,22,42,187.5$

[Note.: Suggested answers of ICAI has forgotten to multiply Total Variable cost by 80% & has wrongly calculated, revenue at BEP as $(₹1,36,87,500 + ₹68,43,750) = ₹1,72,46,250$] (15 Marks) Nov./97

Question 11: Kangan Resorts operates a lodging house with attached facilities of a shopping arcade and restaurant on a National Highway. The following details are available:

(i) The lodging house has 40 twin-bedded rooms, which are to be rented for ₹200 per night on double occupancy basis. The occupancy ratio is expected at 85% and always both the beds in the room will be occupied. The lodging facilities are operated, for 200 days in the year during foreign tourists season time only.

(ii) As per past record the spending pattern of each tourist staying in the lodge will be as under:

₹50 per day in the shopping arcade and ₹80 per day in the restaurant.

(iii) Ratios of variable cost to respective sales volume are:

Shops	Restaurant
50%	60%

(iv) For the lodging house the variable cost on house-keeping and electricity will amount ₹30 per day per occupied room.

(v) Annual fixed overhead for the entire complex is estimated at ₹10,00,000.

Required:

(i) Prepare an income statement for the next year.

(ii) The Lodging House Manager suggests a proposal of reducing room rent to ₹150 per day on double occupancy basis, which will increase occupancy level to 95%. Should the proposal be accepted or not?

[Ans.: (i) Estimated Profit ₹931200 (ii) Proposal should not be accepted as it will result in reduction of profits by ₹152800] (7 Marks) May/08 & Dec./02 (ICWA Final-Adapted)

Question 12: A limited company operates a lodging house with a restaurant, shops and recreational facilities attached. Its manager has entrusted you with the planning of the coming year's operations, more particularly on the level of profits the company was likely to earn.

The lodging house has 100 double-bed room, which are likely to be rented at ₹150 per day. The manager expects an occupancy ratio of 75% for a period of 250 days during the tourist season. It is also anticipated that both the beds in a room will be occupied during the period.

Each person staying in the lodging house is expected to spend on the basis of past statistics ₹30 per day in the shops attached to the lodge and ₹60 per day in the restaurant. The recreational facilities are not charged to the customer.

Some other relevant data available to you is as under:

- (i) Variable cost to volume ratio:

Particulars	Shops	Restaurant
Cost of goods sold	40%	30%
Supplies	5%	15%
Others	5%	10%

- (ii) For lodging house, the variable costs are ₹25 per day per occupied room for cleaning, laundry etc.
 (iii) Annual fixed costs for the entire complex are ₹19,50,000.

From the above, you are required to prepare:

- (a) an income statement for the coming year; and
 (b) an analysis to indicate whether the manager's suggestion of reducing the room rent to ₹125 per day to enhance the occupancy ratio to 90% should be accepted.

[Ans.: (a) ₹1968750, (b) ₹2190000]

Question 13: A company operates a hotel. It is spread over six floors of a building excluding the ground floor with a restaurant in the sixth floor. On the ground floor, the hotel operates a sports centre including a swimming pool and a shopping arcade.

The hotel has a capacity of 100 single rooms and 20 double rooms. The average occupancy of both single and double rooms is expected to be 80% throughout the year of 365 days. The rent for double room has been fixed at 125% of the rent of single room. The costs are as under:

Variable costs	:	Single rooms ₹220 each per day
		Double room ₹350 each per day
Fixed costs	:	Single rooms ₹120 each per day
		Double rooms ₹250 each per day

The income and costs relating to the service centres are as under:

- (a) Restaurant:
 Estimated average sales per day ₹25,000.
 Contribution 30% of sales.
 Fixed costs ₹8,00,000 per annum.
 (b) Sports centers:
 Average number of persons expected to use the centre per day is 50.
 Average contribution per day per person is ₹15.
 Fixed costs ₹4,00,000 per annum.
 (c) Shopping arcade
 Average contribution per month ₹35,000.
 Fixed costs ₹4,00,000 per annum.

Required:

- (i) Calculate the rent chargeable for single and double rooms per day in such a way that the hotel earns a margin of safety of 20% on hire of rooms.
 (ii) Evaluate the profitability of the three service centers and work out the total profit of the hotel per annum based on the rent recommended by you in (i) above.

- (iii) The hotel wants to reserve the normal occupancy of ten single rooms for its regular customers by allowing a discount of 10% on room rent. What increase in occupancy ratio is required in respect of the remaining rooms to earn the same profit envisaged in (ii) above.
- (iv) An associate company wishes to take the entire hotel complex on lease for a total rent of ₹175 lacs for five years. The associate company is prepared to pay the entire lease rent in advance. Taking the Capital recovery factor for 10% return for 5 years at 3.79, advice the management of the hotel company whether or not the leasing arrangement should be entered into. ICWA-June/91

[Ans.: (i) Single room: ₹402; Double room: ₹502.5; (ii) Restaurant: ₹1937000; Sports centre: ₹(126250); Shopping arcade: ₹20000; Hotel: ₹3072250 (iii) Revised occupancy level: 81.66%; (iv) Lease is acceptable]

[Hint.: The margin of safety is 20%, therefore break even point is 80%

At 80% that is at BEP the revenue $(₹84,68,000 \times 80\%) + ₹49,64,000 = ₹1,17,38,400$

\therefore Total desired revenue $= 1,17,38,400 \div 80\% = ₹1,46,73,000$

[Note.: Suggested answers of ICWAI has forgotten to multiply Total Variable cost by 80% & has wrongly calculated, revenue at BEP as $(₹84,68,000 + ₹49,64,000) = ₹1,34,32,000$]

Question 14: A manufacturing company runs its boiler on furnace oil obtained from X oil company and Y oil company whose depots are situated at a distance of 24 kms and 16 kms from the factory site.

Transportation of furnace oil is made by company's own tank lorries (two) of 8 ton capacity each. Onward trips are made only with full load and the lorries return empty. The filling time takes an average of 40 minutes for X oil company and 30 minutes for Y oil company. The empty time in the factory is only 40 minutes for each. The average speed of lorries work out is 24 kms per hour.

The varying operating charges average 80 paise per km covered and fixed charges gives an incidence of ₹7.50 per hour of operation.

Calculate the transportation cost per ton-km for each source of furnace oil.

(8 Marks) Nov/04

[Ans.: X-₹0.33, Y-₹0.347]

Question 15: You are required to calculate a suggested fare per passenger/km. from the following information for a Mini Bus:

- (a) Length of route: 30km.
- (b) Purchase price ₹4,00,000.
- (c) Part of above cost met by loan, annual interest of which is ₹10,000 p.a.
- (d) Other annual charges: Insurance ₹15,000, Garage rent ₹9,000, Road Tax ₹3,000, Repairs & maintenance ₹15,000, Administrative charges ₹5,000.
- (e) Running Expenses: Driver & Conductor ₹5,000 p.m., Repairs/Replacement of tyre-tube ₹3,600 p.a, Diesel and oil cost per km. ₹5.
- (f) Effective life of vehicle is estimated at 5 years at the end of which it will have a scrap value of ₹10,000.
- (g) Mini Bus has 20 seats and is planned to make six no .two-way trips for 25 days p.m.
- (h) Provide profit @ 20% of total revenue.

(15 Marks) Nov./97

[Ans.: Rate per passenger km. 0.43 paise]

Question 16: A Cement Company transports its requirement of limestone from a quarry situated at a distance of 6 km from the factory. Presently the company engages transport contractors for the purpose .The Company has invited tenders from the local transport contractors and the lowest quotation received is ₹18 per tonne of limestone.

The Management is concerned about the increasing cost of transport and has, therefore under its consideration has proposal for the purchase of a fleet of trucks for being used departmentally for the transport of limestone. You have been furnished with the following data to examine the feasibility of the proposal.

- (i) The company has two options regarding purchases of trucks. They are (a) buy 10 tonne capacity trucks or (b) buy 8 tonne capacity trucks.
- (ii) Operation cost data:

Particulars		10 Tonne capacity trucks	8 Tonne capacity trucks
Purchase price of each truck	(₹)	4,30,000	4,00,000
Life in years		5	5
Scrap value at the end of 5 th year of life.	(₹)	82,000	40,000
Km. per liter of diesel		3	4
Repairs and maintenance			
Per annum per truck		47,100	38,400
Road Tax per quarter per truck	(₹)	600	600
Miscellaneous fixed expenses per month	(₹)	3,000	3,000
Oil and sundries per 100 km run	(₹)	10	10

- (iii) Each truck will make 5 trips (to and fro) on an average for 24 days month.
- (iv) Cost of diesel a ₹10m per liter.
- (v) Salary of drivers: ₹1,600 per month per driver.
- (vi) Two extra drivers will be employed to work as relievers.
- (vii) Other staff required
 - One Mechanic @ ₹2,000 per month
 - One Fitter @ ₹1,600 per month
 - One Supervisor @ ₹3,200 per month
- (viii) The capacity of the cement plant is 24,000 tonnes per month of limestone crush.

Required:

- (i) Present a comparative cost sheet on the basis of the aforesaid data showing the transport cost per tonne of operating 10 tonne and 8 tonne capacity trucks at full capacity utilization of the cement plant for an average month by classifying the expenses into (a) varying with km run (b) varying with number of trucks and (c) fixed, and suggest the best alternative out of the three choices available namely (a) selection from two capacity trucks and (b) hiring of transportation.
- (ii) Apart from cost analysis as in (i) above, what other factors may be considered by the management before accepting the proposal for purchase of trucks. ICWA-Dec./91

[Ans.: Cost/Tonne: 10 Tonne trucks-₹14.27; 8 Tonne trucks-₹15.90; Hire Charges-₹18.00]

Question 17: The manager of a hotel providing lodging facilities wants to expand his services to include manual booking (reservation or cancellation) of railway tickets for his clients. He does not want to have electronic booking due to operational difficulty. He has the following information:-

	(₹)/ month
Proportion of rent allocated for office space	4,000
General Telephone expenses allocated to this service	2,400
Proportion of security charges/ maintenance expenses allocated	1,600
Salary to person exclusively doing the booking of tickets	20,000
Mobile phone charges exclusive to person booking ticket	3,000
Share of general miscellaneous fixed expenses allocated	1,000
Conveyance incurred to book tickets (to and fro charges to the nearest booking station)[fixed per month]	4,000

The manager estimates that there will be 2,500 bookings per month for 3 months of peak season, 1,000 bookings per month for 2 months of moderate business and 700 bookings per month during the remaining period. He cannot charge more than the prevailing rate of ₹30 per booking charged by other agents.

Calculate the total cost per booking.

What is the estimated profit the manager hopes to achieve for the full year?

What should be the average minimum volume to justify the setting up of the new service?

(Detailed break-up of monthly revenues or costs is not essential.)

(7 Marks) Nov.10-O.C.

[Ans.: Total cost per booking: ₹4,32,000; Estimated Profit: Nil; Average Minimum Volume: 10800 p.a. (i.e. 900 p.m.)]

Question 18: A Company presently brings coal to its factory from a nearby yard and the rate paid for transportation of coal from the yard located 6km. away to factory is ₹50 per tonne. The total coal to be handled in a month is 24,000 tonne.

The Company is considering proposal to buy its own truck and has the option of buying either a 10 tonne capacity or a 8 tonne capacity truck.

The following information's are available:

Particulars	10 Tonne Truck	8 Tonne Truck
Purchase price	10,00,000	8,50,000
Life (year)	5	5
Scrap value at the end of the 5 th year	Nil	Nil
Km per liter of diesel	3	4
Repair/ Main. p.a. per truck	60,000	48,000
Other Fixed Expenses p.a	60,000	36,000
Lubricants & sundries per 100 km	20	20

Each truck will daily make 5 trips (to and fro) on an average for 24 days in month. Cost of Diesel ₹15 per liter.

Salary of Drivers ₹3, 000 per month- Two Drivers will be required for a Truck.

Other Staff expenses ₹1,08,000 p.a.

Present a comparative Cost Sheet on the basis of the above data showing transport cost per tonne of operating 10 tonne and 8 tonne Truck at full capacity utilization.

(12 Marks) Nov./98

[Ans.: Truck capacity 10 Tonne 8 Tonne
Cost per tonne (₹) 29.87 31.59]

Question 19: Modern Airways owns a single jet aircraft and operates between EXETOWN and WYETOWN. Flights leave EXETOWN ON Mondays and Thursdays and depart from WYETOWN on Wednesdays and Saturdays. Modern Airways cannot afford any more flights between EXETOWN and WYETOW. Only tourist class seats are available on its flights. An analyst has collected the following information:

Seating capacity per plane	360
Average passengers per flight	200
Flights per week	4
Flights per year	208
Average on-way fare	₹5,000
Variable fuel costs	₹1,40,000 per flight
Food service to passengers (not charged to passengers)	₹200 per passenger
Commission paid to travel agents paid by Modern Airways on each ticket booked on Modern Airways. (Assume that all Modern Airways tickets are booked by travel agents)	8% of fare
Fixed annual lease costs allocated to each flight	₹5,30,000 per flight
Fixed ground services (maintenance, check-in ,baggage handling) costs allocated to each flight	₹70,000 per flight
Fixed salaries of flight crew allocated to each flight	₹40,000 per flight

For the sake of simplicity, assume that fuel costs are unaffected by the actual number of passengers on flight

Required:

- What is the operating income that Modern Airways makes on each one-way flight between EXETOWN and WYETOWN?

- b. The market research department of Modern Airways indicates that lowering the average one-way fare to ₹4,800 will increase the average number of passengers per flight to 212. Should Modern Airways lower its fare?
- c. Zed Tours and Travels, a tour operator, approaches Modern Airways to charter its jet aircraft twice each month, first to take Zed's international tourists from EXETOWN TO WYETOWN and then bring the tourists back from WYETOWN to EXETOWN. If Modern Airways accepts the offer, it will be able to offer only 184 (208 minus 24) of its own flights each year. The terms of the charter are:
 - i. For each one-way flight Zed will pay Modern ₹7,50,000 to charter the plane and to use its flight crew and ground services staff.
 - ii. Zed will pay for fuel costs.
 - iii. Zed will pay for all food costs.

On purely financial considerations, should Modern Airways accept the offer from Zed Tours and Travel? What other considerations should Modern Airways consider in deciding whether or not charter its plane to Zed Tours and Travels?

(19 Marks) May/98

[Ans.: (a) ₹100000; (b) Excess contribution due to lowering of fare is ₹13792; (c) If, fares are not lowered then increase in contribution is ₹10000, although, if fares are lowered then reduction in contribution is ₹3792]

[Note: In part (c), suggested answers of ICAI has assumed that revenue from chartering shall be compared with contribution after lowering of fare. This assumption seems grossly wrong, because each part is to be considered independently & we shall compare revenue from chartering with contribution before lowering of fare (as done in next question of ICWA).]

Question 20: In order to develop tourism, Reliable Airline has been given permit to operate three flights to and fro in a week between Station A and Station B. The airline operates a single aircraft of 160 seats capacity. The normal occupancy is estimated at 60% throughout the year of 52 weeks. The one way fare is ₹7,000.

The costs of operation of flights are:

Fuel cost variable	₹95,000 per flight
Food served on board on non-chargeable basis	₹130 per passenger
Fixed costs:	
Aircraft lease	₹3,50,000 per flight
Crew, landing charges etc.	₹72,000 per flight
Commission	5% of fare applicable for all bookings.

Required:

- (i) Calculate the net operating income per flight.
- (ii) The airline expects that its occupancy will increase to; 108 passengers per flight if the fare is reduced to ₹6,720. Advise whether this proposal should be implemented.
- (iii) A travel agency firm proposes to charter the aircraft for one return trip (to and fro) in each month on payment of a fixed charge of ₹5 lakhs per flight.

The travel agency firm will meet the fuel and food costs. Should the airline accept this proposal?

[Ans.: (i) ₹108920; (ii) ₹580432; (iii) ₹30920]

[ICWA-June/2000]

Question 21: Aero Ltd. has hired an aircraft to specially operate between cities A and B. All the seats of the aircraft are economy class.

The following information is available :

Seating capacity of the aircraft	=320 passengers
Average number of passengers per flight	=240 passengers
Average one way fare from A to B	=₹5,000 per passenger
Variable fuel costs per flight from A to B	₹90,000
Food Cost (no charge to passenger)	₹300 per passenger
Commission to travel agents (All tickets are through agents)	10% of the fare

Annual lease costs allocated to each flight	₹2,00,000
Ground services, baggage handling / check-in services costs per flight A to B	₹40,000
Flight crew salaries per flight A to B	₹48,000

There is an offer from another airlines operator, Mid Air Ltd. for a stop-over at destination D, which is on the way from A to B. Due to this, the flight will operate from A to D, then D to B.

The following terms are to be considered for the stop-over:

50 seats will be booked by Mid Air at ₹2,500 per ticket, whether or not Mid Air is able to sell them to its customers. No agent's commission is payable on these tickets.

60 new passengers will be booked by Aero's travel agents for travel from A to D at a fare of ₹2,000 per passenger.

Since the stop-over wastes more time, 25 of Aero's original passengers from A to B will drop out and seek other airlines which fly directly from A to B.

Due to the stop-over, fuel costs will increase from ₹90,000 to ₹1,35,000, Additional airport landing/ baggage handling charges of ₹19,000 per stop-over will have to be incurred by Aero Ltd.

Aero Ltd. will have to serve snacks to all passengers in the D to B sector at no charge to passenger. Each snack will cost Aero Ltd. ₹200. This will be in addition to the original food at ₹300 served in the A to D sector.

You may assume that fuel costs are not affected by the actual number of passengers in a flight. You may ignore non-financial considerations, additional wear and tear to aircraft due to extra landing / take-off.

Without considering Mid Air's offer,

- (i) What is the profit earned by Aero Ltd. per flight from A to B?
- (ii) What is the break-even number of passengers for each flight from A to B?

Considering the effects of Mid Air's offer,

- (iii) Evaluate whether Aero should accept the offer.

(A detailed profitability statement is not essential, a relevant cost-revenue analysis would suffice)

[Ans.: (i) ₹6,30,000; (ii) 90 passengers; (iii) Net benefit ₹146000] (12 Marks) Nov./10-O.C.

[Assumption: In part (iii) 50 seats blocked by Mid Air are both for A to D & D to B. Further it is assumed that these seats will remain fully occupied, hence food cost & snacks costs also incur on such seats]

[Note: There seems some drafting error in part (iii) because per it tickets sold are 325 ({240-15} + 50 + 60) although seating capacity is of 320 passengers only.]

Question 22: A private university with a current enrolment of 12,000 students is reviewing cost and revenue data for the past academic year. Student tuition is ₹3,600 a year. Tuition normally covers 75 per cent of university expenditures. The remaining 25 per cent comes from endowments and contributions. During the last academic year fixed costs amounted to ₹300 lakhs. The rest of the costs varied with student enrolment. Costs have been rising more rapidly than tuition or contributions, and the university just broke even last year. A tuition increase is being contemplated. The budget committee thinks endowment revenues and contributions will remain constant at last year's level for the next several years.

The fixed costs are expected to increase by ₹30 lakhs and the variable costs are expected to increase by 10 per cent. The president of the university tells the budget committee that the expects a new grant of ₹50 lakhs in addition to the normal contributions for each of the next 5 years from a large corporation owned by an alumnus of the university. The university has been postponing a number of major capital improvements and building projects.

Required:

- (i) If the grant is received and tuition is raised to ₹4,200, how much money would the university have available in the first year for capital improvements and building with student enrolment of 11,200 and the expected cost increases?
- (ii) If the grant is received and costs increases as predicted for the coming year, what tuition should the university charge to break-even with its current enrolment of 12,000 students after providing ₹40.40 lakhs for capital improvements?

[Ans.: ₹5104000; ₹4000 per student]

Question 23: DD amusement Park charges ₹4 each for all rides in the park. Variable costs amount to ₹0.80 per ride and fixed costs are ₹32, 00,000. last year's net income was ₹6, 40,000 on sales of ₹48, 00,000. Rising costs have cut sharply into net income for DD for the last 2 years. This year management again expects a cost increase of 25 per cent in variable costs and 10 per cent in fixed costs. To help offset these increases, the management is considering raising the price of a ride to ₹5.

Required:

- (i) How many rides did DD sell last year?
- (ii) If the price increase is not implemented, what is the expected net income from this year assuming the same volume of activity?
- (iii) Compute the price in difference point for the new ride price.
- (iv) Compute the Break-even point for this year using the old price and the new price.
- (v) Should management raise the price of a ride, if the price increase will reduce ride volume 10 per cent from the last years' level? In that situation, what will be the expected net income?

