

<b>Marginal Cost</b>	<ul style="list-style-type: none"> <li>• It is the amount at any given volume of output by which aggregate costs are changed if the volume of output is increased or decreased by one unit.</li> <li>• In other words, it is the incremental cost of production for producing one additional unit of product.</li> <li>• In other words, with the increase in one unit of output the total cost is increased and this increase in total cost due to change in the volume of output is known as marginal cost.</li> </ul>
<b>Marginal Costing</b>	<ul style="list-style-type: none"> <li>• It is the ascertainment of marginal costs and of the effect on profit of changes in volume or type of output, by differentiating between the fixed costs and variable cost.</li> <li>• Marginal costing is a technique which presents management with required information enabling it to measure the profitability of an undertaking by considering the behavior of costs.</li> <li>• It is a costing system where products or services and inventories are valued at variable cost only.</li> </ul>
<b>Characteristics of Marginal Costing</b>	<ul style="list-style-type: none"> <li>• All elements are classified into fixed and variable components.</li> <li>• The variable costs are treated as the cost of product.</li> <li>• Value of finished goods and work-in-progress is valued at marginal cost basis only.</li> <li>• Fixed cost are treated as period costs.</li> <li>• Profitability is determined with reference to their contribution margin.</li> </ul>
<b>Advantages of Marginal Costing</b>	<ul style="list-style-type: none"> <li>• <b>Help in managerial decisions</b> – The most important advantage of variable costing is the assistance that it renders to management in taking many valuable decisions.</li> <li>• <b>Cost Control</b> – Greater control over cost is possible. This is so because by classifying costs in fixed and variable, the management can concentrate more on the control of variable cost which are generally controllable and pay less attention to fixed costs which may be controlled only by the top management and that too, to a limited extent.</li> <li>• <b>Constant cost per unit</b> – Marginal costing takes into account only variable costs which remain the same per unit of product irrespective of the volume of output. It therefore avoids the effect of varying cost per unit as it ignores fixed costs which are incurred on a time basis and have no relation with the size of production.</li> </ul>

	<ul style="list-style-type: none"> <li>• <b>No under and over-absorption of overheads</b> – In marginal costing, there is no problem of under-or-over absorption of overheads.</li> <li>• <b>Aid to profit planning</b> – To aid profit planning marginal costing technique enables data to be presented to management in such a way as to show cost-volume-profit relationship.</li> <li>• <b>Simple technique</b> – Variable costing is comparatively simple to operate because it avoids the complications involved in allocation, apportionment and absorption of fixed overheads which is, in fact, arbitrary division of indivisible fixed costs.</li> <li>• <b>Realistic valuation of stocks</b> – In marginal costing, stocks of work-in-progress and finished goods are valued only at variable costs. Thus, no fictitious profits can arise due to fixed cost being absorbed and capitalized in unsold stock. Stock valuation in marginal costing, is, therefore more realistic and uniform.</li> <li>• <b>Valuable addition to other technique</b> – Marginal costing is a valuable addition to standard costing and budgetary control.</li> </ul>
<b>Limitations of Marginal Costing</b>	<ul style="list-style-type: none"> <li>• <b>Difficulty in classifying fixed and variable elements</b> - It is difficult to classify exactly the expenses into fixed and variable category. Most of the expenses are neither totally variable nor wholly fixed. For example, various amenities provided to workers may have no relation either to volume of production or time factor.</li> <li>• <b>Dependence of key factors</b> - Contribution of a product itself is not a guide for optimum profitability unless it is linked with the key factor.</li> <li>• <b>Ignores time factor and investment</b> - Marginal costing ignores time factor and investment. For example, the marginal cost of two jobs may be the same but the time taken for their completion and the cost of machines used may differ. The true cost of a job which takes longer time and uses costlier machine would be higher. This fact is not disclosed by marginal costing.</li> <li>• <b>Unpredictable nature of cost</b> - Some of the assumptions regarding the behavior of a various costs are not necessarily true in a realistic situation. For example, the assumption that fixed cost will remain static throughout is not correct. Fixed cost may change from one period to another. For example, salary bill may go up because of annual increments or due to change in pay rate etc.</li> <li>• <b>Faulty valuations</b> - Overheads of fixed nature cannot altogether be excluded particularly in large contracts, while valuing the work-in-progress. In order to show the correct position, fixed overheads have to be included in work-in-progress.</li> <li>• <b>Scope for low profitability</b> - Sales staff may mistake marginal cost for total cost and sell at a price; which will result in loss or low profits. Hence, sales staff should be cautioned while giving marginal cost.</li> </ul>
<b>Absorption Costing</b>	<ul style="list-style-type: none"> <li>• It is an approach to product costing in which all manufacturing costs, variable costs and fixed costs are charged to the cost of goods manufactured and inventories.</li> <li>• In absorption costing all manufacturing costs—variable and fixed—are charged to products, material and labour costs by direct measurement while indirect manufacturing costs by some methods of apportionment.</li> </ul>