[Ans.: (i) 1200000; (ii) 80000 (iii) 1040000 (iv) At old price: 1173334; At new price: 880000 (v) 800000]

Question 24: A city health centre provides health and other related services to the citizens who are covered under insurance plan. The health centre receives a payment from the insurance company each time any patient attends the centre for consultation as under:

Consultations involved	Payment from Insurance company
No treatment	₹ 60
Minor treatment	250
Major treatment	500

In addition, the adult patients will have to make a co-payment which is equivalent to the amount of payment for the respective category of treatment made by the insurance company. However, children and senior citizens are not required to make any such co-payment.

The health centre will remain open for 6 days in a week for 52 weeks in a year. Each physician treated 20 patients per day although the maximum number of patients that could have been treated by a physician on any working day is 24 patients.

The health centre received a fixed income of ₹225280 per annum for promotion of health products from the manufacturers.

The annual expenditure of the health centre is estimated as under:

Materials and consumables (100% variable) ₹2232000

Staff salaries per annum per employee (fixed):

Physician ₹450000

Assistants ₹150000

Administrative staff ₹90000

Establishment and other operating costs (fixed) ₹1600000

The non-financial information is as under

- (i) Staff:

No. of physicians employed 6

Assistants 7

Administrative staff 2

(ii) Patient Mix:	
Adults	50%
Children	40%
Senior Citizens	10%
(iii) Mix of patients appointments (%)	
Consultation requiring no treatment	70%
Minor treatment	20%
Major treatment	10%

Required:

- (a) Calculate the Net Income of the city health centre for the next year.
- (b) Determine the percentage of maximum capacity required to be utilized next year in order to break even.

(8 Marks) Nov./08-O.C.

[Ans.:(i) ₹438000 (ii) 77%]

[Assumption: Patient mix and mix of patient appointments will be same in the next year.]

Question 25: A Multinational company runs a Public Medical Health Centre. For this purpose, it has hired a building at a rent of ₹10,000 per month with 5% of total taking*. Health centre has three types of wards for its patients namely. General ward, Cottage ward and Deluxe ward. State the rent to be charged to each bed-day for different type of ward on the basis of the following information:

- (i) The number of beds of each type are General ward 100, Cottage ward 50, Deluxe ward 30.
- (ii) The rent of Cottage ward bed is to be fixed at 2.5 times of the General ward bed and that of Deluxe ward bed as twice of the Cottage ward bed.
- (iii) The occupancy of each type of ward is as follows:
General ward 100%, Cottage ward 80% and Deluxe ward 60%. But, in general ward there were occasions when beds are full, extra beds were hired at a charges of ₹20 per bed. The total hire charges for the extra beds incurred for the whole year amount to ₹12,000.
- (iv) The Health Centre engaged a heart specialist from outside and on an average fees paid to him was ₹15,000 per trip. He makes three trips in the whole year.

- (v) The other expenses for the year were as under:

Salary of Supervisors, Nurses, Ward boys	₹ 4,25,000
Repairs and maintenance	90,000
Salary of doctors	13,50,000
Food supplied to patients	40,000
Laundry charges for their bed linens	80,500
Medicines supplied	74,000
Cost of oxygen, X-ray etc. other than directly borne for treatment of patients	49,500
General administration charges	63,000

- (vi) Provide profit @ 20% on total taking*.

- (vii) The Health Centre imposes 8% service tax on rent received.

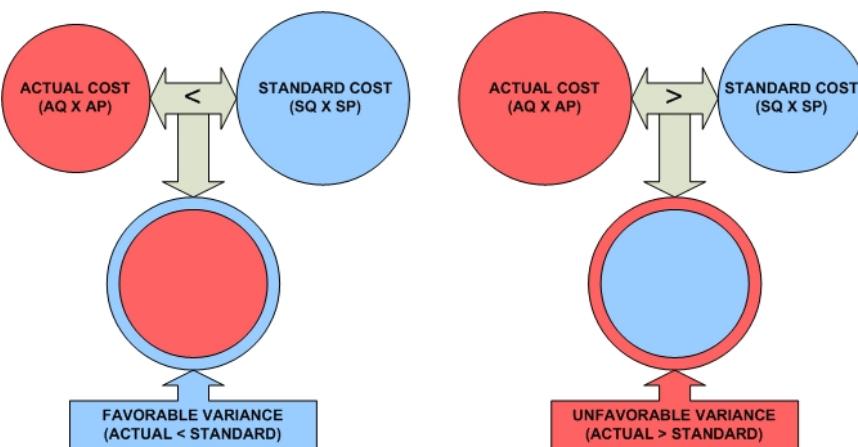
- (viii) 360 days may be taken in a year.

(12 Marks) Nov./06

[Ans.:	General ward	₹32.22	₹33.10*
	Cottage ward	₹80.55	₹82.76*
	Deluxe ward	₹161.08	₹165.51*

*If total taking includes Service Tax]

5



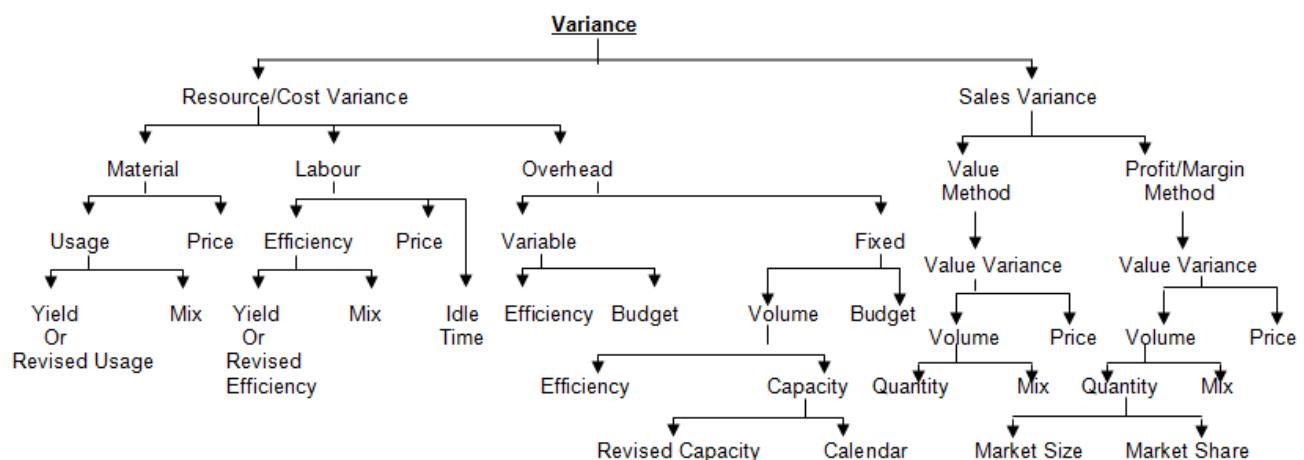
Standard Costing & Variance Analysis

CIMA defines standard cost as "a standard expressed in money. It is built up from an assessment of the value of cost elements. Its main uses are providing bases for performance measurement, control by exception reporting, valuing stock & establishing selling price."

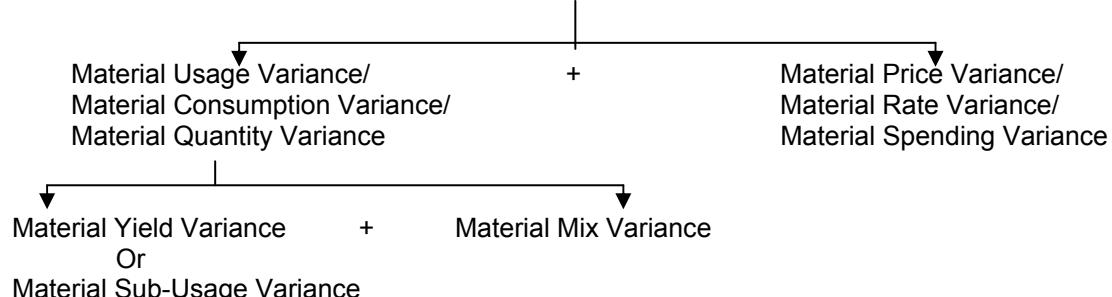
The term **static budget** refers to the budget that is prepared at the **beginning** of the budgeting period and is **valid for only the planned level of activity**.

A **flexible budget** provides estimates of what costs should be for **any level of activity** within a specified range.

A static budget is **suitable for planning**, but it is inadequate for evaluating how well costs are controlled because the actual level of activity is unlikely to equal the planned level of activity, thus resulting in "**apples-to-oranges**" cost comparisons. Flexible budget, when used for performance evaluation purposes, actual costs are compared to **what the costs should have been for the actual level of activity** during the period. This enables "apples-to-apples" cost comparisons.



Direct Material Cost Variance



1. Total Material Cost Variance (TMCV)

TMCV = (Standard Qty × Standard Rate) – (Actual Qty Purchased^a × Actual Rate)
OR

= Standard Cost for Actual Output – Actual Cost for Actual Output

2. Material Usage Variance (MUV)

MUV = (Standard Qty for Actual Output – Actual Qty Used) × Standard Rate

3. Material Price Variance (MPV)

MPV = [Standard Price (Rate) – Actual Price (Rate)] × Actual Quantity Purchased^a

^a**Note:** [There are two approaches of taking Actual Quantity while calculating TMCV & MPV. (i) Quantity is taken as quantity purchased (ii) Quantity is taken as quantity used.]

Remember, since price variance is reported in the period in which it is incurred it is recommended to use quantity purchased approach.

If quantity purchase is not equal to quantity used then, $TMCV \neq MUV + MPV$

If quantity purchase is not equal to quantity used & question is silent, you are supposed to write assumption about the approach used for taking actual quantity.]

4. Material Yield Variance (MYV)

MYV = (Actual Output/Yield – Std. Output for Actual Mix) × Std. price per unit of output
= (Actual Output – [c]) × [b]

Where, Std. price per unit of Output = $\frac{\text{Total Standard Cost of Input}}{\text{Total Standard Output}}$

OR

Material Sub-Usage Variance (MSUV)

MSUV = (Std. Quantity for actual output – Revised Std. Quantity) × Standard Price

Revised Standard Qty = $\frac{\text{Total Qty of Actual Mix} \times \text{Std. Qty}}{\text{Total Qty in Std. Mix}}$

5. Material Mix Variance (MMV)

Main Formula:

MMV = (Revised Standard Quantity – Actual Quantity) × Standard Price

Rarely used Alternate Formula:

MMV = (Std. Rate of Std. Mix – Std. Rate of Actual Mix) × Total Actual Mix

Where, Std. Rate of Std. Mix = $\frac{\text{Total Std. Cost for Actual Output}}{\text{Total Std. Quantity}}$

&, Std. Rate of Actual Mix = $\frac{\text{Total Actual Qty at Std. Rate}}{\text{Total Actual Qty}}$

- All Material Variances save Yield Variance are calculated as Std. – Actual. Yield Variance is calculated as Actual – Std.
- All Material Variances save Yield Variance are calculated on Input quantity. Yield Variance is calculated for Production.

Question 1: Actual Output is 90 kgs., Standard mix for material A, B, & C is 50%, 30%, & 20% @ ₹2 per kg, ₹3 per kg and ₹4 per kg respectively. Standard Normal Loss is 10%. Actual quantity used is 60 kgs @ ₹4 per kg of A, 50 kgs @ ₹2 per kg of B, & 10 kgs @ ₹3 per kg of C. Calculate all material variances.

[Ans.: MCV: 100(A); MPV: 60(A); MUV: 40(A); MMV: 14(F); MYV: 54(A)]

Question 2: A Ltd. produces an article by blending 2 raw materials. The following standards have been set up for raw materials:

Material	Standard Mix	Standard Price (₹ per kg.)
A	40%	4
B	60%	3

The standard loss in processing is 15%. During Sept'08, the company produces 1700 units of finished goods. The position of stock and purchases for the month of Sept'08 is as under:

Material	Stock on 1-9-08	Stock on 30-9-08	Purchases during Sept'08
			Kg. Cost ₹
A	35	5	800 3400
B	40	50	1200 3000

Calculate all material variances. Assume FIFO for the issue of material. The opening stock is to be valued at standard price.

[Ans.: MUV: 90(A); MMV: 22(A); MYV: 68(A); On the basis of purchase - MCV: 400(F); MPV: 400(F); On the basis of usage - MCV: 286(F); MPV: 376(F)]

Question 3: The standard cost for producing 180 kgs of a product whose raw material inputs are A and B is given below:

	Standard Cost (₹)
Material A 60 kgs @ ₹10 per kg	600
Material B 140 kgs @ ₹2 per kg	280
	880

The actual prices of A and B were ₹12 and ₹8 per kg respectively. Consumption of B was 108 kg. The actual output at 80% yield was 144 kg.

Calculate the following direct material variances:

- (i) Mix variance
- (ii) Yield variance
- (iii) Price variance
- (iv) Usage variance

[Ans.: (i) 144(A); (ii) 88(A); (iii) 792(A); (iv) 232(A)]

(5 Marks) Nov./10-O.C.

Question 4: The standard set for a chemical mixture of a firm is as under:

Material	Standard mix %	Standard price per kg (₹)
A	40	60
B	60	30

The standard loss in production is 10 %. During a period, the actual consumption and price paid for a good output of 182 kg. are as under:

Material	Quantity in kg.	Actual price per kg (₹)
A	90	18
B	110	34

Calculate the variances.

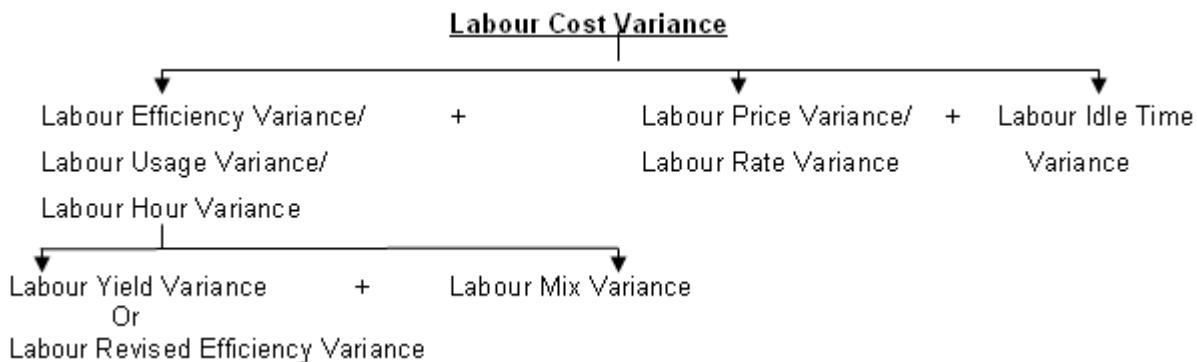
[Ans.: MCV: 3100.30(F); MPV: 3340(F); MUV: 206.70(A); MMV: 300(A); MYV: 93.30(F)]

Question 5: The standard quantity of material required is 4 kgs. per unit of actual output. The relevant figures are as under:

Material	A	B	C	D
Standard mix %	30%	40%	20%	10%
Price per kg. (₹)	1.25	1.50	3.50	3.00
Actual qty. used (Kg.)	1,180	1,580	830	440
Actual price per kg. (₹)	1.30	1.80	3.40	3.00
Actual output: 1,000 units				

Calculate price variance, mix variance, sub-usage variance and total material cost variance.

[Ans.: MCV: 620(A); MPV: 450(A); MUV: 170(A); MMV: 110.75(A); MSUV: 59.25(A)]



1. Labour Cost Variance (LCV):

$$LCV = \text{Standard Labour Cost} - \text{Actual Labour Cost}$$

OR

$$= (\text{Standard Hours} \times \text{Standard Rate}) - (\text{Actual Hours}^b \times \text{Actual Rate})$$

2. Direct Labour Efficiency Variance (LEV):

$$LEV = (\text{Standard Hours for actual output} - \text{Actual Hours}^b) \times \text{Standard Rate}$$

3. Labour Rate Variance (LRV):

$$LRV = (\text{Standard Rate} - \text{Actual Rate}) \times \text{Actual Hours}^b$$

4. Idle Time Variance (ITV):

$$ITV \text{ (Always Adverse)} = \text{Idle Hours} \times \text{Standard Rate}$$

^b**Note:** In case we are not supposed to calculate idle time variance then we will calculate 3 labour variances (i.e. Labour Cost, Rate & Efficiency variance) at actual hours worked otherwise, Labour Cost & Rate variance will be calculated on actual hours paid basis & efficiency variance is calculated on actual hours worked basis.

5. Labour Yield Variance (LYV)

$$LYV = (\text{Actual Output/Yield} - \text{Std. Output for Actual Mix of Labour Worked}) \times \text{Std. price per unit of output}$$

Where,

$$\text{Std. price per unit of Output} = \frac{\text{Total Standard Cost of Input Labour Hours}}{\text{Total Standard Output}}$$

OR

Labour Revised Efficiency Variance (LREV)

$$LREV = (\text{Std. Hours for actual output} - \text{Revised Std. Hours Worked}) \times \text{Standard Price}$$

$$\text{Revised Standard Hrs.} = \frac{\text{Total Hrs Worked of Actual Mix} \times \text{Std. Hrs.}}{\text{Total Hrs. in Std. Mix}}$$

6. Labour Mix Variance (Gang Variance) or (Composite Variance):

$$LMV = (\text{Revised Std. Hrs. Worked} - \text{Actual Hours Worked}) \times \text{Standard Price}$$

- Actual Hours Worked = Actual Hours Paid – Idle Time
- All Labour Variances save Yield Variance are calculated as Std. – Actual. Yield Variance is calculated as Actual – Std.
- All Labour Variances save Yield Variance are calculated on Input hours. Yield Variance is calculated for Production.
- Since CIMA terminology doesn't define Labour Yield Variance, so until question specifically demands, it is recommended to find Labour Revised Efficiency variance instead of Labour Yield Variance.

Question 6: 100 skilled workmen, 40 semi-skilled workmen and 60 unskilled workmen were to work for 30 weeks to get a contract job completed. The standard weekly wages were ₹60, ₹36 and ₹24 respectively. The job was actually completed in 32 weeks by 80 skilled, 50 semi-skilled and 70 unskilled workmen who were paid ₹65, ₹40 and ₹20 respectively as weekly wages.

Find out the labour cost variance, labour rate variance, labour mix variance and labour efficiency variance.

[Ans.: LCV: 8800(A); LRV: 10240(A); LEV: 1440(F); LMV: 19200(F)]

Question 7: Given the following data, compute the variances.

	Skilled	Semi-Skilled	Unskilled
Number of workers in standard gang	16	6	3
Standard rate per hour	3	2	1
Actual number of workers in the gang	14	9	2
Actual rate of pay per hour (₹)	4	3	2

In a 40-hour week, the gang as a whole produced 900 standard hours. (10 Marks) Nov/09-NC-Adapted

[Ans.: LCV: 1212(A); LEV: 212(A); LRV: 1000(A); LREV: 252(A); LMV: 40(F)]

Question 8: A firm gives you the following data:

Standard time per unit	2.5 hours
Actual hours paid	2,000 hours
Standard rate of pay	₹2 per hour
25 % of the actual hours has been lost as idle time.	
Actual output	1,000 units
Actual wages	₹4,500

Calculate the idle time variance.

[Ans.: LCV: 500(F); LRV: 500(A); LEV: 2000(F); ITV: 1000(A)]

[Note: All variances other than idle time variance are calculated just for practice]

Question 9: The following details are available from the records of A Ltd. engaged in manufacturing article A for the week ended 28th Feb.

Particulars	Hours	Rate per hour (₹)	Total
Skilled labour	10	3	30
Semi-skilled labour	8	1.50	12
Unskilled labour	16	1	16
			58

The actual production was 1000 articles A for which the actual hours worked and rates are given below:

Particulars	Hours	Rate per hour (₹)	Total
Skilled labour	9000	4	36000
Semi-skilled labour	8400	1.50	12600
Unskilled labour	20000	0.90	18000
			66600

From the above set of data, you are asked to calculate: (i) Labour cost variance (ii) Labour rate variance (iii) Labour efficiency variance (iv) Labour yield variance (v) Labour mix variance.

[Ans.: 8600 (A), 7000 (A), 1600(A), 5800 (A), 4200 (F)]

FACTORY OVERHEAD VARIANCE

Variable Factory Overhead Variance Fixed Factory Overhead Variance

- 1. Overheads are usually measured in relation to output if details of input quantities on which these variable overheads have been incurred are not readily available.
- 2. Overheads are calculated on Actual Hours/Days **Worked**.
- 3. Under-absorption = Adverse Variance & Over-absorption = Favourable Variance
- 4. Remember if Cost-allocation base is specified, we will only take the specified cost allocation for absorption purpose otherwise, if question is silent, Variable overheads are absorbed on actual hours.

1) Std. Overhead Rate per unit	=	<u>Budgeted Overheads</u> <u>Budget Output</u>
2) Std. Overhead Rate per hour	=	<u>Budgeted Overheads</u> <u>Budget Hours</u>
3) Std. Hours for actual output	=	<u>Budgeted Hours×Actual Output</u> <u>Budgeted Output</u>
4) Std. Output for actual time	=	<u>Budgeted Output×Actual Hours</u> <u>Budgeted Hours</u>
5) Recovered/Absorbed Overheads	=	Std. Rate per unit×Actual Output Std. Rate per hour×Std. Hours for actual output
6) Budgeted Overheads	=	Std. Rate per unit×Budgeted Output Std. Rate per hour×Budgeted hours
7) Standard Overheads	=	Std. Rate per hour×Actual Hours Std. Rate per unit×Std. Output for actual time
8) Possible Overheads	=	Std. Rate per day×Actual Days Std. Rate per hour×Std. hrs. per day×Actual Days
9) Actual Overheads	=	Actual Rate per unit×Actual Output Actual Rate per hour×Actual Hours

- o **Variable Factory Overhead**

Variable Cost Variance

Variable Overhead Efficiency Variance / + Variable Overhead Expense Variance
Variable Overhead Hour Variance Variable Overhead Rate Variance

1. **Variable Overhead Cost Variance (VOCV):**
VOCV = Standard Cost – Actual Cost

2. **Variable Overhead Efficiency Variance (VOHV):**

VOHV = (Budgeted units of variable overhead cost allocation base allowed for actual output - Actual units of variable overhead cost allocation base for actual output) × Budgeted Variable Overhead Rate
= (Standard Hours for actual output – Actual Hours) × Standard Rate

3. **Variable Overhead Expense Variance (VOEV):**

$$\begin{aligned} \text{VOEV} &= (\text{Budgeted Variable Overhead Rate} - \text{Actual Variable Overhead Rate}) \times \text{Actual units of variable overhead cost allocation base for actual output} \\ &= (\text{Standard Rate} - \text{Actual Rate}) \times \text{Actual Hours} \end{aligned}$$

Question 10: XYZ Company has established the following standards for variable factory overhead.

Standard hours per unit : 6

Variable overhead per hour : ₹2/-

The actual data for the month are as follows:

Actual variable overheads incurred	₹2,00,000
Actual output (units)	20,000
Actual hours worked	1,12,000

Required:

Calculate variable overhead variances viz :

- (i) Variable overhead variance.
- (ii) Variable overhead budget variance.
- (iii) Variable overhead efficiency variance.

[Ans.: (i) 40000(F); (ii) 24000(F); (iii) 16000(F)]

Question 11: The following information has been extracted from the books of Goru Enterprises which is using standard costing system:

Actual output	= 9,000 units
Direct wages paid	= 1,10,000 hours at ₹22 per hour, of which 5,000 hours, being idle time, were not recorded in production
Standard hours	= 10 hours per unit
Labour efficiency variance	= ₹3,75,000 (A)
Standard variable Overhead	= ₹150 per unit
Actual variable Overhead	= ₹16,00,000

You are required to calculate:

- (i) Idle time variance
- (ii) Total variable overhead variance
- (iii) Variable overhead expenditure variance
- (iv) Variable overhead efficiency variance

(6 Marks) May/08

[Ans.: (i) 125000(A), (ii) 250000(A) (iii) 25000(A) (iv) 225000(A)]

Question 12: Z Ltd. uses standard costing system in manufacturing of its single product 'M'. The standard cost per unit of M is as follow:

Direct material	- 2 meters @ ₹6 per meters	12.00
Direct labour	- 1 hour @ ₹4.40 per hours	4.40
Variable overhead	- 1 hour @ ₹3 per hour	3.00
		19.40

During July 2004, 6000 units of M were produced and the related data are as under:

Direct material acquired	- 19000 meters @ 5.70 per meters.
Material consumed	- 12670 meters.
Direct labour - ? hour @ ₹? Per hour	₹27,950
Variable overhead incurred	₹20,475

The variable overhead efficiency variable is ₹1,500 adverse. Variable overhead are based on direct labour hour. There are no stock of raw material in the beginning.

You are required to compute the missing figures and work out all the relevant variances.
Compute of standard cost and actual costs

(Nov./93)

[Ans.:

Material cost variance	₹36,300(A)	Material price variance	₹5,700(F)
Material usage variance	₹4,020(A)	Labour cost variance	₹1,550(A)
Labour rate variance	₹650 (F)	Labour efficiency variance	₹2,200(A)
Variable overhead variance	₹2,475(A)	Variable overhead efficiency variance	₹1,500(A)
Variable overhead budget variance	₹975(A)]		

Question 13: Mr. M provides the following information relating to 1,000 units of product 'ZED' during the month of April, 1998

Standard price per kg. of raw material – ₹3

Actual total direct material cost – ₹10,000

Standard direct labour hours – 1,600

Actual direct labour hours – 1,800

Total standard direct labour cost – ₹8,000

Standard variable overhead per direct labour hour – Re.1

Standard variable overhead cost per unit of ZED – ₹1.60

Total standard variable overheads – ₹1,600

Actual total variable overheads – ₹1,620

The material usage variance is ₹600 (adverse) and the overall cost variance per unit of ZED is Re.0.07 (adverse) as compared to the total standard cost per unit of ZED of ₹21.

You are required to compute the following:

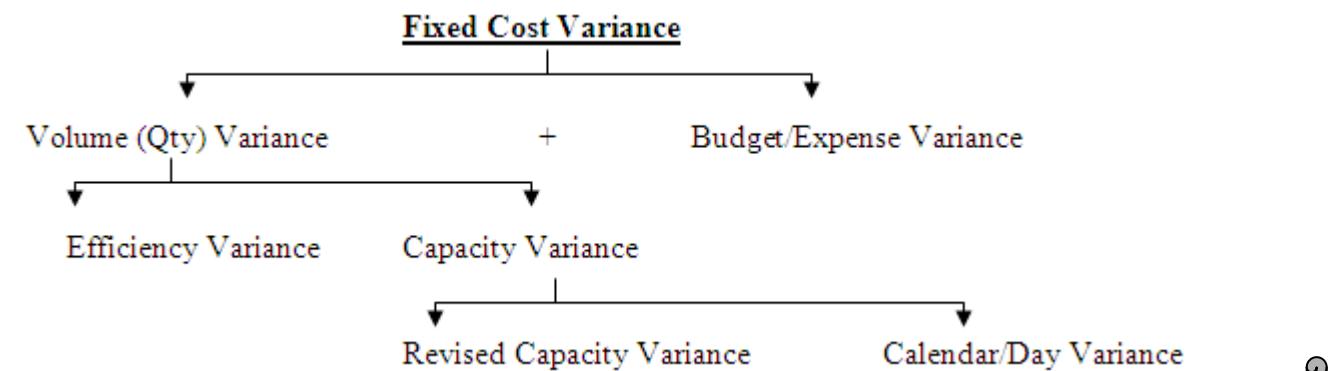
- (a) Standard quantity of raw-material per unit of ZED.
- (b) Standard direct labour rate per hour.
- (c) Standard direct material cost per unit of ZED.
- (d) Standard direct labour cost per unit of ZED.
- (e) Standard total material cost for the output.
- (f) Actual total direct labour cost for the output
- (g) Material price variance.
- (h) Labour rate variance.
- (i) Labour efficiency variance.
- (j) Variable overhead expenditure variance.
- (k) Variable overheads efficiency variance.

(May/93)

[Ans.:

Standard quantity of raw material per unit of ZED	3.8 Kgs.	Standard direct labour rate per hour	₹5
Standard direct material cost per unit of ZED	₹11.40	Standard direct labour cost per units of ZED	₹8
Standard total material cost for the output	11,400	Actual total direct labour cost for the output	9,450
Material price variance	₹2,000(F)	Labour rate variance	₹450 (A)
Labour efficiency variance	₹1,000(A)	Variable overhead expenditure variance	₹180(F)
variable overhead efficiency variance	₹200(A)		

- **Fixed Overhead Variance**



- In case we are supposed to calculate Calendar Variance then we will calculate Revised Capacity Variance along with Calendar Variance but will name it as Capacity Variance rather than Revised Capacity Variance. We will not calculate capacity variance in such case.

1. **Fixed Overhead Cost Variance (FOCV):**

$$\text{FOCV} = \text{Absorbed Overhead} - \text{Actual Overhead}$$

2. **Fixed Overhead Volume Variance (FOVV):**

$$\text{FOVV} = \text{Absorbed Overhead} - \text{Budgeted Overhead}$$

3. **Fixed Overhead Budget Variance (FOBV):**

$$\text{FOBV} = \text{Budgeted Overhead} - \text{Actual Overhead}$$

4. **Fixed Overhead Efficiency Variance (FOEV):**

$$\begin{aligned}\text{FOEV} &= \text{Absorbed Overhead} - \text{Standard Overhead} \\ &= (\text{Std. Hours for Actual Output} - \text{Actual Hrs Worked}) \times \text{Std. Overhead per Hour}\end{aligned}$$

5. **Fixed Overhead Capacity Variance (FO Cap V):**

$$\begin{aligned}\text{FO Cap V} &= \text{Standard Overhead} - \text{Budgeted Overhead} \\ &= (\text{Actual Hrs} - \text{Budgeted Hours}) \times \text{Std. Overhead per hour}\end{aligned}$$

6. **Fixed Overhead Revised Capacity Variance (FORCV):**

$$\begin{aligned}\text{FORCV} &= \text{Standard Overhead} - \text{Possible Overhead} \\ &= (\text{Actual Hrs per Day} - \text{Std. Hrs. per Day}) \times \text{Actual Days Worked} \times \text{Std. Overhead per hour}\end{aligned}$$

7. **Fixed Overhead Day/Calendar Variance (FODV):**

$$\begin{aligned}\text{FODV} &= \text{Possible Overhead} - \text{Budgeted Overhead} \\ &= (\text{Actual Days Worked} - \text{Std. Days}) \times \text{Std. Hours per Day} \times \text{Std. Overhead per hour} \\ &= (\text{Actual Days Worked} - \text{Standard Days}) \times \text{Standard Overhead per Day}\end{aligned}$$

Question 14: Budgeted No. of working days

24

Budgeted No. of hours per month

12,000

Fixed overhead rate

Re.0.50 per hour

Actual No. of working days in June

25

Compute the calendar variance

[Ans.: FODV: 250(F)]

Question 15: Assuming the expenses to be fixed, calculate from the following data:

- (a) Efficiency variance, (b) Volume variance, (c) Calendar variance and (d) Expense variance

	Budget	Actual
No. of working days per month	20	22
Man hours per day	8,000	8,400
Output per man hour in units	1.0	1.2
Standard overhead rate per man hour	₹2	
Actual fixed expenses per month		₹3,25,000

[Ans.: (a) 73920(F); (b) 123520(F); (c) 32000(F); (d) 5000(A)]

Question 16: You are given the following data:

	Budgeted	Actual
Fixed overhead for July	₹10,000	₹10,200
Units of production in July	5,000	5,200

Standard time for one unit 4 hours
 Actual hours worked 20,100 hours

Calculate all variances relating to fixed overheads

[Ans.: FOCV: 200(F); FOBV: 200(A); FOVV: 400(F); FO Cap V: 50(F); FOEV: 350(F)]

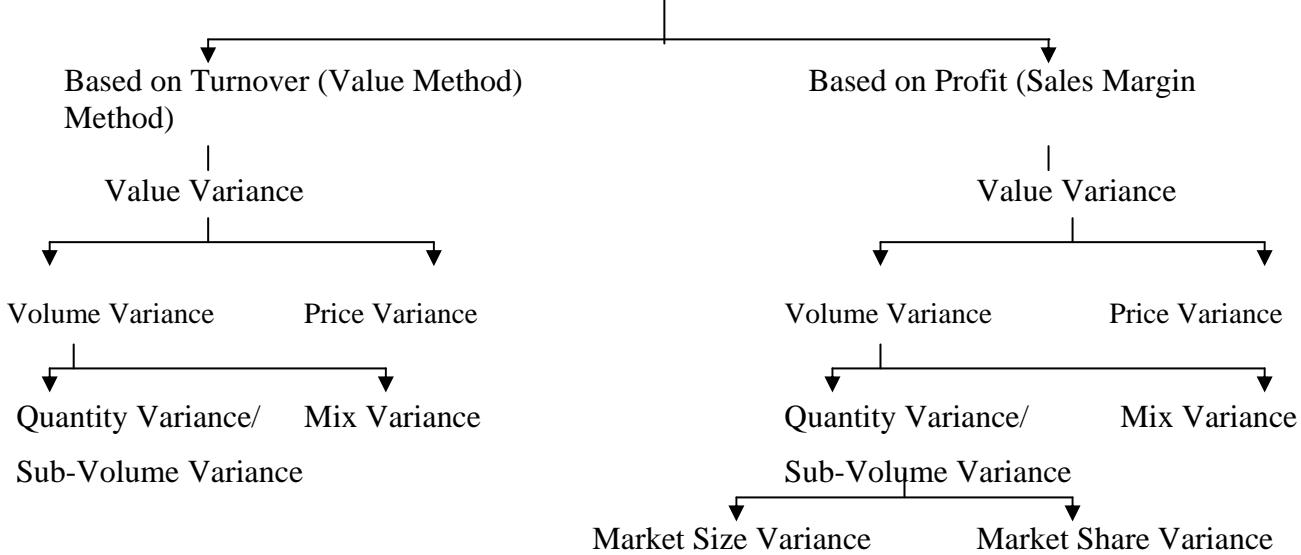
Question 17: ABC limited provides the following information for April, 2002:

	Budget	Actual
Number of working day	20	21
Man hours	40,000	43,000
Output per manhour (unit)	3.2	3.0
Overhead – Fixed (₹)	32,000	31,500
Variable (₹)	1,02,400	1,14,400

Required

Compute variable overhead, fixed overhead variance and total overhead variance (12 Marks) May/02
 [Ans.: Total variable overhead variable ₹11,200(A); Variable overhead expenditure variance ₹4320(A); Variable overhead efficiency variance ₹6,880(A); Fixed overhead expenditure variance ₹500(F); Fixed overhead volume variance ₹250(F); Fixed overhead efficiency variance ₹2150(A); Fixed overhead capacity variance ₹800(F); Calendar variance ₹1600(F); Total overhead variance ₹10450(A)]

Sales Variance:



Sales Variances are calculated in same way as that of Material Variances save Material Variances are calculated as Std. – Actual & Sales variances are calculated as Actual – Std.

Based on Turnover:

1. Sales Value Variance (SVV)

$$SVV = \text{Actual Sales} - \text{Budgeted Sales}$$

2. Sales Volume Variance (S Vol V)

$$\begin{aligned} SVV &= \text{Standard Sales} - \text{Budgeted Sales} \\ &= (\text{Actual Sales Qty} - \text{Budgeted Sales Qty}) \times \text{Standard Sale Price} \end{aligned}$$

3. Sales Price Variance (SPV)

$$\begin{aligned} SPV &= \text{Actual Sales} - \text{Standard Sales} \\ &= [\text{Actual Price (Rate)} - \text{Standard Price (Rate)}] \times \text{Actual Quantity Sold} \end{aligned}$$

4. Sales Mix Variance (SMV)

$$SMV = \text{Std. Sales} - \text{Revised Std. Sales}$$

Based on Quantity : Products are Homogenous (Better Approach)
 $SMV = (\text{Actual Qty sold} - \text{Revised Std. Quantity}) \times \text{Standard Selling price}$
 Where, Revised Std. Qty. = $\frac{\text{Total Qty of Actual Mix} \times \text{Std. Quantity}}{\text{Total Quantity of Std. Mix}}$

Based on Value : Products are not Homogenous
 $SMV = \text{Std. Sales} - \text{Revised Std. Sales}$

Where, Revised Std. Sales = Budgeted Ratio of Sales \times Std. Sales
 & Budgeted Ratio of Sales = $\frac{\text{Budgeted Sales of Product}}{\text{Total Budgeted Sales}}$

5. Sales Quantity Variance (SQV)

$$SQV = \text{Revised Std. Sales} - \text{Budgeted Sales}$$

Based on Profit:

These are exactly same as sales variance (based on turnover). Std. Selling Price is replaced with Std. Margin & Actual Selling Price by Actual Margin, but Std. Margin = Std. Selling Price – Std. Cost & Actual Margin = Actual Selling Price – Standard Cost

Question 18: Compute the sales turnover variances from the following figures: -

Product	Budget		Actual	
	Quantity	Price ₹	Quantity	Price ₹
A	2,000	2.50	2,400	3.00
B	1,500	5.00	1,400	4.50
C	1,000	7.50	1,200	7.00
D	500	10.00	400	10.50

[Ans.: SVV: 1100(F); SPV: 100(F); S Vol V: 1000(F); SMV: 1000(A); SQV: 2000(F)]

Question 19: A Trident Toys Ltd. had drawn up the following sales budget for August, 2004 :-

'Bravo' Toys	5,000 units at ₹100 each
'Champion' Toys	4,000 units at ₹200 each
'Super ' Toys	6,000 units at ₹ 180 each

The actual sales for August, 2004 were:

'Bravo' Toys	5,750 units at ₹120 each
'Champion ' Toys	4,850 units at ₹180 each
'Super ' Toys	5,000 units at ₹165 each

The cost per unit of Bravo , Champion and super Toys were ₹90, ₹170, ₹130 respectively .

Analyse the variance to show:

- (a) the effect on turnover
 - (1) Sales price variance
 - (2) Sales mix variance
 - (3) Sales quantity variance
 - (4) Total sales value variance
- (b) the effect on profit :
 - (1) Sales margin : price variance
 - (2) Sales margin : mix variance
 - (3) Sales margin : quantity variance
 - (4) Total sales margin variance

(Nov/91)

[Ans.:

Sales price variance	₹57,000(A)	Sales mix variance	₹30,200(A)
Sales Quantity Variance	₹95,200(F)	Total sales value variance	₹8,000(F)
Sales margin price variance	₹57,000(A)	Sales margin mix variance	₹35,800(A)
Sales margin quantity variance	₹18,800(F)	Total sales margin variance	₹74,000 (A)

Market Size Variance = (Budgeted mkt. share %) × (Actual Industry sales volume in units – Budgeted industry sales volume in units) × (Budgeted Avg. Contribution margin per unit)

Market Share Variance = (Actual Mkt. Share % - Budgeted Mkt. Share %) × (Actual industry sales volume) × (Budgeted Average Contribution Margin per unit)

Question 20: Super computers manufactures and sells three related PC models:

1. PC — Sold mostly to college students
2. Portable PC— Smaller version of PC positioned as home computer
3. Super PC — Sold mostly to business executives

Budgeted and actual data for 1995 is as follows:

Budget for 1995				
	Selling Price per Unit	Variable Cost per Unit	Contribution margin per Unit	Sales Volume in Units
	₹	₹	₹	
PC	24,000	14,000	10,000	7,000
Portable PC	16,000	10,000	6,000	1,000
Super PC	1,00,000	60,000	40,000	2,000
				10,000

	Actual for 1995			
	Selling Price per Unit	Variable Cost per Unit	Contribution margin per Unit	Sales Volume in Units
PC	₹ 22,000	₹ 10,000	₹ 12,000	8,250
Portable PC	₹ 13,000	₹ 8,000	₹ 5,000	1,650
Super PC	₹ 70,000	₹ 50,000	₹ 20,000	1,100
				11,000

Super computers derived its total unit sales budget for 1995 from the internal management estimate of a 20% market share and an industry sales forecast by computer manufacturers association of 50,000 units. At the end of the year the association reported actual industry sales of 68,750 units.

Required:

- (i) Compute the individual product and total sales volume variance.
- (ii) Compute total sales quantity variance.
- (iii) Compute the market size and market share variances.
- (iv) Compute individual product and total sales mix variances.
- (v) Comment on your results.

(15 Marks) May/96

[Ans.: (i) PC: 12500000(F); Portable PC: 3900000(F); Super PC: 3600000(A); (ii) 15600000(F); (iii) 58500000(F) & 42900000(A); (iv) PC: 5500000(F); Portable PC: 3300000(F); Super PC: 4400000(A)]

[Note: Since question is silent that whether sales variances are supposed to calculated on the basis of value or margin, we can calculate it on either basis]

Reconciliation Statement:-

Operating statement is prepared to reconcile the actual profit with the budgeted profit

Particulars	Favorable	Unfavorable	(₹)
Budgeted Profit :			
Add Favorable variances & Deduct Unfavorable variances			
Sales Variances :			
Sales Margin price variance			
Sales Margin mix variance			
Sales Margin qty. variance			
Total:			
Cost variance :-			
Material :			
Price variance			
Yield variance			
Mix variance			
Labour :			
Rate variance			
Mix variance			
Yield variance			
Idle time variance			
Variable overhead variance :			
Expenditure variance			
Efficiency variance			
Fixed overhead variance :			
Expenditure variance			
Efficiency variance			
Capacity variance			
Calendar variance			
Total Cost Variances:			
Actual Profit :			

1. Whenever we are following Marginal Costing instead of Absorption costing, Fixed overhead expenditure variance = Fixed overhead cost variance & Fixed overhead volume variance or any of its sub-parts can not be calculated in such cases. Also, while calculating sales margin variances, Std. Margin = Std. Selling Price – **Std. Variable Cost** & Actual Margin = Actual Selling Price – **Std. Variable Cost**
2. Standard Profit = Actual Output × Standard Margin p.u.
3. If question has provided information about Selling and administration expense, it should be ignored. Reconciliation statement should be prepared showing actual profit before Selling and distribution. After this, amount of selling and distribution expenses should be deducted to arrive at the figure of actual profit for the month. Remember, Selling & distribution expense is not an item of production cost.

Question 21: A company, which uses standard marginal costing, furnishes the following details relating to a single product manufacturing and sold in a quarter:

	Budget	Actual
Sale units	6,000 (₹'000)	6,400 (₹'000)
Sales	<u>1500</u>	<u>1696</u>
Direct materials	240	270
Direct labour	360	416
Variable overheads	<u>600</u>	<u>648</u>
Total variable costs	<u>1200</u>	<u>1,334</u>

The sales budget is based on the expectation of the company's estimate of market share of 12%. The market report reveals that the actual sales of the product in the whole country for the quarter is 60,000 units. Further data are given as under:

	Standard	Actual
Direct material price per Kg.	₹8	₹7.50
Direct labour rate per hour	₹6	₹6.40

Required:

i) Compute the following variances for the quarter :

- Gross margin sales volume variance
- Market size variance
- Market share variance
- Sales price variance
- Direct materials usage and price variance
- Direct labour efficiency and rate variances
- Variable overheads efficiency and expense variances.

ii) Prepare an operating statement reconciling the budgeted contribution with actual contribution.

(12 Marks) May/03 & (9 Marks) June/09 [Old Course-Adapted]

[Ans.: (a) Market size variance ₹60,000(F), (b) Market share variance ₹40,000(A), (c) Gross margin sales volume variance ₹20,000(F), (d) Gross margin sales price variance ₹96,000(F), (e) Direct material usage variance ₹32000(A), Direct Material Price variance ₹18,000(F), (f) Direct labour efficiency variance ₹6,000(A), Direct labour rate variance ₹26,000(A), (g) Variable overhead efficiency variance ₹10,000(A), Variable overhead expense variance ₹2,000(F); (2) Total actual contribution ₹3,62,000.]

Question 22: A single product company has furnished the following standard cost data per unit of output:

Direct materials	20 kg @ ₹10 per kg
Direct labour	12 hours at ₹5.50 per hour
Variable overheads	12 hours at ₹10 per hour
Fixed overheads	₹9,00,000 per month based on a normal volume of 60,000 direct labour hours
Selling price	₹600 per unit.

The cost incurred and other relevant information for the month of November 2004 are as under:

Direct Materials used	1,00,000 kg at a cost of ₹10,50,000
Direct Wages paid	₹3,10,000 for 62,000 hours worked
Overheads	₹15,26,000 out of which a sum of ₹9,40,000 is fixed.
Actual output	4,800 units sold for ₹28,32,000

Assume no stocks of work-in-progress or finished goods at the beginning or the end of the month.

Required:

- (i) Compute all variance
- (ii) Prepare an operating statement reconciling the budgeted profit and actual profit.

[Ans.: (i) DMCV: ₹90000(A); DMPV: ₹50000(A); DMUV: ₹40000(A); DLCV: ₹6800(F); DLRV: ₹31000(F); DLEV: ₹24200(A); VOCV: ₹10000(A); FOCV: ₹76000; FO Exp V: ₹40000(A); FOVV: ₹36000(A); FO Cap V: ₹30000(F); FO Eff. V: ₹66000(A); SVV: ₹168000(A); SPV: ₹48000(A); S Vol. V: ₹120000(A); S Margin Vol. V: ₹6800(A) (ii) Actual Profit: ₹(54000); Std. profit per unit: ₹34]

Question 23: The budgeted output of a single product manufacturing company for the year ending 31st March was 5,000 units. The financial results in respect of the actual output of 4,800 units achieved during the year were as under:

	₹
Direct material	29,700
Direct wages	44,700
Variable overheads	72,750
Fixed overheads	39,000
Profit	36,600
Sales	2,22,750

The standard wage rate is ₹4.50 per hour and the standard variable overhead rate is ₹7.50 per hour. The cost accounts recorded the following variances for the year:

Variances	Favourable		Adverse	
	₹	₹	₹	₹
Material price	—	300	—	—
Material usage	—	600	—	—
Wage rate	750	—	—	—
Labour efficiency	—	2,250	—	—
Variable overhead expenses	3,000	—	—	—
Variable overhead efficiency	—	3,750	—	—
Fixed overhead expense	—	1,500	—	—
Selling price	6,750	—	—	—

Required:

- (i) Prepare a statement showing the original budget.
 - (ii) Prepare the standard product cost sheet per unit.
 - (iii) Prepare a statement showing the reconciliation of originally budgeted profit and the actual profit.
- [Ans.; Budgeted Profit: 37500; Selling price per unit: ₹45]

Miscellaneous Topics:

Non Conventional Variance Analysis:

Quality Cost Variance = It represents difference between (a) actual quality cost, and (b) budgeted quality cost.

Ex post variance analysis: Variance analysis if environment is different from that anticipated. In such cases actual performance should be compared with a standard which reflects these changed conditions. As per CIMA, Operating & Planning Variances are subsets of material total variance replacing traditional usage & price variances. These variances are used to isolate variances caused by (i) unforeseen circumstances, i.e. planning variance & (ii) operational variance, which reflects non-standard performance.

Planning variances seek to explain the extent to which the original standard needs to be adjusted in order to reflect changes in operating conditions between the current situation and that envisaged when the standard was originally calculated, in effect it means that the original standard is brought up to date so that it is a realistic attainable target in current conditions. It can be controllable as well as uncontrollable.

Operating variances indicate the extent to which attainable targets (i.e. the adjusted standards) have been achieved. Operating variances would be calculated after the planning variances have been established and are thus a realistic way of assessing performance. Operating Variance is always controllable.

Price Planning Variance = (Std. Rate-Revised Std. Rate)× Standard Quantity on revised standard

Usage Planning Variance = (Std. Qty.- Revised Std. usage)×Std. Price

Price Operating Variance = (Prevailing Rate/Revised Std. Rate-Actual Rate)× Actual Quantity

Usage Operating Variance = (Std. usage based on revised std.-Actual Qty.)×Revised Std. Price

Case Study

XYZ Ltd. manufactures a standard animal feed.

The predetermined standards for the budget period Jan-March 2005 were set by management in October 2004.

Standard hours per tonne of product is 1.1

Standard direct labour rate per hour is ₹8.50

Standard usage of material per tonne of product is 1.2 tonnes

Standard price of material is ₹70 per tonne

Research shows that in the quarter ended 31 March 2005 the prevailing market price of material had been ₹71 per tonne. Since the budget was set the wage rate had increased to ₹8.75 per hour, national pay award. During the quarter modifications to plant and machinery shows that direct labour hours per unit should be 1.05 per tonne of product and that standard usage would reduce to 1.175 tonnes per tonne of product.

During the quarter ended 31 March 2005 activity and costs showed:

Actual production 15,400 tonnes

Raw material usage 16,555 tonnes

Actual cost of raw materials used ₹1,191,960

Actual direct labour cost 16,632 hours ₹143,035

Variance Analysis Report

Traditional Approach

Direct Labour

Direct Labour Cost Variance = Standard Cost for Actual Production – Actual Cost

$$= ((15400 \times 1.1) \text{ hrs} \times ₹8.5) - ₹143035 = ₹955(F)$$

Direct Labour Rate Variance = (Standard Rate-Actual Rate)× Actual Hours

$$= (₹8.50 - ₹8.5999) \times 16632 = ₹1663 (A)$$

Direct Labour Efficiency Variance = (Std. Hours for actual Output-Actual Hours)×Std. Rate

$$= (16940 - 16632) \times ₹8.50 = ₹2618 (F)$$

Direct Material

Direct Material Cost Variance = Standard Cost for Actual Production – Actual Cost

$$= ((15400 \times 1.2) \text{ tonnes} \times ₹70) - ₹1191960 = ₹101640(F)$$

Direct Material Rate Variance = (Standard Rate-Actual Rate)× Actual Quantity
 $= (\text{₹}70-\text{₹}72) \times 16555 = \text{₹}33110 \text{ (A)}$

Direct Material Quantity Variance = (Std. Qty. for actual Output-Actual Qty.)×Std. Rate
 $= (18480-16555) \times \text{₹}70 = \text{₹}134750 \text{ (F)}$

Operating & Planning Variances

Direct Material Price Operating Variance = (Prevailing Rate-Actual Rate)× Actual Quantity
 $= (\text{₹}71-\text{₹}72) \times 16555 = \text{₹}16555 \text{ (A)}$

Direct Material Price Planning Variance = (Std. Rate-Revised Std. Rate)× Standard Quantity on revised standard
 $= (\text{₹}70-\text{₹}71) \times (15400 \times 1.175) = \text{₹}18095 \text{ (A)}$

Direct Material Usage Operating Variance = (Std. usage based on revised std.-Actual Qty.)×Revised Std. Price
 $= (18095-16555) \times \text{₹}71 = \text{₹}109340 \text{ (F)}$

Direct Material Usage Planning Variance = (Std. Qty.- Revised Std. usage)×Std. Price
 $= (18480-18095) \times \text{₹}70 = \text{₹}26950 \text{ (F)}$

Summary

Planning Variances		₹
		₹
Price		18,095 (A)
Usage		26,950 (F)
		8,855 (F)
Operating Variances		
Price		16,555 (A)
Usage		109,340 (F)
		92,785 (F)
Traditional Variance		101,640 (F)

Direct Labour

Direct Labour Rate Operating Variance = (Revised Rate-Actual Rate)× Actual Hours
 $= (\text{₹}8.75-\text{₹}8.5999) \times 16632 = \text{₹}2495 \text{ (F)}$

Direct Labour Rate Planning Variance = (Std. Rate-Revised Std. Rate)× Standard hours based on revised standard
 $= (\text{₹}8.50-\text{₹}8.75) \times (15400 \times 1.05) = \text{₹}4042.50 \text{ (A)}$

Direct Labour Efficiency Operating Variance = (Std. hours based on revised std.-Actual Hrs.)×Revised Std. wage rate
 $= (16170-16632) \times \text{₹}8.75 = \text{₹}4042.50 \text{ (A)}$

Direct Labour Efficiency Planning Variance = (Std. Hrs.-Revised Std. hrs.)×Std. Rate
 $= (16940-16170) \times \text{₹}8.50 = \text{₹}6545 \text{ (F)}$

Summary

Planning Variances		₹
		₹
Rate		4,042.50 (A)
Efficiency		6,545 (F)
		2,502.50 (F)
Operating Variances		
Rate		2,495 (F)
Efficiency		4,042.50 (A)
		1,547.5 (A)
Traditional Variance		955 (F)

Note: In foregoing case material planning variance is controllable though labour planning variance is uncontrollable.

Ex post sales variances {Least important topic}:

The conventional sales volume variance reports the difference between actual and budgeted sales, priced at the budgeted contribution per unit. The variance merely indicates whether sales volume is greater or less than expected. It does not indicate how well sales management actual sales volume should be compared with an *ex post* estimate that reflects the market conditions prevailing during that period. In such cases only total sales margin variance be reported & it should be separated in planning and appraisal element using following formulae:

Total sales margin variance (planning element):

$$= \{Ex\ post\ budgeted\ sales\ volume \times (Ex\ post\ selling\ price - Standard\ cost) - Original\ budgeted\ sales\ volume \times (Budgeted\ selling\ price - Standard\ cost)\}$$

Total sales margin variance (appraisal element):

$$= \{\text{Actual sales volume} \times (\text{Actual selling price} - \text{Standard cost})\}$$

$$= Ex\ post\ budgeted\ sales\ volume \times (Ex\ post\ selling\ price - Standard\ cost)\}$$

The figure of "Ex post budgeted sales volume" for a particular product can be determined by estimating the total market sales volume for the period and then multiplying the estimate by the target percentage of market share. Where industry statistics are published, this calculation should be based on actual total industry sales volume.

Question 24: C Preserves produces Jams, Marmalade and Preserves. All the products are produced in a similar fashion; the fruits are cooked at low temperature in a vacuum process and then blended with glucose syrup with added citric acid and pectin to help setting

Margins are tight and the firm operates, a system of standard costing for each batch of Jam.

The standard cost data for a batch of raspberry jam are

Fruits extract	400 kgs @ ₹16 per kg.
Glucose syrup	700 kgs @ ₹10 per kg.
Pectin	99 kgs. @ 33.2 per kg.
Citric acid	1 kg at ₹200 per kg.
Labour	18 hours @ ₹32.50 per hour.
Standard processing loss 3%.	

The climate conditions proved disastrous for the raspberry crop. As a consequence, normal prices in the trade were ₹19 per kg for fruits abstract although good buying could achieve some savings. The impact of exchange rates for imported sugar plus the minimum price fixed for sugarcane, caused the price of syrup to increase by 20%.

Fruit extract	428 Kgs at ₹18 Per Kg .
Glucose syrup	742 Kgs at ₹12 per Kg .
Pectin	125 Kgs at ₹32.8 per Kg .
Citric aid	1 Kgs at ₹95 per Kg .
Labour	20 hrs .at ₹30 per hour .

Actual output was 1,164 kgs of raspberry jam.

You are required to:

- (i) Calculate the ingredients planning variances that are deemed uncontrollable.
- (ii) Calculate the ingredients operating variances that are deemed controllable.
- (iii) Calculate the mixture and yield variances.
- (iv) Calculate the total variances for the batch.

(CIMA May/88) & (11 Marks) May/05

[Ans.: (1) Total ₹2,600(Adverse), (2) Total ₹1,316.2(adverse) Price variance 583(F), Usage variance 583 (F) Usage variance 1,899.2 (A) (3) Total 340.3 (A) Yield variance 155.9 (A), Labour operating variance 15 (A) , (5) Total variance 3931.2 (A)]

[Hint: Material mix & yield variance are supposed to be calculated on revised standard rates & quantity & not on standard rates and quantity]

Budget Ratios:

1) Efficiency Ratio

$$\begin{aligned} &= \frac{\text{Output expressed in terms of std. hours} \times 100}{\text{Actual Hours spent for producing the output}} \\ &= \frac{\text{Standard Hours} \times 100}{\text{Actual Hours worked}} \\ &= \frac{\text{Actual Output} \times 100}{\text{Standard Output}} \end{aligned}$$

2) Activity Ratio

(a.k.a. Volume Ratio)

$$\begin{aligned} &= \frac{\text{Actual Output in Std. hours} \times 100}{\text{Budgeted output in std. hours}} \\ &= \frac{\text{Standard Hours} \times 100}{\text{Budgeted Hours}} \end{aligned}$$

3) Actual usage of budgeted capacity ratio

(a.k.a. Capacity Ratio)

$$\begin{aligned} &= \frac{\text{Actual Working Hours} \times 100}{\text{Budgeted Hours}} \\ &= \frac{\text{Standard Output} \times 100}{\text{Budgeted Output}} \end{aligned}$$

4) Calendar Ratio

$$\begin{aligned} &= \frac{\text{Actual No. of working days in a period} \times 100}{\text{No. of working days in related budgeted period}} \\ &= \frac{\text{Max. possible standard working hrs in actual days} \times 100}{\text{Budget Hours}} \end{aligned}$$

5) Actual Capacity Usage Ratio

$$= \frac{\text{Actual Hours worked} \times 100}{\text{Max. Possible no. of working hours in budget days}}$$

6) Standard Capacity Usage Ratio

$$= \frac{\text{Budgeted Hours} \times 100}{\text{Max. Possible no. of working hours in budget days}}$$

Reconciliation of Budget ratios:

$$\text{Activity Ratio} = \text{Efficiency Ratio} \times \text{Capacity Ratio}$$

Question 25: What are the various formulae used in calculating budget ratios. (3 Marks) June/09-N.C.

Question 26: A company manufactures two products X and Y. Product X requires 8 hours to produce while Y requires 12 hours. In April, 2004, of 22 effective working days of 8 hours a day, 1,200 units of X and 800 units of Y were produced. The company employs 100 workers in production department to produce X and Y. The budgeted hours are 1,86,000 for the year.

Calculate Capacity, Activity and Efficiency ratio and establish their relationship.

(6 Marks) Nov./04

[Ans.: Capacity ratio = 113.55%, Activity ratio = 123.87%, Efficiency ratio = 109.09%]

Question 27: A company manufactures two products X & Y. Product X requires 5 hours to produce while Y requires 10 hours. In July 2004, of 25 effective working days of 8 hours a day, 1000 units of X and 600 units of Y were produced. The company employs 50 workers in the production department to produce X and Y. The budget hours are 102000 for the year.

Calculate capacity ratio, activity ratio and efficiency ratios. Also establish their interrelationship

[Ans.: 117.65%, 129.41%, 110%]

(7 Marks) Nov./96

Question 28: The following data have been obtained from the records of a machine shop for an average month:

Budget:

No. of working days	25
Working hours per day	8
No. of direct workers	16
Efficiency	One standard hour per clock hour
Down time	20%
Overheads	Fixed ₹15,360 Variable ₹20,480

The actual data for the month of September 1985 are as follows :

Overhead	Fixed ₹16,500 Variable ₹14,500
Net operator hours worked	1920
Standard hours produced	2112

There was a special holiday in September 1985.

Required to present reports to Departmental manager:

- (i) Calculate efficiency, activity, calendar and standard capacity usages & actual capacity utilization ratio.
(ii) Setting out the analysis of variances. (Nov./85), (10 Marks) Nov./10-N.C. [Adapted]

[Ans.: (i) 110%, 82.5%, 96%, 80%, 75%;(ii) FOCV 3828(A), FOEV 1140(A), FOVV 2688(A), FOCal V 614(A), FOCV 3226(A), FOEV 1152(F), VOCV 2396(F), VOEff V 1536(F), VOExp V 860(F)]

Question 29: Following data is available for T.T.D and Co:

Standard working hours	8 hours per day of 5 days per week
Maximum capacity	50 employees
Actual working	40 employees
Actual hours expected to be worked per four week	6,400 hours
Std. hours expected to be earned per four weeks	8,000 hours
Actual hours worked in the four week period	6,000 hours
Standard hours earned in the four week period	7,000 hours.

The related period is of 4 weeks. In this period there was a one special day holiday due to national event. Calculate the following ratios:

- (1) Efficiency Ratio, (2) Activity Ratio, (3) Calendar Ratio, (4) Standard Capacity Usage Ratio, (5) Actual Capacity Usage Ratio. (6) Actual Usage of Budgeted Capacity Ratio

[Ans.: (1) 116.67%, (2) 109.375%, (3) 95%, (4) 80%, (5) 75%, (6) 93.75%]

[Hint: "Actual hours expected to be worked per four week" means budgeted hours, "Std. hours expected to be earned per four weeks" means Max. Possible no. of working hours in budget period & "Standard hours earned in the four week period" means Actual output expressed in terms of standard hours (i.e. standard hours for actual output)]

Possible Causes of Cost Variances :

Variance	Favourable	Adverse
a) Material Price	<ul style="list-style-type: none"> • Unforeseen discounts received • Greater care taken in purchasing • Change in material standard 	<ul style="list-style-type: none"> • Price Increase • Careless Purchasing • Change in material Standard
b) Material Usage	<ul style="list-style-type: none"> • Material used of higher quality than standard • More effective use of material • Errors in allocating material to jobs 	<ul style="list-style-type: none"> • Defective material • Excessive Waste • Theft • Stricter quality control • Errors in allocating material to jobs
c) Labour Rate Pay	<ul style="list-style-type: none"> • Use of apprentices or other 	<ul style="list-style-type: none"> • Wage Rate Increase

	workers at a rate of pay lower than standard	
d) Idle Time		<ul style="list-style-type: none"> • Machine Breakdown • Non-Availability of Labours • Illness or injury to workers
e) Labour Efficiency	<ul style="list-style-type: none"> • Output produced more quickly than expected, i.e., actual output in excess of standard output set for same no. of hrs. because of work motivation, better quality of Labour or equipments 	<ul style="list-style-type: none"> • Lost time in excess of standard allowed • Output lower than standard set because of deliberate restriction, lack of training, or sub standard Labour used. • Errors in allocating time to jobs.
f) Overhead Expenditure	<ul style="list-style-type: none"> • Savings in costs incurred • More economical use of services 	<ul style="list-style-type: none"> • Increase in cost of services used. Excessive use of change in type of services used.
g) Overhead efficiency	<ul style="list-style-type: none"> • The same reasons as for the labour efficiency variance have caused overhead recovery to be different from standard. 	<ul style="list-style-type: none"> • The same reasons as for the labour efficiency variance have caused overhead recovery to be different from standard.
h) Overhead Volume	<ul style="list-style-type: none"> • Excess of Actual time worked over budget. 	<ul style="list-style-type: none"> • Excessive Idle time • Shortage of Plant Capacity

A/cing procedure for standard cost:

Single Plan: It contemplates analysis of variance at source i.e. the analysis of variance is done from the original documents like invoices, labour sheets, etc. Unlike partial plan, price variance can be analyzed at the time of receipt of material (in case of material) & usage variance can be analyzed & recorded as & when finished output is recorded i.e. when excess materials are used. The features of single plan can be summarized as:

- i) Work-in-progress A/c is debited & credited with standard cost.
- ii) Inventory is valued at standard cost
- iii) All Variances are computed at any stage before debiting WIP A/c. Rate & Expenditure variances are computed at the inception. Quantity/efficiency variances are calculated at the time of crediting control A/cs.

1	Material Control A/c Dr. Material Price Variance A/c Dr.	Actual Qty Purchased @ Std. Rate Unfavourable Variance	
	To Material Price Variance A/c		Favourable Variance
<i>(To record purchase of raw materials at standard price and related unfavourable/favourable variance)</i>			
2	Work-in-Progress Control A/c Dr. Material Usage Variance A/c Dr.	Std. Qty @ Std. Rate Unfavourable Variance	
	To Material Usage Variance A/c To Material Control A/c		Favourable Variance Actual Qty @ Std. Rate
<i>(To transfer raw materials to production at standard usage rates and related unfavourable/favourable quantity variance)</i>			
3	Same Entry for Labour as in entry 1		
4	Same Entry for Labour as in entry 2		

5	Factory Overhead Control A/c Dr. To Cash <i>(To record expenses on overhead)</i>	Actual Overhead	Actual Overhead
6	Work-in-Progress A/c Dr. Overhead Expense Variance A/c Overhead Efficiency Variance A/c To Overhead Expense Variance A/c To Overhead Efficiency Variance A/c To Factory Overhead Control A/c <i>(To increase work in process for the standard variable overhead, and record the related efficiency and spending variance)</i>	Absorbed Overhead Adverse/Underapplied Adverse/Underapplied Favourable/Overapplied Favourable/Overapplied Actual Qty @ Actual Rate	

Note: 1. Overhead Volume Variance will be calculated inspite of Overhead Efficiency Variance in case of Fixed Overhead.

Partial Plan: In this system variances are analyzed at the end of period. Overhead A/c will be opened & closed on normal basis. If nothing is specified in question, Partial Plan will be followed. Some salient features of partial plan are:

- i) Work-in-progress A/c is debited with actual cost of material, actual cost of labour & actual overhead.
- ii) Work-in-progress A/c will be credited with standard cost of production.
- iii) At the end of A/cing period work-in-progress A/c is credited with standard cost of unfinished goods.
- iv) After entering at iii) above is passed, debit & credit sides of work-in-progress account are compared & difference is transferred to cost variance, which is further analyzed for reporting to management on the basis of additional information not recorded in accounts.

1	Material Control A/c Dr. To General Ledger Adjustment A/c <i>(To record purchase of raw materials at actual price)</i>	Actual Qty <u>purchased</u> @ Actual Rate	
2	Work-in-Progress Control A/c Dr. To Material Control A/c <i>(To transfer raw materials to production)</i>	Actual Qty <u>consumed</u> @ Actual Rate	
3	Same Entry for Labour as in entry 1		
4	Same Entry for Labour as in entry 2		
5	Factory Overhead Control A/c To General Ledger Adjustment A/c <i>(To record expenses on overhead)</i>	Actual Overhead	
6	Work-in-Progress Control A/c Dr. To Factory Overhead Control A/c <i>(To record expenses on overhead incurred)</i>	Actual Overhead	Actual Overhead

7	Finished Goods A/c Dr. To Work-in-Progress A/c <i>(Being the standard cost of production transferred to finished good)</i>	Standard Cost	Standard Cost
8	Cost of Sales A/c Dr. To Finished Goods A/c <i>(Being the standard cost of goods sold transferred to Cost of Sales A/c)</i>	Standard Cost	Standard Cost
9	Work-in-Progress A/c Dr. To All favourable variances <i>(Being variances carried to respective A/cs pending investigation before being finally disposed off)</i>		Favourable/Overapplied
10	All unfavourable variances Dr. To Work-in-Progress A/c <i>(Being variances carried to respective A/cs pending investigation before being finally disposed off)</i>		Unfavourable/Underapplied

In case Non-Integrated System is adopted, expenses will be transferred to Cost Ledger Control A/c (also known as Nominal Ledger Control A/c, General Ledger Control A/c) in spite of A/cs Payable, Wages Payable, Cash A/c, etc. Also balance of P&L A/c is transferred to Cost Ledger Control A/c. In case of Partial Plan it generally taken as Non-Integrated System

④

Disposition of Variances:

(3 Marks) Nov/98

There is no unanimity of opinion in regard to disposition of variances. The following are various methods:

- 1) Write off all variances to P&L A/c or cost of sales every month.
- 2) Distribute the variance prorate of cost of sales, work-in-progress and finished good stocks.
- 3) Write off quantity variance to P&L A/c but the price variance may be spread over cost of sales, work-in-progress & finished goods stock. The reason behind apportioning price variances to inventories & cost of sales is that they represent cost although they are described as variance.

Question 30: Under the single plan, record the journal entries giving appropriate narration, with indication of amounts of debits or credits alongside the entries, for the following transactions using the respective control A/c.

- (i) Material price variance (on purchase of materials)
- (ii) Material usage variance (on consumption)
- (iii) Labour rate variance.

(6 Marks) Nov./06

Question 31: Material purchased 10,000 pieces at ₹1.10

₹11,000

Materials consumed 9,500 pieces at ₹1.10

₹10,450

Actual wages paid 2,475 hours at ₹3.50

₹8,662.50

Actual factory expenses incurred ₹17,000 (Budgeted ₹16,500) Units produced: 900 units and sold at ₹60 per unit.

The standard rates and prices are as under:

Direct materials Re. 1.00 per unit Standard input 10 pieces per unit Direct labour rate ₹3.00 per hour

Standard requirement 2.5 hours per unit
Overheads ₹6.00 per labour hour

Explain the operation of the recording of standard cost under this method.

Question 32: Standard cost sheet per unit output is as under

	₹
Direct material 3 pcs. @ ₹2.15	6.45
<i>Direct Labour:</i>	
Dept. A 2 hrs @ ₹1.75	3.50
Dept. B 4 hrs. @ ₹1.50	6.00
<i>Overheads :</i>	
Dept. A 2 hrs. @ Re. 0.50	1.00
Dept. B 4 hrs. @ Re. 1.00	4.00
	5.00
	20.95

Transactions for the period are as under :

Materials purchased and consumed:

8,600 pcs. @ ₹2.50 each

Labour time spent

Dept. A. 5,200 hours

Dept. B. 12,000 hours

There is no change in labour rates.

Actual factory overheads are :

Dept. A. ₹3,000

Dept B. ₹12,500

Units produced:

Dept. A. 2,800

Dept. B. 2,800

Budgeted overheads:

Dept. A. ₹3,000

Dept. B. ₹12,000

Record the transactions under single plan.

Question 33[Reverse calculations]: Upasana Ltd. manufactures paint. It uses a standard costing system and the variances are reported to the management on the fortnightly basis. A fire destroyed some important records of the company. You have been able to collect the following information from the spoilt papers/reports and as a result of consultation with accounting personnel in respect of a fortnight:

- a) The paint requires 2 types of raw material RM₁ and RM₂. The standard quantity of RM₂ in the final product is 5 liters and the standard cost thereof is ₹36 per liter.
- b) The company purchased 200 kg of RM₁ and 550 liters of RM₂ during that fortnight.
- c) The standard wage rate is ₹24 per labor hour. Actual labor hours were 460 during that fortnight.
- d) Variances are disclosed from some spoiled papers are:
 - i. Price Variance (RM₂) - ₹1,320 (A)
 - ii. Usage Variance (RM₁) - ₹240 (F)
 - iii. Labor efficiency variance - ₹1,440 (A)
- e) Some incomplete ledger entries for that fortnight reveal
- f)

(1) Sundry Creditors

	₹		₹
		Purchase of raw materials	25,440
		(2) RM₂	
Opening Balance	3,600	Closing Balance	8,280
		(3) RM₁	
Opening Balance	0	Closing Balance	3600
			1200

(4) Works-in-progress		
Opening Balance	0	
RM ₂	14,400	Closing Balance
(5) Wages		
Paid & Outstanding	10,350	

You have been asked to compute the meaningful variances to be presented before the management. (Key computations should form part of the answer.) (19 Marks) Nov./95

[Ans.: Material cost variances ₹7200(A); Material price variance (RM₁) ₹480(F); Material usage variance (RM₂) ₹720(A); Labour cost variance ₹750(A); Labour rate variance ₹690(F)]

Question 34 [Reverse calculations]: Rainbow Ltd. manufactures paint in batches. The company uses standard costing system and the variances are reported weekly. You have taken the account sheet for study for variance analysis discussion. While working coffee was spilled on these sheets and only following could have been retrieved:

Dr.	Cr.
	Raw Material -1
Beg. Balance	0
	18,000
	Closing Balance
	6,000
	Raw Material -2
Beg. Balance	18,000
	Closing Balance
	41,400
	Work in Progress
Beg. Balance	0
Raw Material -2	72,000
	Closing Balance
	0
	Sundry Creditors
	1,27,200
	Wages outstanding
	51,750
	Quantity Variance-Material-1
	1,200
	Price Variance-Material-2
	6,600
	Efficiency Variance-Labour
	7,200

Other information's are: standard cost of Material – 2 is ₹180 per litre and standard quantity is 5 litres. Standard wages rate is ₹24 per hour and a total 2,300 hours were worked during the week. 1,000 kg of Material -1and 550 litres of Material-2 were purchased. Sundry creditors are for material acquisition, and wages outstanding pertain to direct labour.

You are required to compute Material-1 Rate Variance, Material-2 Quantity Variance & Labour Spending Variance, Standard hours allowed for production and purchase value of Material-1 for variance analysis discussion.

[Ans.: Material – 1 rate variance	= ₹2,400(F)
Material - 2 quantity variance	= ₹3,600(A)
Labour spending variance	= ₹3,450(F)
Standard hour allowed	= 2000 hour
Cost of material allowed	= ₹21,600]

(11 Marks) Nov/05

[Note: A/cs in this question are misprinted in suggested answers of ICAI]

Question 35: F Manufacturing Ltd., uses the three variances method to analyses the manufacturing overhead variances. Manufacturing overhead variances for the fiscal year just ended were computed as follows:

Spending	₹86,000	Adverse
Efficiency	₹36,000	Favorable
Volume	₹80,000	Favorable

The manufacturing overhead application rate for the year was ₹160 per machine hours of which ₹60 per machine hour was the variable component. The year end balance in the Manufacturing Overhead Control Account was ₹16,50,000 and the standard machine hours for the year were 11,300.

From the above data compute:

- (i) Budgeted Machine Hours.
- (ii) Actual Machine Hours.
- (iii) Applied Manufacturing Overhead.
- (iv) Total Amount of Fixed Overhead Cost (budgeted).

(13 Marks) Nov./00

[Ans.: (i) 10500hrs (ii) 10700hrs (iii) 1680000 (iv) 922000]

[Note.: There seems some drafting error in question because Budgeted Fixed Overhead can also be calculated as Budgeted Hours calculated in (i) × Standard Fixed Overhead application rate i.e. $10500 \times (160 - 60) = 10,50,000$, although value of Budgeted Fixed Overhead as per calculation in (iv) is ₹9,22,000]

Miscellaneous Questions

Question 36: Following is the standard cost card of a component:

Materials	2 Units at ₹15	₹30
Labour	3 Hours at ₹20	₹60
Total overheads	3 Hours at ₹10	₹30

During a particular month 10,000 units of the component were produced and the same was found to be at 60% capacity of the budget. In preparing the variance report for the month, the cost accountant gathered the following information:

Labour	₹6,50,000
Variable overheads	₹2,00,000
Fixed overheads	₹3,00,000
Material price variance	₹ 70,000 (A)
Material cost variance	₹ 50,000 (A)
Labour rate variance	₹ 50,000 (F)
Fixed overhead expenditure variance	₹ 50,000 (A)

You are required to prepare from the above details:

- (1) Actual material cost incurred
- (2) Standard cost of materials actually consumed
- (3) Labour efficiency variance
- (4) Variable OH efficiency variance
- (5) Variance OH expenditure variance
- (6) Fixed OH efficiency variance
- (7) Fixed OH capacity variance
- (8) Fixed OH volume variance

[Ans.: (1) ₹350000; (2) ₹280000; (3) ₹100000(A); (4) 25000(A); (5) 25000(A); (6) 25000(A); (7) 75000(A); (8) 100000(A)]

(14 Marks) May 99 & (14 Marks) Nov./05

Question 37: The following is the Operating Statement of a company for April, 2001.

Budgeted profit	₹	1,00,000
Variances:		
	Favourable	Adverse
Sales Volume	₹	₹
		4,000

Price	9,600		
Direct Materials - Price	4,960		
- Usage	6,400		
Direct Labour - Rate	3,600		
- Efficiency	3,600		
Fixed Overhead -Efficiency	2,400		
Capacity	4,000		
Expense	1,400		
	17,000	22,960	5,960(A)
Actual profit			94,040

Additional information is as under :

Budget for the year 120,000 unit

Budgeted fixed overhead ₹4,80,000 per year

Standard cost of one unit of product is :

Direct materials	5kg @ ₹4 per kg .
Direct labour	2hour @ ₹3 per hour
Fixed overheads are absorbed on direct labour	
Profit 25% on sales.	

You are required to prepare the annual ^{Note} financial profit/loss statement for April, 2001 in the following format

Account	Qty./hour	Rate/price	Actual value
Sale			
Direct materials			
Direct labour			
Fixed overheads			
Total cost			
Profit			(13 Marks) May/01

[Ans : Profit 94040]

[Note: Although annual statements have been demanded but we will prepare financial statement for April, '01 only, because operating statement has been provided for April 2001 only.]

Question 38[Standard Costing with equivalent production units]: A single product company has prepared the following cost sheet based on 8,000 unit of output per month:

Direct materials 1.5 kg @ ₹24 per kg	36.00
Direct labour 3 hour @ ₹4 per hour	12.00
Factory overhead	12.00
Total	<u>60.00</u>

The flexible budget for factory overhead is as under:

Output (unit)	6,000	7,500	9,000	10,500
Factory overhead (₹)	81,600	92,400	1,03,200	1,14,000

The actual results for the month of October 2002 are given below:

- Direct material purchase and consumed were 11,224 Kg at ₹2,66,570.
- Direct labour hour worked were 22,400 and direct wages paid amounted to ₹96,320.
- Factory overhead incurred amounted to ₹96,440 out of which the variable overhead is ₹ 2.60 per direct labour hour worked.
- Actual output is 7,620 unit.
- Work-in-process:

Opening WIP:	300 unit:
	Material 100% complete
	Labour and overhead 60% complete
Closing WIP:	200 unit:
	Material 50% complete
	Labour and overhead 40% complete

You are required to analyze the variance.

(12 Marks) Nov/02

[Ans.: Material price variance ₹2806(F); Material cost variance ₹550(F); Material usage variance ₹2256(A); Labour cost variance ₹6080(A); Labour efficiency variable ₹640(F); Variable overhead expenditure variance ₹4480(A); Variable overhead efficiency variance ₹384(F); Total variance overhead cost variance ₹4096(A); Expenditure variance ₹200(F); Efficiency variable ₹256(F); capacity variable ₹2560(A); Volume variance ₹2304(A); Total fixed overhead cost variance ₹2104(A)]

Question 39[Standard Costing with equivalent production units]:

The following information relates to a manufacturing concern	(₹)
Material A 24,000 kgs @ ₹3 per kg	72,000
Material B 12,000 kgs @ ₹4 per kg	48,000
Wages 60,000 hours @ ₹4 per hour	2,40,000
Variable overheads 60,000 hours @ Re. 1 per hour	60,000
Fixed overheads 60,000 hours @ ₹2 per hour	1,20,000
Total cost	5,40,000
Budgeted profit	60,000
Budgeted sales	6,00,000
Budgeted production (units)	12,000
Actual	(₹)
Sales (9,000 units)	4,57,500
Material A consumed 22,275 kgs.	62,370
Material B consumed 10,890 kgs	44,649
Wages paid (48,000 hours)	1,91,250
Fixed overhead	1,20,900
Variable overhead	45,000
Labour hours worked	47,700
Closing work in progress	900 units
Degree of completion	
Material A and B	100%
Wages and overheads	50%

You are required to:

- i) Calculate all the material and labour variances.
- ii) Calculate variable overhead expenditure and efficiency variances, fixed overhead expenditure and volume variances and sales price and sales volume variances. (10 Marks) Nov./09-O.C.

[Ans.: Material price variance ₹3366(F); Material cost variance ₹8019(A); Material usage variance ₹11385(A); Material Yield Variance = 11550(A); Material Mix Variance = 165(F); Labour cost variance ₹2250(A); Labour efficiency variable ₹1800(A); Labour rate variance ₹750(F); Labour Idle time variance ₹1200(A); Variable overhead expenditure variance ₹2700(F); Variable overhead efficiency variance ₹450(A); Fixed overhead expenditure variance ₹900(A); Fixed overhead volume variance ₹25500(A); Sales price variance ₹7500(F); Sales volume variance ₹150000(A)]

Question 40[Standard Costing with equivalent production units]: The standard product-cost sheet of MSC Ltd., which plans to produce 8000 units of a product, is as under:

Direct materials (1.50 kg. @ ₹6)	(₹)
Direct labour (4 hrs. @ ₹6)	9
Variable overheads	24
Fixed overheads	4
Selling price	12
	53

The actual results of a period are as under:

Actual orders received	8200 units
Actual sales	7500 units
Actual production	7500 units
Direct materials purchased & issued to production	12000 kg
Direct materials price/kg	₹6.50
Direct labour hours worked	29000
Direct labour hour rate	₹6.25

Total overheads incurred	₹130000
Out of which variable overheads were	₹36000

Closing work-in-progress 300 units-Materials 100% complete & Labour & overheads 60% complete.

Opening work-in-progress 600 units-Materials 100% complete & Labour & overheads 75% complete.

The budgeted market share was 16% and the actual sales in the country for the period of this product is 60000 units.

Actual selling price ₹54 per unit.

Analyse the variances in as much details as possible.

(ICWA-June/98)

[Ans.: Non-Conventional Analysis: Sales Margin Production Quantity Variance = 2800(A) Market size variance: ₹6400(F); Market share variance: ₹5600(A); **Conventional Analysis:** Sales margin volume variance: ₹2000(A); Sales margin price variance: ₹7500(F); Material usage variance: ₹7200(A); Material price variance: ₹6000(A); Labour efficiency variance: ₹480(A); Labour rate variance: ₹7250(A); Variable overhead efficiency variance: ₹80(A); Variable overhead expenditure variance: ₹7000(A); Fixed overhead efficiency variance: ₹240(A); Fixed overhead volume variance: ₹9240(A); Fixed overhead capacity variance: ₹9000(A); Fixed overhead expenditure variance: ₹2000(F)]

[Note: Since actual order received ≠ actual sales quantity, Market share variance will be on the basis of actual order received and we will also calculate one further variance regarding inefficiency of production department about fulfilling order quantity, Sales Margin Production Quantity Variance = (Actual sales quantity – Sales order quantity) × Std. margin p.u. While calculating all other variance sales order quantity shall be ignored.]

Question 41: The following figures are available. Find out the missing figures, giving appropriate

Budgeted profit	₹ 15,000
Less: Adverse variances:	
Contribution price variance	10,600
Direct materials variance	1,000
Fixed overhead variance	<u>600</u>
	<u>(12,200)</u>
	<u>2,800</u>
Add: Favourable variances	
Contribution quantity variance	1,800
Direct wages variance	600
Variable overhead variance	<u>1,800</u>
Actual profit	<u>4,200</u>
There is no inventory	<u>7,000</u>
Production units = Sales units for both actual and budget	
Other Information	
Standard selling price	₹18/unit
Standard variable cost	₹15/unit
Standard contribution	₹3/unit
Actual selling price	₹17/unit
Budgeted sales	10,000 units

Standard material cost p.u. = Re. 1 (which is 5 kg. @ ₹20 Paise/kg.).

Material usage variance = 400 (Adv.)

Actual labour hours @ actual rate = ₹63,000

Actual labour hours @ standard rate = ₹61,950

Variable overhead standard rate = ₹2

Standard hours of production = 4 per unit

Variable overhead at standard rate = ₹84,800.

Variable overhead expenditure variance = 400 (A).

Budgeted fixed overhead = ₹15,000.

Find out the following:

- (i) Actual sales units
- (ii) Actual sales rupees

- (iii) Actual quantity of raw materials used
- (iv) Labour efficiency variance
- (v) Actual variable overhead in rupees
- (vi) Variable overhead efficiency variance
- (vii) Actual Fixed Overhead
- (viii) Operating profit variance

(8 Marks) Nov/06

[Ans.: (i) 10,600 units (ii) 1,80,200 (iii) 55,000 Kgs (iv) 1650 (f) (v) ₹83,000 (vi) 2,200 (F) (vii) ₹15,600 (viii) for budget profit ₹8,000(A) For standard profit ₹9,800(A)]

[Hint: Operating profit variance means summation of all cost variances with Sales margin variance]

Question 42: A company produces a product X, using raw materials A and B. The standard mix of A and B is 1:1 and the standard loss is 10% of input.

You are required to compute the missing information indicated by "?" based on the data given below:

	A	B	Total
Standard price of raw material (₹/kg.)	24	30	
Actual input (kg.)	?	70	
Actual output (kg.)			?
Actual price ₹/kg.	30	?	
Standard input quantity (kg.)	?	?	
Yield variance (sub usage)	?	?	270(A)
Mix variance	?	?	?
Usage variance	?	?	?
Price variance	?	?	?
Cost variance	0	?	1300(A)

[Ans.: (14 Marks) May/07

	Yld variance	Mix variance	Usage variance	Price variance	Cost variance
A	1200 – 1320 = 120(A)	1320 – 960 = 360(F)	1200 – 960 = 240(F)	960 – 1200 = 240(A)	1200 – 1200 = 0
B	1500 – 1650 = 150(A)	1650 – 2100 = 450(A)	1500 – 2100 = 600(A)	2100 – 2800 = 700(A)	1500 – 2800 = 1300(A)
	<u>270A)</u>	<u>90A)</u>	<u>360A)</u>	<u>940A)</u>	<u>1300A)</u>

Question 43: A single product company operates a system of standard costing. The following data relate to actual output, sales, costs and variances for a month :

Actual output	18,000 units
Actual sales and costs incurred :	₹
Sales	<u>12,15,000</u>
Direct materials purchased and used 63,000 kg	2,04,750
Direct wages	2,12,040
Variable overheads	2,77,020
Fixed overheads	<u>3,25,000</u>
Total costs	10,18,810
Profit	<u>1,96,190</u>

Standard wage rate is ₹6 per hour. Budgeted output for the month is 20,000 units.
Variances are :

Direct materials	— Price variance	15,750(A)
	— Usage variance	27,000(A)
Direct labour	— Rate variance	6,840(A)

Variable overheads	— Efficiency variance	10,800(F)
	— Efficiency variance	14,400(F)
Fixed overheads	— Expense variance	3,420(A)
Sales price variance	— Expense variance	25,000(A) 45,000(F)

Required :

- (i) Present the original budget along with cost sheet showing the standard cost and profit per unit.
- (ii) Calculate the sales gross margin volume and fixed overheads volume variances.
- (iii) Prepare an operating statement reconciling the budgeted profit with actual profit.

[Ans.: (1) Standard gross margin ₹2,60,000 ; (2) Sales gross margin volume variance ₹26,000 (A) fixed overhead volume variance ₹30,000(A) ; (3) Budgeted profit ₹2,60,000]

(12 Marks) May/04 & (11 Marks) Nov./08-O.C. [Adapted]

Question 44: Gems and co. manufacturing a product for which the standard selling price has been ascertained as below :

Materials – 2 units at ₹20	40
Labour – 20 hrs. @ ₹2.00	40
Variable overhead	8
Fixed overhead	20
Total cost	108
Profit	32
Selling	140

During the budget period , the company could produce and sell only 8,000 units as against budget of 10,000 units . The company's profit and loss account is presented below :

Profit and loss account for the year ended

Particular	₹	Particular	₹
To materials (16,500 units)	3,96,000	By sales (8,000 units)	11,20,000
To wages (1,70,000 hours)	3,46,800		
To variable overhead	60,000		
To fixed overhead	1,84,000		
To net profit	<u>1,33,200</u>		
	11,20,000		11,20,000

4,000 hours were lost due to power failure. There was no opening or closing work-in-progress. You are to Reconcile the actual profit with the standard profit , in term of variance. (May/92)

[Ans.: Standard profit (8,000 @ ₹32) 2,56,000
Actual profit 1,33,200]

Question 45: Ravi, Richard, Rahim and Roop Singh are regional salesmen distributing the product of Super Perfumes Ltd. The selling price of the product is ₹400 per unit. The sales quota and the standard selling expenses for the year are:-

Salesmen	Sales quota	Standard selling expenses	
		₹	₹
Ravi	7,50,000	2,25,000	
Richard	9,00,000	2,47,500	
Rahim	11,50,000	2,87,500	
Roop Singh	6,00,000	2,25,000	

Actual data for the year were as follows : -

	Ravi	Richard	Rahim	Roop Singh
Days on field work	200	175	225	250
Kilometres covered	20,000 ₹	18,000 ₹	18,000 ₹	30,000 ₹
Sales	8,00,000	10,00,000	10,50,000	5,20,000
Salary	80,000	80,000	80,000	80,000
Free samples	9,000	7,500	5,375	8,000
Postage and stationery	8,000	9,000	10,000	6,000
Other expenses	9,000	5,000	4,000	10,000

The salesmen are allowed conveyance allowance of ₹1.50 per kilometre and a daily allowance of ₹80 per day for the days spent on field work. Ravi gets a commission of 6 percent on sales and others are given a commission of 5 percent on sales. Corporate sales office expenses are chargeable at the rate of ₹30 per unit sold in the case of Ravi and Richard and ₹30 per unit in the case of Rahim and Roop Singh. Prepare a schedule showing the selling cost variances by salesmen.

[Ans.:] Particular	Ravi	Richard	Rahim	Roop singh
Selling cost variance	20,000(A)	7,500(F)	39,375(A)	52,000(A)
The total selling cost variance (adverse)=₹1,03,875]				

Question 46 [Equivalent production (of output)]: Goodwill Ltd. manufactures readymade shirts of a specific quality in lots to each special order from its overseas customers.

The standard cost for one dozen of shirt are:

Direct material	(24 metres @ ₹11)	264
Direct labour	(3hour @ ₹49)	147
Overheads	(3hour @ ₹40)	120
Standard cost per dozen		531

During July, 2004 it worked on three orders, for which the month's job cost record as following:

Lots no	Units	Materials used	Hours worked
45(UK)	1,700Doz	40,440 metres	5,130
46(US)	1,200Doz	28,825 metres	2,890
47(CAN)	1,000Doz	24,100 metres	2,980

Additional information:

- (a) The company bought 95,000 metres of material during July at a cost of ₹10,64,000. The material price variance is recorded when material are purchased .All inventories carries as cost.
- (b) Direct labour during July the amounted to ₹5,50,000. The employees were paid at ₹50 per hour.
- (c) Overhead during the month amounted to ₹4,56,000.
- (d) A total of ₹57,60,000 was budgeted for overhead for the year 2003-04 ,based on estimated production of the plants normal capacity of 48,000 dozen shirts annually .
- Overhead at the level of production is 40% fixed and 60% variable. Overheads is applied on the basis of direct labour hours.
- (e) There was no work-in-progress at the beginning of July. During July, lot nos. 45and 47 were completed. All material were issued for lots no. 46 which was 80% completed as regard conversion.

Required:

- (A) Computation of standard cost of production of the shirts per dozen as well as in total for lot nos. 45, 46 and 47.
- (B) Find out the variation in quantity of material used and labour hours worked of each lot as well as in total.
- (C) Calculate the material price variance; labour rate variance; variable overhead efficiency variance and fixed overhead volume variance. (19 Marks) May/94

[Ans.: (A) ₹477.60 per dozen; (B) Total variation Material 235(F), Labour 20(A); (C) Material price variance ₹19000(A); Labour rate variance ₹11000(A); variable overheads efficiency variance ₹480(A) and fixed overheads volume variance ₹16320(A)]

Question 47: The standard cost sheet of a company based on the normal output of 30,000 units for a quarter is as under:

	(₹)
Direct material	(4Kg. @ 2 per Kg.)
Direct wages	(6 hour @ ₹4 per hour)
Overhead	(50% of direct wages)
Total cost	<u>44.00</u>
Profit	<u>6.00</u>
Selling price	<u>50.00</u>

The budgeted fixed overhead amount to ₹1,44,000 per quarter and it is included in the overhead cost included above.

On the basis of the budgeted activity of 36,000 units, the company estimated the profit for the second of the year as under :

	(₹)
Direct material	2,88,000
Direct wages	8,64,000
Overhead	<u>4,32,000</u>
Total cost	<u>15,84,000</u>
Sales	<u>18,00,000</u>
Profit	<u>2,16,000</u>

The cost records revealed the following actual for the second quarter of the year:

Production 25,000 units

Direct material consumed 96,000 Kg. at ₹2.25 per kg.

Direct wages paid 1,60,000 hours at ₹4.10 per hour. Out of which 6,000 hour being idea time were not recorded on production.

Overhead ₹3,32,000 out of which ₹1,50,000 were fixed .

Sales 25,000 units at an average price of ₹51.50 per unit.

You are required to:

- (i) Prepare a statement of actual Profit/Loss for the second quarter of the year.
 - (ii) Analyse the variances and present on operating statement reconciling the budgeted profit with actual profit.
- (19 Marks) Nov./94

[Ans.: Budgeted Profit: ₹216000; SVMV: ₹66000(A); SPV: ₹37500(F); MPV: ₹24000(A), MUV: ₹8000(F); LEff V: ₹16000; LRV: ₹16000; ITV: ₹24000; VOEV: ₹2800(F), VOEff V: ₹4800(A); FOEV: ₹6000(A); VOEffV: ₹3200; FOCap.V: ₹20800; Actual Profit: ₹83500]

[Hint: In above question, Examiner has specifically provided us Standard rate in Standard Cost card but has committed error while calculating Total Budgeted Overhead for Second quarter. Remember Budgeted Fixed Overhead shall not vary with change in output, which examiner has erroneously done. So, while doing this question we have 2 options:

1st: Assuming that out of Budgeted Overhead ₹432000, Budgeted Fixed Overhead are still ₹144000 & since Std. Overhead rate p.u./hr. is same at 36000 units as that of 30000 units, Std. Variable/Fixed overhead p.u./hr shall also be taken as same as that at Normal capacity of 30000 units. In other words there will be no change in Std. rate.

2nd: Assuming that out of Budgeted Overhead ₹432000, Budgeted Fixed Overhead are still ₹144000, but since budgeted units has changed from the time standard was set, hence although Standard Overhead p.u./hr. is same but Std. Variable/Fixed overhead p.u. will get changed and will become

Std. Variable Overhead p.u. = $(432000 - 144000)/36000 = ₹8 \text{ p.u.}$

Std. Variable Overhead p.u. = $(432000 - 144000)/36000 * 6 = ₹1.33 \text{ p.h.}$

Std. Fixed Overhead p.u. = $(144000)/36000 = ₹4 \text{ p.u.}$

Std. Fixed Overhead p.u. = $(144000)/36000 * 6 = ₹0.67 \text{ p.h.}$

Since, there is drafting error in question while making budget, hence you are free to follow any of the 2 assumptions, but 1st assumption was followed by Suggested answers of ICAI.]

Question 48: The overhead expense budget for a cost centre is as under:

Indirect material	Re.0.40 per hour
Indirect labour	Re.0.60 per hour
Maintenance	Re. 0.40 per hour
Power	Re. 0.30 per hour
Sundries	Re. 0.30 per hour
Total variable expenses	₹2.00 per hour
Fixed overhead budgeted	₹240

Budgeted output = 9,600 units or 120 standard hours.

At the end of a period the actual rates given by the accounts department are as under:

Power Re.0.32; maintenance Re.0.45; indirect labour Re.0.60; indirect material Re.0.50 and sundry expenses Re. 0.29 per hour; total variable expenses were ₹2.16 per hour. The actual output is 12,160 units for which the actual hours worked are 156. The fixed expenses amounted to ₹250. Compute the variances.

[Ans.: VOCV: 33A; FOVV: 64(F); FOBV: 10(A); FOCV: 54(F)]

Question 49: The Standard Cost of producing one unit of Item 'Q' is as under:

Direct Material --	A – 12 Kg. @ ₹10/-	= ₹120
	B – 5 kg. @ ₹6/-	= ₹30
Direct Wages --	5 hrs. @ ₹3/-	= ₹15
Fixed Production Overheads		= ₹35
Total Standard Cost:		= ₹200
Standard Gross Profit		= ₹50
Standard Sale Price		= ₹250

Fixed Production overhead is absorbed on expected annual output of 13,200 units.

Actual result for the month of September, 1997 are under:

Actual Production:	1,000 units	₹
Sales	1,000 Units @ ₹250	= 2,50,000
Direct Material --	A – 11,000 kg.	= 1,21,000
	B – 5,200 kg.	= 28,600
Direct wages	5,500 hrs.	= 17,500
Fixed Overheads		= 39,000
		= 2,06,100
	Gross profit	= 43,900

You are required to calculate all variances. Material price variance is taken out at the time of receipt of Material. Material purchases were:

12,000 kg. 'A' @ ₹11 & 5,000 kg. of 'B' @ ₹5.50

(12 Marks Nov./97)

[Ans.: Material price variance ₹9500(A); Material cost variance ₹9500(F); Material usage variance ₹8800(F); Material mix variance ₹1741.18(F); Material Yield variance ₹7052.82; Material purchase price variance ₹9500(A); Labour cost variance ₹2500(A); Labour efficiency variable ₹1500(A); Labour Price Variance 1000(A); Fixed Overhead Expenditure variance ₹500(A); Efficiency variable ₹3500(A); Volume variance ₹3500(A); Total fixed overhead cost variance ₹4000(A)]

Question 50: The following information is available in respect of Y Ltd. for a week:

- (a) 400 kg of raw material were actually used in producing product 'EXE'. The purchase cost thereof being ₹24,800. The standard price per kg of raw material is ₹60. The expected output is 12 units of

product 'EXE' from each kg of raw material. Raw material price variance and usage variance as computed by cost accountant are ₹800 (adverse) and ₹600 (adverse) respectively.

- (b) The week is of 40 hours. The standard time to produce one unit of 'EXE' is 30 minutes. The standard wage rate is ₹5 per labour hour. The company employs 60 workers who have been paid hourly wage rate as under:

Number of workers	6	8	46
Hourly Wage Rate (₹)	4.80	5.20	5.00

- (c) Budgeted overheads for a four-weekly period is ₹81,600. The actual fixed overheads spent during the said week are ₹19,800.

- (d) Entire output of 'EXE' has been sold at its standard selling price of ₹15 per unit.

You are required to:

- (i) Compute the variances relating to labour and overheads.
- (ii) Prepare a statement showing total standard costs, standard profit, and actual profit for the week.

[Ans.: Sales ₹70200; Standard profit ₹15210; Actual profit ₹13584]

(19 Marks) May/97

Question 51: Stand cost Corporation produces three products A,B and C. The master budget called for the sale of 10,000 units of A at ₹12 6,000 units of B at ₹15 and 8,000 units of C at ₹9. In addition, the standard variable cost for each product was ₹7 for A, ₹9 for B and ₹6 for C. Infact, the firm actually produced and sold 11,000 units of A at ₹11.50, 5,000 units of B at ₹15.10 and 9,000 units of C at ₹8.55.

The firm uses two input to produce each of the products X and Y. The standard price of material X is ₹2 and for a unit of material Y is Re. 1. The materials budgeted to be used for each product were:

Products	Materials	
	X (units)	Y (units)
A	2	3
B	4	1
C	1	4

The firm actually used 54,000 units of X at a cost of ₹1,09,620 and 72,000 units of Y at a cost of ₹73,000.

Required:

Determine the mix, quantity and rate variances for sales as well as the yield, mix and price variance for materials.

[Ans.: Sales mix variance ₹5750(A); Sales quantity variance ₹11750(F), Sales rate variance ₹9050(A); Sales margin mix variance ₹2583(A); Sales margin quantity variance ₹9050(A), Sales margin rate variance ₹7050(A); Material Yield variance ₹1408(A); Material mix variance ₹2592(A); Material Price variance ₹2620(A)]

[Note: Since question is silent that whether sales variances are supposed to calculated on the basis of value or margin, we can calculate it on either basis]

Question 52: The working results of a company for two corresponding years are shown below:

	Year 1 ₹in lakhs	Year 2 ₹in lakhs
Sales	1,200	1,540
Direct Material	600	648
Direct Wages and Variable Overheads	360	412
Fixed Overheads	160	300

	1,120	1,360
Profit	80	180

In year 2, there has been an increase in the selling price by 10%. Following are the details of material consumption and utilization of direct labour hours during the two years.

	Year 1	Year 2
Direct Material Consumption in m/t	5,00,000	5,40,000
Direct Labour Hours	75,00,000	80,00,000

You are required to :

- (i) Keeping year 1 as base year, analyse the results of year 2 and work out the amount which each factor has contributed to change in profit.
 - (ii) Find out the break even sales for both years.
 - (iii) Calculate the percentage increase in selling price that would be needed over the sale value of year 2 to earn a margin of safety of 45%.
- (13 Marks) May/00

[Ans.: (ii) BES: Yr. 1- ₹800 Lacs; Yr. 2- ₹962.50 Lacs (iii) 4.25%]

Question 53[Equivalent Production]: Standard Cost Card of a product is as under:

	(₹)
Direct Materials	
A 2kg @ ₹3 per kg	6.00
B 1kg @ ₹4 per kg	4.00
Direct Wages 5 hours @ ₹4 per hour	20.00
Variable overheads 5 hours @ ₹1 per hour	5.00
Fixed overheads 5 hours @ ₹2 per hour	10.00
Total	45.00
Standard Profit	5.00
Standard Selling Price	50.00

Budgeted output is 8,000 per month.

In October 2004, the company produced and sold 6,000 units. The actual sales value was ₹3,05,000. Direct materials consumed was: Material A 14,850 kg valued at ₹43,065 and Material B 7,260 kg valued at ₹29,750. The total direct labour hours paid were 32,000 and wages paid therefore amounted to ₹1,27,500. The direct labour hours actually booked on production was 31,800. Overheads recorded were: Fixed ₹80,600 and Variable ₹30,000. Closing work-in-progress was 600 units in respect of which metals A and B were fully issued and labour and overheads were 50% complete.

Analyse the variances and present an operating statement showing the reconciliation between budgeted and actual profit for the month in the following format.

	Operating Statement	(₹)
Budgeted Profit		
Sales Variance		
Price		
Volume		
Total		
Cost Variance		
Direct Materials		
Price		
Yield		
Mix		
Direct Wages		
Rate		

Efficiency
 Idle time
 Variable Overheads
 Expenses
 Efficiency
 Fixed Overheads
 Expenses
 Efficiency
 Idle time
 Capacity
 Total Cost Variance
 Actual Profit

[Ans.: Actual Profit-₹10585, Budgeted Profit-₹40000; Equivalent units: DM-6600 & DL-6300]

[Note: If we are specifically asked to calculate Fixed Overhead Idle Time Variance then we will calculate Capacity Variance at Actual Hours **paid** in spite of **worked**. All other variance will remain same.]

Question 54: The Standard cost card per unit of output of Product K produced by a firm is as under:

	(₹)
Direct Material	A. (10kg @ ₹10) B. (5 kg @ ₹3)
Direct wages	(5 hrs. @ ₹3)
Fixed production overheads	25
Total Standard Cost	155
Standard Gross Profit	45
Standard Selling Price	200

The fixed production overheads has been absorbed on the expected annual output of 10,800 units produced at a an even flow throughout the year.

During the month of November 2004, the following were the actual results for an actual production of 800 units

	(₹)
Sales 800 units @ ₹200	1,60,000
Direct Material	A 7,800 kg B 4,300 kg
Direct wages 4,200 hours	12,075
Fixed overheads	23,500
Total	1,27,350
Gross profit	32,650

The material price variance is extracted at the time of receipt of materials. Materials purchased were A. 9,000kg @ ₹10.25 per kg; B 5,000 kg @ ₹2.75 per kg.

Required:

- (i) Calculate all variances.
- (ii) Prepare an operating statement showing the standard gross profit, variances and the actual gross profit.
- (iii) Explain the reason for the difference in the actual gross profit given above and the actual gross profit arrived at by you.

[Ans.: Sales-₹160000; Std. Cost of Sales-₹124000; Actual Profit-₹32525; Actual Profit (On Issue Basis)-₹32650] ICWA-Dec/89 & (12 Marks) May/10-N.C.[Adapted]

Question 55: A small company, making a single product, produces accounts for a costing period, as following:

	(₹)
Direct Material	792
Direct Wages	1,192
Variable Overhead	1,940
Fixed Overhead	1,040
	<u>4,964</u>

Profit	976
Sales	5,940

The original budget was in respect of 1,000 per period, but during this period only 960 units were produced and sold.

Standard direct wages rate is ₹0.60 per hour and standard variable overhead rate is ₹1 per hour.

Cost variances during the period are as follows:

Particulars	₹)	Gains	Losses
Material Price	-	8	
Material Usage	-	16	
Wage rate	20	-	
Labour Efficiency	-	60	
Variable Overhead Expenditure	80	-	
Variable Overhead Efficiency	-	100	
Fixed Overhead Cost	-	40	
Sales Price	180	-	

From the above information, prepare for the period the original budget and a flexible budget for the sales achieved.

[Ans.: Sales: Std. Cost p.u.: ₹6; Original Budget (1000 units): 6000; Flexible Budget (960 units): 5760]

Question 56: The accountant of a company has presented the following operating statement to the General Manager of Department 'P' for the month of May 2004.

Particulars	Budget	Actual May 2004	Variance
Sales	24,00,000	22,00,000	2,00,000
Direct Materials	6,00,000	5,20,000	80,000
Direct Labour	8,00,000	7,56,000	44,000
Factory Overheads (V)	2,00,000	1,84,000	16,000
Factory Overheads (F)	1,00,000	1,16,000	(16,000)
Selling Overheads (V)	3,00,000	2,88,000	12,000
Selling Overheads (F)	2,00,000	1,84,000	1,60,000
Total	22,00,000	20,48,000	1,52,000
Profit	2,00,000	1,52,000	(48,000)
Direct Labour Hours	1,00,000	95,000	
Units of Production and Sale	20,000	18,000	

The general manager was surprised to see that his operation have resulted in the adverse profit variance of ₹48,000 for the month. On the basis of the budgeted profit of ₹10 per unit, he expected that he would make a profit of ₹1,80,000 on a sale of 18,000 units of production in May 2004 instead of the budgeted profit of ₹2,00,000 resulting in an adverse profit variance of ₹20,000 only.

You are required to :

- (a) Redraft the above statement to show the original budget, flexible budget, actual expenses incurred and variations for May 2004.
- (b) Calculate all variance relating to sales, direct material, direct labour and overheads.

[Ans.: Net Profit- Original Budget: 200000; Flexible Budget: 150000; Actual: 152000]

Question 57: The following information is available from the record of Sunrise Ltd. which produces only one product:

Budgeted Income Statement: January 1995			
	₹	₹	₹
Sales Revenue: (20,000 units at ₹5)			1,00,000
Production Costs:			

Budgeted production 20,000 units

Direct Materials:

A	(10,000 Kg. @ ₹0.30)	3,000	
B	(10,000 Kg. @ ₹0.70)	7,000	10,000
Direct Labour			
Skilled	(9,000 Hrs @ ₹3.00)	27,000	
Un-skilled	(5,200 Hrs @ ₹2.50)	13,000	40,000
Production Overhead:			
Fixed		20,000	
Variable	(20,000 units @ ₹0.50)	10,000	
Add: Opening Stock (1,000 units @ ₹4.00)		80,000	
Deduct Closing Stock (1,000 units @ ₹4.00)		4,000	
Budgeted Profit		84,000	4,000
			80,000
			20,000

During January 1995 production and sales were both above budget and the following income statement was prepared:

Income Statement: January 1995

	₹	₹	₹
Sales Revenue:			
(14,000 units at ₹5)			70,000
(8,000 units at ₹4.75)			38,000
			<u>1,08,000</u>

Production Costs:

Actual production 24,000 units

Direct Materials:

A	(16,000 Kg. @ ₹0.20)	3,200	
B	(10,000 Kg. @ ₹0.80)	8,000	11,200
Direct Labour			
Skilled	(13,000 Hrs @ ₹2.95)	38,350	
Un-skilled	(6,300 Hrs @ ₹2.60)	16,380	54,730
Production Overhead:			
Fixed		18,020	
Variable	(24,000 units @ ₹0.625)	15,000	
Add: Opening Stock (1,000 units @ ₹4.00)		98,950	
Less: Closing Stock (3,000 units @ ₹4.00)		4,000	
Actual Profit		1,02,950	12,000
			<u>90,950</u>
			17,050

During the period 1,000 abnormal idle hours for skilled labour due to machine breakdown was reported. In the above statement stock is valued at standard cost of ₹4 per unit.

Required:

Prepare a standard costing statement analyzing the differences between the budget and the actual performance. In your analysis include calculations of the sales volume and sales price variances; direct material price, mix, yield and usage variances; direct labour rate, idle time and efficiency variances; overhead expenditure and volume variances. (19 Marks) Nov./95

[Ans.: Sales volume margin variance ₹2000(F); Sales margin price variance ₹2000(A); Material price variance ₹600(F); Material mix variance ₹1200(F); Material yield variance ₹1000(A); Labour rate variance ₹20(F); Labour Efficiency variance ₹3750(A); Idle time variance ₹3000(A); Variable overheads exp. Variance ₹3000(A); Fixed overheads Exp. Variance ₹1980(F); Fixed overhead volume variance ₹4000(F)]

Question 58: GLOBAL LTD. is engaged in marketing of wide range of consumer goods. A, B, C and D are the zonal sales officers for four zones. The company fixes annual sales target for them individually. You are furnished with the following:

- (1) The standard costs of sales target in respect of A, B, C and D are ₹5,00,000, ₹3,75,000, ₹4,00,000 and ₹4,25,000 respectively.
- (2) A, B, C and D respectively earned ₹29,900, ₹23,500, ₹24,500 and ₹25,800 as commission at 5% on actual sales effected by them during the previous year.
- (3) The relevant variances as computed by a qualified cost accountant are as follows:

	A ₹	B ₹	C ₹	D ₹
Sales price variance	4,000 (F)	6,000 (A)	5,000 (A)	2,000 (A)
Sales volume variance	6,000 (A)	26,000 (F)	15,000 (F)	8,000 (F)
Sales margin mix variance	14,000 (A)	8,000 (F)	17,000 (F)	3,000 (A)

(A) = Adverse variance and (F) = Favourable variance.

You are required to:

- 1) Compute the amount of sales target fixed and the actual amount of contribution earned in case of each of the zonal sales officer.
- 2) Evaluate the overall performance of these zonal sales officers taking three relevant base factors and then recommend whose performance is the best.

(13 Marks) Nov./96

[Ans.: Actual Margin/Sales-15.05; 16/38; 18.78; 15.50; Rank: IV; II; I; III]

[Hint: In part 2) Actual margin is to be calculated instead of actual contribution, because actual cost is not given.]

[Note: Suggested Answers of ICAI has assumed that sales margin quantity variance is Nil]

Behavioural aspects of Standard Costing

1. Projection of fixed overheads and estimated selling price in a Standard Cost Sheet is a circular exercise with no added value.

In an award winning article, "COST / MANAGEMENT ACCOUNTING: THE 21ST CENTURY PARADIGM", published in Management Accounting (USA), December 1995, William L Ferrara argues that while preparing a Standard Cost Sheet, one of the objectives of which is to assist management in pricing products, a professional cannot project fixed overheads until and unless he is aware of the production quantum to be effected. The forecast of future production can only be made if a tentative selling price of the product is known because, in a competitive market, it is the selling price which decides the sale quantity and therefore the production volume. The authors contend that in case the selling price is known at the time of projecting fixed overheads then the re computation of the same is a valueless exercise.

2. Traditional costing tools like standard costing induce a static behaviour in the employees.

During the past decade and a half, various writers such as Johnson and Kaplan, Ferrara and Monden etc have questioned the productivity and use of traditional systems such as standard costing and variance analysis. They argue that the use of standard costing renders employees static and curbs innovation and that companies following traditional standard costing find it difficult to improve upon standards because of severe resistance from employees who are convinced that the established best practise cannot be improved further.

3. Fear of adverse variances forces managers to give undue importance to material price, labour rate and efficiency and capacity utilisation. These concepts are detrimental to the modern day world class manufacturing environment characterized by concepts of JIT and TQM.

In a World Class Manufacturing environment, characterised by Just in Time policies, the focus of the management is to produce only as much as is required. This requires purchase of small quantities of raw material, increase in the number of set ups and minimal importance to capacity utilisation. Policies like this result in increased adverse variances related to raw material prices, labour efficiency and production volume. Critics argue that the fear of such adverse variances affects goal congruence and forces managers to behave against their company's policies.

4. Traditional costing does not provide the management with what is the allowable cost; rather it emphasises on the standard or actual costs.

This is looked upon as one of the major reasons for lack of innovation especially in the global era where competition amongst companies is unprecedented. It is argued that techniques like Target costing are much

more motivating when compared to Traditional costing since the former encourage the use of concepts like value engineering and value analysis.

Question 59: Describe the role of cost accountant in the area of operating efficiency. (4 Marks) May/97

Ans.: Role of Cost Accountant in the area of operating efficiency: Operating efficiency relates to the efficient use of various resources, viz material, labour, machines etc. The cost accountant can contribute towards efficient and effective use of man, material and machine by introducing control and accounting procedures. In the area of labour efficiency, the role of cost accountant includes reporting efficiency variances and evaluating wage incentive schemes. In the case of material, efficiency can be increased by introducing effective material control and accounting procedures and computing material usage variance. In the area of machine efficiency, his objective would be to ensure optimum utilization of machine time. He may also give his advice based on his information and analysis, to the management, towards the replacement of old machine with the latest one. The efficiency of operating procedures will be monitored by industrial engineers and organization & methods specialists but the cost accountant may be required to calculate the net savings to be expected from the procedural change.

Question 60: Explain the problems concerning control of operations that a manufacturing company can be expected to experience in using a standard costing system during periods of rapid inflation. (4 Marks) May/96

Ans.: The problems concerning control of operations that a manufacturing company can be expected to experience in using a standard costing system during periods of rapid inflation are as follows:

- (i) The formulation/setting of material standards makes assumptions about the inflation, which will prevail in future, if this assumption is not stated clearly then it is difficult to determine how much of price variance is due to inflation and how much is due to buying efficiency.
- (ii) Price indices tend to reflect average price changes. Consequently, it is difficult for a company to predict future costs and interpret variances if the specific rate of inflation for its inputs is considerably different from the general rate of inflation.
- (iii) Inflation may result in relative changes in the prices of inputs. Therefore, standard mixes requiring different inputs may no longer be the most efficient mix.
- (iv) If standard prices are not adjusted then the efficiency variances will be understated.
- (v) Sharp rises in prices will raise questions as to whether unadjusted standards can be used in the decision making process (e.g. Pricing decisions).
- (vi) Administrative work involved in maintaining upto-date standards when prices are constantly changing will increase.

Question 61: "Overhead variances should be viewed as interdependent rather than independent". Explain.

Ans.: The operations of a firm are so inter linked that the level of performance in one area of operation will affect the performance in other areas. Improvements in one area may lead to improvements in other areas. A sub-standard performance in one area may be compensated by a favourable performance in another area. Because of such interdependency among activities in the firm, the managers should not jump to conclusions merely based on the label of variances namely favourable or unfavourable. They should remember that there is a room for trade off amongst variances. Hence, variances need to be viewed as 'attention directors' rather than problem solvers. Thus, a better picture will be captured when overhead variance are not viewed in isolation but in an integrated manner. (4 Marks) May/02

Question 62: What are the basic differences between Standard Costing and Budgetary Control?

(7 Marks) Nov/97

Ans.: Basic differences between Standard Costing and Budgetary Control are as follows:

- (i) Standard costs are ascertained for material labour and overheads Here the control of each elements of cost is effected by comparing actual costs with standard costs of actual output. Whereas budgets are prepared for different functions like sales, production capital assets etc. of business. Budgetary control here is concerned with the overall profitability and financial position of the business.
- (ii) Range of standard costing is narrow as it is mainly confined to the control of production costs. But the range of budgeting is wider than that of standard costing. It in fact covers sales, capital and financial expenses as well.

- (iii) Standard costing is confined of the projection of cost accounts only whereas budgetary control includes projection of financial accounts as well.
- (iv) For exercising control, variances are computed in standard costing as well as budgetary control. But these variances are normally recorded in different cost accounts under standard costing whereas they are not revealed under budgets.
- (v) Under standard costing various causes of variances in respect of each cost element can be analysed in minute detail and corrective action taken accordingly.
- Whereas budgetary control system deals with total expenses and revenues based on estimates.

Question 63: "Calculation of variances in standard costing is not an end in itself, but a means to an end." Discuss. (7 Marks) May/99

Ans.: The crux of standard costing lies in variance analysis. Standard costing is the technique whereby standard costs are predetermined and subsequently compared with the recorded actual costs. It is a technique of cost ascertainment and cost control. It establishes predetermined estimates of the cost of products and services based on management's standards of efficient operation. It thus lays emphasis on "what the cost should be". These should be costs are when compared with the actual costs. The difference between standard cost and actual cost of actual output is defined as the variance.

The variance in other words is the difference between the actual performance and the standard performance. The calculations of variances are simple. A variance may be favourable or unfavourable. If the actual cost is less than the standard cost, the variance is favourable but if the actual cost is more than the standard cost, the variance will be unfavourable. They are easily expressible and do not provide detailed analysis to enable management to exercise control over them. It is not enough to know the figures of these variances from month to month. We in fact are required to trace their origin and causes of occurrence for taking necessary remedial steps to reduce / eliminate them.

A detailed probe into the variance particularly the controllable variances helps the management to ascertain:

- (i) the amount of variance
- (ii) the factors or causes of their occurrence
- (iii) the responsibility to be laid on executives and departments and
- (iv) corrective actions which should be taken to obviate or reduce the variances.

Mere calculation and analysis of variances is of no use. The success of variance analysis depends upon how quickly and effectively the corrective actions can be taken on the analysed variances. In fact variance gives information. The manager needs to act on the information provided for taking corrective action. Information is the means and action taken on it is the end. In other words, the calculation of variances in standard costing is not an end in itself, but a means to an end.

Investigation of variances

When deciding which variances to investigate, the following factors should be considered:

- Reliability and accuracy of the figures: Mistakes in calculating budget figures, or in recording actual costs and revenues, could lead to a variance being reported where no problem actually exists (the process is actually 'in control').
- Materiality: The size of the variance may indicate the scale of the problem and the potential benefits arising from its correction.
- Possible interdependencies of variances: Sometimes a variance in one area is related to a variance in another. For example, a favourable raw material price variance resulting from the purchase of a lower grade of material, may cause an adverse labour efficiency variance because the lower grade material is harder to work with. These two variances would need to be considered jointly before making an investigation decision.
- The inherent variability of the cost or revenue: Some costs, by nature, are quite volatile (oil prices, for example) and variances would therefore not be surprising. Other costs, such as labour rates, are far more stable and even a small variance may indicate a problem.
- Adverse or favourable? Adverse variances tend to attract most attention as they indicate problems. However, there is an argument for the investigation of favourable variances so that a business can learn from its successes.

- **Trends in variances:** One adverse variance may be caused by a random event. A series of adverse variances usually indicates that a process is out of control.
- **Controllability/probability of correction:** If a cost or revenue is outside the manager's control (such as the world market price of a raw material) then there is little point in investigating its cause.
- **Costs and benefits of correction:** If the cost of correcting the problem is likely to be higher than the benefit, then there is little point in investigating further.

Variance investigation models can be classified into the following categories:

- **Simple rule of thumb model:** Under this approach, company managers use simple models based on arbitrary criteria such as percentage of standard cost approach. Any variance larger than a fixed percentage of standard cost is investigated. It is a simple system to operate, but it ignores many of the issues listed above. For example, it takes no account of the reliability of the figures, possible interdependencies of variances, the inherent variability of the costs involved, recent trends in variances, or the costs and potential benefits of investigation.
- Statistical models that do not incorporate costs and benefits of investigation.
- Statistical decision models that take into account the cost and benefits of investigation.

Investigation will indicate that variance is due to:

- Random uncontrollable factors when the operation is under control.
- Assignable causes, but the cost of investigation exceeds benefits.
- Assignable causes, but the benefits of investigation exceed the cost.

Note : The aim is to investigate only those variances in the third category.

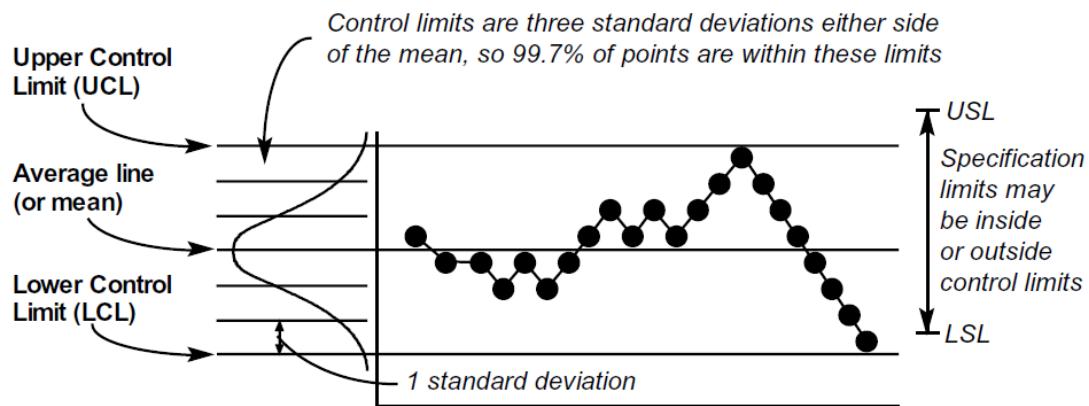
Statistical investigation models not incorporating cost and benefits

When deciding whether to investigate a variance it is important to distinguish between variances caused by normal random cost variation (those that occur even though the process is 'in control'), and those caused by genuine problems (often referred to as the process being 'out of control').

Some costs are inherently variable, and standards can be viewed as representing an average cost. Small variances (adverse or favourable) can often be accounted for by the normal random variation that occurs around this average. Larger variances are less likely to be explained by normal random variation, and are more likely to suggest that the process is out of control.

Control charts provide a visual representation of the variation of actual costs around standard.

1. Assume actual observations when under control indicate a mean usage of 10 kg per unit with a SD of 1 kg (normally distributed).
2. Actual usage is 26000 kg for an output of 2000 units.
Therefore, average usage = 13 kg per unit.
3. $Z = \frac{\text{Actual usage (13 kg)} - \text{Expected usage (10 kg)}}{\text{SD (1 kg)}}$ = 3.0
4. Normal distribution table indicates that an observation 3 SDs from the mean has a probability of 0.13% (50%-49.87%).



5. Thus the probability of actual average material usage per unit of output being 13 kg or more when the operation is under control is 0.13%. It is very unlikely that material usage comes from 'in control distribution'.
6. Statistical control charts, which rely on the above principles, can be used to monitor resources usage and the probability that operations are out of control.

Statistical quality control charts

Figure above shows a variance control chart. Actual costs are plotted on the diagram as they occur, given as percentages of standard cost. As long as the actual cost percentage remains within the limits no action is taken. These small variations from standard are assumed to be due to normal random variation. If actual costs move outside the limits, this indicates the need for corrective action.

Limits can be set on the basis of experience, or on the basis of a standard normal distribution, a technique that is explained in "Test of Hypothesis"

A control chart provides a useful visual representation of data, and helps isolate normal random (uncontrollable) variation in cost. It also gives a clear picture of trends in variances. However, a control chart is only really useful for costs where an average can be established, and its use is usually restricted to efficiency rather than expenditure variances.

Statistical decision models that take into account the cost and benefits of investigation.

1. If the process is out of control there is a benefit (B) associated with returning it to its in-control state (i.e. cost savings from avoiding variances in future periods). Say $B = ₹400$.
2. Let C = cost of investigation (Say $C = ₹100$).
3. Let P = probability that the process is out of control.
4. Expected benefit = PB
5. Investigate if $PB > C$, or $P > C/B$
6. $P > 100 / 400 = 0.25$
7. Probability (Process is in control) = 0.0013 (from example in control charts)
8. $P = 1 - 0.0013 = 0.9987$
9. Decision = Investigate the variance

Remember, Variances should only be investigated if the expected value of the resulting benefits exceeds the costs of investigation.

Illustration 1

The cost accountant for X plc has reported a large adverse material usage variance for the previous month. An initial investigation has shown that a faulty machine is causing the variance.

X plc is trying to decide whether to close down the production line for one day to allow engineers to perform a temporary repair, at an incremental cost of ₹200,000. Past experience suggests that there is a 60% chance of the temporary repair correcting the fault. If the fault is not corrected now it is estimated that an extra material cost of ₹400,000 will be incurred before the fault is permanently corrected by scheduled maintenance work, due to take place in three-months' time.

Solution:

Probability of the process being out of control, $P = 0.60$

Cost savings, $B = ₹400,000$

Incremental cost of correction, $C = ₹200,000$

$C/B = 2,00,000 / 4,00,000 = 0.50$

Investigation is desirable when the probability of being out of control exceeds 0.50

Since $P > C/B$ hence investigation is advisable.

A probability-based model appears very sensible but its major drawback is the need for accurate estimates of probabilities. In above example, it could be questioned how the firm estimated the 60% chance of success.

CONCLUSION

Variances are calculated to assist managers in the control of a business. Effective decisions on whether to investigate variances are crucial for successful control.

Illustration 2

A company using a detailed system of standard costing finds that the cost of investigation of variances is ₹20,000. If after investigation an out of control situation is discovered, the cost of correction is ₹30,000. If no investigation is made, the present value of extra cost involved is ₹1,50,000. The probability of the process

being in control is 0.82 and the probability of the process being out of control is 0.18. You are required to advise.

- (i) Whether investigation of the variances should be undertaken or not;
- (ii) The probability at which it is desirable to institute investigation into variances.

(ICWA-June/87)

Solution:

Cost of investigation, C = ₹20,000

Cost of Correction, M = ₹30,000

Extra cost if no investigation, L = ₹1,50,000

Benefit of investigation, B = L – M = ₹1,20,000

Probability of the process being out of control, P = 0.18

C/B = 20,000/1,20,000 = 0.167

Investigation is desirable when the probability of being out of control exceeds 0.167

Since P>C/B hence investigation is advisable.

Illustration 3

A machine produces 1,00,000 standard components per day at a cost of ₹1.50 per unit. If the process is in control, on an average 3% of the output is defective. If the process is out of control, the rate of defective will be 5%. The entire cost of a defective unit is a loss.

The cost of carrying out an investigation is ₹600. If the process is found to be out of control after an investigation then it costs another ₹400 to rectify the error. The probability of the process being in control is 0.7.

(ICWA-Dec./98)

Solution:

Cost of investigation, C = ₹600

Cost of Correction, M = ₹400

Extra cost if no investigation, L = 1,00,000 × (5-3)% × 1.50 = ₹3,000

Benefit of investigation, B = L – M = ₹2,600

Probability of the process being out of control, P = 0.3

C/B = 600/2,600 = 0.231

Investigation is desirable when the probability of being out of control exceeds 0.231

Since P>C/B hence investigation is advisable.

BALANCE SCORECARD

Balanced Score Card:

Balanced Score Card is a set of financial and non-financial measures relating to a company's critical success factors.

It is an approach advocated by Kaplan & Norton, which provides information to management to assist in strategic policy formulation and achievement.

The main objective of Balanced Score Card is to provide a comprehensive framework for translating a firm's strategic objectives into a coherent set of performance measures.

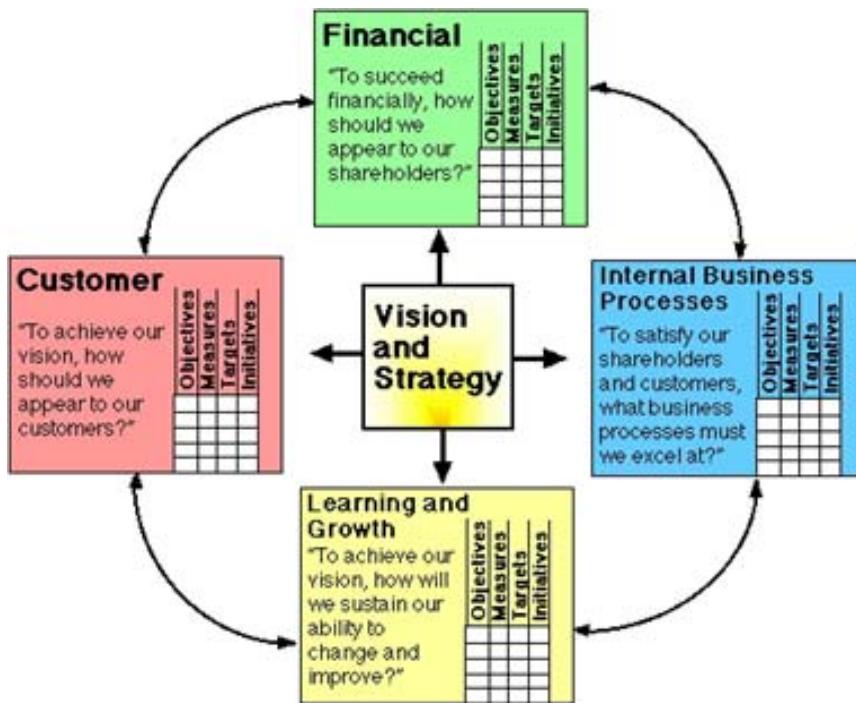
Components of a balanced score card:

A well designed balanced score card combines financial measures of past performance with measures of firm's drivers of future performance.

The specific objectives and measures of an organisation's balanced score card are derived from the firm's vision and strategy.

There are a number of "balances" in the BSC, among which are the balance or equilibrium between four historical domains or perspectives considered to be mutually linked in terms of strategy and performance:

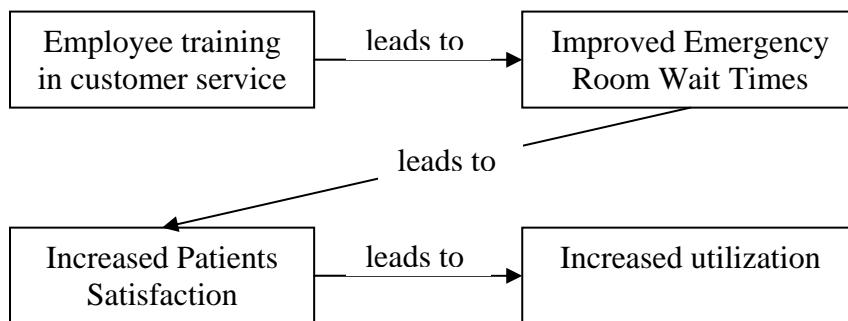
1. **Customer perspective** i.e how customers see us? In order to translate effective internal processes into organization success, customers/clients must be happy with the service they receive. The Customer perspective considers the business through the eyes of the customers, measuring and reflecting upon customer satisfaction.



2. **Internal perspective** i.e. in what must the organization excel? The internal perspective focuses attention on the performance of the key internal processes, which drive the business. The nature of the processes is dependent on the nature of the organization.
3. **Innovation and learning perspective**, i.e. Can we continue to improve and create value? The value & Growth perspective is a measure of potential future performance – it directs attention to the basis of all future success – the organization people and infrastructure. Adequate investment in these areas is critical to all long-term success.
4. **Financial, perspective** i.e. How we look to our shareholders? The financial perspective measures the results that the organization delivers to its shareholders.

Thus, the scoreboard provides a view of an organization's overall performance by integrating financial measures with other key performance indicators. All these four perspectives provide a balanced view of the present and future performance of the business.

Paul Niven's analogy of the Balanced Scorecard is that of a tree. The Learning and Growth perspective are the roots, the trunk is the Internal Process perspective, Customers are the branches, and the leaves are the Financial perspective. Each perspective is interdependent on those below as well as those above. It is a continuous cycle of renewal and growth. Leaves (finances) fall to fertilize the ground and root system, which stimulates growth throughout the organization. In this analogy, learning and growth is the foundation on which all other perspectives are built. For example, if a hospital assesses patient satisfaction and discovers patients aren't satisfied (Customer Perspective), one of the strategies might be the implementation of employee training in the area of customer service (Learning & Growth Perspective). Improved customer service through a reduction of wait time in the emergency room (Internal Process Perspective) can ultimately improve utilization (Financial Perspective). Refer to below-mentioned figure. There are definite cause and effects between and among each of the four perspectives. The key is to identify the right strategies.



Source: http://www.ruralcenter.org/?id=res_bsc

One of the reasons the Balanced Scorecard has been so successful is that it is a balanced approach. This balance includes:

1. Balance between financial and non-financial indicators of success
2. Balance between internal and external constituents of the organization
3. Balance between lag and lead indicators of performance.

Internal constituents might include employees whereas external constituents might include physician groups or insurers. **Lag indicators** generally represent past performance and might include customer satisfaction or revenue. Although these measures are objective and accessible, they lack any predictive power. **Lead indicators** are the performance drivers that lead to the achievement of lag indicators and often include the measurement of processes and activities. For example, Emergency Room wait time might represent a leading indicator of patient satisfaction. A Balanced Scorecard should contain a variety of different measures.

Process of creating a Balanced Score Card:

Step	Description
1.	Identify the vision i.e. where an organization is going. For example, the vision of a company may be to dominate the market.
2.	Identify the organisation's strategies i.e. how an organization is planning to go there. For example, strategy may be to focus on cost efficiency, high quality and fresh investment in new technology.
3.	Define critical success factors and perspective i.e. what we have to do well in each perspective (see Note Below for illustration of perspectives and performance measures)
4.	Identify measures , which will ensure that every thing is going in the expected way.
5.	Evaluation of Balanced score card i.e. ensuring what we are measuring is right
6.	Create action plans and plan reporting of the Balanced Score Card
7.	Follow-up and manage i.e. which person should have reports and how reports should look like

A. Innovation and Learning Perspective

Goals	Performance
Technology leadership	Product performance compared to competitors, number of new products with patented technology.
Cost leadership	Manufacturing overheads per quarter as a percentage of sales rate of decrease in cost of quality per quarter
Market leadership	Market share in all major markets
Research and development	Number of new products, numbers of patents

B. Internal business Perspective

Goals	Performance
Efficiency of manufacturing process	Manufacturing cycle time
Sales penetration	Annual sales vs. Plan sales, increase in number of customers in a unit of time.
New Product introduction	Rate of new product introduction/quarter

C. Customer Perspective

Goals	Performance
Price	Competitive price
Delivery	Number of on time delivery, lead time from receipt of order to delivery to customers.
Quantity	Own quality relative to industry standards, number of defects or defect level
Support	Response time, customer satisfaction surveys

D. Financial Perspective

Goals	Performance
Sales	Revenue and profit Growth
Cost Of Sales	Extent to which it remained fixed or decreased each year
Profitability	Return on capital employed
Prosperity	Cash Flow

Advantages of Balanced Score Card:

1. **Wholistic approach:** It brings strategy and vision as the center of management focus. It helps companies to assess overall performance, improve operational processes and enable management to develop better plans for improvements. It provides management with a comprehensive picture of business operations.
2. **Overall Agenda:** It brings together in a single management report many of the seemingly desperate elements like customer oriented, shortening response time, improving quality etc. of competitive agenda.
3. **Objectivity:** It emphasizes the need to provide the user with a set of information, which addresses all relevant areas of performance in an objective and unbiased manner.
4. **Management By Objectives:** The methodology of balanced score card facilitates communication and understanding of business goals and strategies at all levels of an organization. Thus it enables management by objective.
5. **Feedback and Learning:** It provides strategic feedback and learning. The Balanced Score Card guards against subordination. It emphasizes an integrated combination of traditional and non-traditional performance measures.
6. **System Approach:** It helps senior managers to consider all important performance measures together and allows them to see whether an improvement in one area has been achieved at the expense of another.

Question 64: "Balanced score card and performance measurement system endeavours to create a blend of strategic measures, outcomes and drive measures and internal and external measures". Discuss the statement and explain the major components of a balanced score card. (4 Marks) May/05

Ans.: The balanced score card translates an organization's mission and strategy into a comprehensive set of performance measures that provides the framework for implementing its strategy. The balanced score card does not focus solely on achieving financial objectives. It is an approach, which provides information to management to assist in strategic policy formulation and achievement. It emphasizes the need to provide the user with a set of information, which addresses all relevant areas of performance in an objective and unbiased manner. As a management tool it helps companies to assess overall performance, improve operational processes and enables management to develop better plans for improvements.

Major components of a balanced scorecard - The components of balanced score cards varies from business to business. A well designed balanced scorecard combines financial measures of past performance with measures of firm's drivers of future performance. The specific objectives and measures of an organization-balanced scorecard can be derived from the firm's vision and strategy. Generally, balanced score card has the following four perspectives from which a company's activity can be evaluated.

1. Financial perspective: Financial perspective measures the results that the organization delivers to its stakeholders. The measures are: operating income, revenue growth, revenues from new products, gross margin percentage, cost reduction in key areas, economic value added, return on investment.
2. Customer perspective: The customer perspective considers the business through the eyes of customers, measuring and rejecting upon customer satisfaction. The measures are: - market share, customer satisfaction, customer retention percentage, time taken to fulfil customer's requests.
3. Internal business perspective: The internal perspective focuses attention on the performance of the key internal processes, which drive the business such as innovative process, operation process and post-sales services.
4. Learning & growth perspective: The measure are:- employee education & skills levels, employee turnover ratio, information system availability, percentage of employee suggestion implemented etc.

Question 65: What are the elements of a Balanced Score card? Also explain how it can be used as a Financial Planning model. (4 Marks) May/06

Question 66: Explain briefly the major components of a balanced score card.

(4 Marks) May/07 & (4 Marks) Nov./10-N.C.

Question 67: "In many organisations, initiatives to introduce balanced score card failed because efforts were made to negotiate targets rather than to build consensus."

Required:

Elucidate the above statement.

(8 Marks) Nov./07

Ans.: Balanced scorecard is a set of financial and non-financial measures relating to a company's critical success factors. It is an approach which provides information to management to assist in strategy implementation. Therefore, the components to be included in the balanced score card must flow from strategy. The targets should be measurable and must flow from strategy and corporate plan of the company. It is necessary that managers should agree to the components and targets because in absence of a consensus, managers may not commit to the targets established by the top management / the board of directors. Moreover, the functions are interdependent and results in one functional area/perspective (e.g. innovation and learning) have direct bearing on the results in other functional area / perspective (e.g. customer perspective). Therefore, it is not sufficient that individual managers agree to their targets. Successful implementation requires that the top management builds an overall consensus on the components and targets of the balanced score card. Negotiation undermines the fundamental principle that the components and targets should flow from strategy. As a result, an approach to establish targets through negotiation defeats the very purpose of balanced score card.

Question 68: Explain goals and performance measure for each perspective of Balance Score Card.

(4 Marks) June/09-O.C.

Strategic Analysis of Operating Income

(1) Growth Component: It measures the change in operating income attributable solely to increase in the quantity of output sold between 2 year i.e. it is measures the increase in revenues minus the increase in costs from selling the more units of product. In it we assume that output prices, efficiency & capacity of Year 1 will continue in Year 2. The calculations of growth component are similar to sales-volume variance (read in Standard Costing).

(a) Revenue effect = (Actual output sold in Year 2 – Actual output sold in Year 1)×Output price/unit in Year 1

(b) Cost effect = (Actual Input or capacity used in Year 1 – Actual Input or capacity which would have been used to produce output of Year 2 assuming same input output relationship that existed in Year 1)×Input price/unit in Year 1

(2) Price Recovery Component: It measures the change in operating income attributable solely to changes in prices of input & output between 2 years. It measures the amount by which the output price increases outstrips input price increases. The calculations of price recovery component are similar to selling price variance, and input price & spending variance for material, labour & overheads (read in Standard Costing).

(a) Revenue effect = (Selling Price in Year 2 – Selling Price in Year 1)×Actual output sold in Year 2
 {Revenue effect is similar to Selling price variance}

(b) Cost effect = (Input price/unit in Year 1 - Input price/unit in Year 2)×Actual units of Input or capacity which would have been used to produce output of Year 2 assuming same input output relationship that existed in Year 1
 {Cost effect is similar to Material price variance}

(3) Productivity Component: It measures the change in operating income attributable to a change in quantity of inputs units used in Year 2 relative to the quantity of inputs that would have been used in Year 1 to produce the Year 2 output. It measures the amount by which operating income increases by using inputs productively to lower costs even when the prices of products are not increasing. The calculations for the productivity variance are similar to efficiency variance (read in Standard Costing).

Cost effect = (Actual Input or capacity which would have been used to produce output of Year 2 assuming same input output relationship that existed in Year 1 - Actual Input or capacity used in Year 2)×Input price/unit in Year 2

Question 69 [Balance Scorecard]: Kitchen King company makes a high-end kitchen range hood 'Maharaja'. The company presents the data for the year 2003 and 2004:

	2003	2004
1. Units or maharaja produced and sold	40,000	42,000
2. Selling Price per unit in ₹	1,000	1,100
3. Total Direct Material (Square feet)	1,20,000	1,23,000
4. Direct material cost per square feet in ₹	100	110
5. Manufacturing Capacity (in units)	50,000	50,000
6. Total Conversion cost in ₹	1,00,00,000	1,10,00,000
7. Conversion cost per unit of capacity (6)/(5)	200	220
8. Selling and customer service capacity	300	290
	customer	customer
9. Total selling and customer service cost in ₹	72,00,000	72,50,000
10. Cost per customer of selling and customer service capacity (9)/(8)	24,000	25,000

Kitchen King produces no defective units, but it reduces direct material used per unit in 2004. Conversion cost in each year depends on production capacity defined in terms of Maharaja units that can be produced. Selling and Customer service cost depends on the number of customers that the selling and service functions are designed to support. Kitchen King has 230 customers in 2003 and 250 customers in 2004. You are required

1. Describe briefly key elements that would include in Kitchen King's Balance Score Card.
2. Calculate the Growth, Price-recovery and productivity component that explain the change in operating income from 2003 to 2004.

(18 Marks) Nov/05

Ans.: The change in operating income from 2003 to 2004 is analyzed as follows:

	2003	Growth component	Price recovery	Cost effect of productivity component	2004
Revenue	40000	2000 (F)	4200 (F)	-----	46200
Cost	29200	600 (A)	2560 (A)	580 (F)	31780
Operating Income	10800	1400(F)	1640 (F)	580 (F)	14420