<b>Difference between Absorption and Marginal Costing</b>	<b>Basis</b>	<b>Absorption Costing</b>	<b>Marginal Costing</b>
	1. Calculation of manufacturing overhead rates	Absorption rate includes, both fixed and variable manufacturing overheads.	Marginal costing rate includes only variable manufacturing overhead.
	2. Valuation of inventory	Valuation is on Product cost i.e. Prime cost + applied fixed and variable manufacturing overhead.	Valuation will be at Prime cost + applied variable manufacturing overhead.
	3. Classification of Overhead	Overheads may be classified as factory, administrative, selling and distribution	Overheads are classified as variable and fixed.
	4. Operating profit	Gross Profit = Net sales – Prime cost - fixed and variable manufacturing overheads	Contribution = Net sales – variable manufacturing cost of goods sold – variable administrative selling and distribution overhead
	5. Net operating profit	Net operating profit = Gross profit – administrative selling and distribution overheads (fixed and variable)	Net operating profit = Contribution - fixed manufacturing overhead – fixed administrative overhead – fixed selling and distribution overhead
	6. Effect of stock valuation	The difference in the magnitude of opening and closing stock affect the unit cost of production.	The difference in the magnitude of opening and closing stock doesn't affect the unit cost of production.
	7. Decision Making	It distorts decision making	It aids decision making
<b>Difference in Profit under Marginal and Absorption Costing</b>	<ul style="list-style-type: none"> <li>• <b>No Opening or closing stock</b> – Both profit/loss will be equal.</li> <li>• <b>When opening stock is equal to closing stock</b> – Both profit/loss will be equal provided fixed cost in both stock is same.</li> <li>• <b>When closing stock is more than opening stock</b> – Profit as per absorption will be more than marginal.</li> <li>• <b>When opening stock is more than closing stock</b> – Profit in marginal will be more than absorption.</li> </ul>		
<b>Cost-Volume-Profit (CVP) Analysis</b>	<ul style="list-style-type: none"> <li>• It studies the variations in cost and profit in relation to change in the volume of output and sales though a large number of internal and external factors influence e.g. the amount of profit, the volume of output etc.</li> <li>• The three factors of CVP analysis are interlinked and interdependent.</li> </ul>		

<p><b>Importance and uses of CVP Analysis</b></p> <p><b>[TRICK – Profit Decision depend on Cost Budget]</b></p>	<ul style="list-style-type: none"> <li>• <b>Profit Planning</b> - In profit planning it becomes essential to know the relationship between cost, volume and profit. The most important feature of C-V-P analysis is the manner in which it relates cost, selling price and volume and enable calculation to be made to show the effect of change in these on profit. Accordingly, the management can plan profit with reference to C-V-P analysis.</li> <li>• <b>Decision Making</b> - C-V-P analysis is very useful in taking managerial decisions like make or buy, pricing, selection of a product mix, selection of best method of production, etc.</li> <li>• <b>Cost Control</b> - In the field of cost control C-V-P analysis is of great assistance to the management. The effect of cost of change in the volume can be evaluated for the purpose of reviewing profits earned and cost incurred.</li> <li>• <b>Preparation of Flexible Budget</b> - C-V-P analysis is of special help in the preparation of fixed budget which indicates cost and profit at different levels of activity.</li> </ul>
<p><b>Assumption underlying CVP Analysis</b></p>	<ul style="list-style-type: none"> <li>• All costs can be divided into fixed and variable category.</li> <li>• This analysis relates to the given capacity <i>i.e.</i>, it is basically a short- term analysis.</li> <li>• It assumes that variable cost fluctuates with volume proportionally.</li> <li>• This analysis presumes that fixed cost remains constant over a given volume.</li> <li>• Selling price per unit remains constant.</li> <li>• Costs and revenues are influenced only by the volume of output and sales.</li> <li>• Production technology and level of efficiency remains constant.</li> <li>• This analysis relates to a single product-mix which remains constant.</li> <li>• This analysis also presumes that prices of input factors will remain constant.</li> <li>• All stocks, both opening and closing are valued at variable cost.</li> </ul>
<p><b>Methods for Segregation of Semi-variable overheads</b></p>	<ul style="list-style-type: none"> <li>• <b>Levels of output compared to levels of expenses method</b> – The output at two different levels is compared with corresponding level of expenses. Since the fixed expenses remain constant, the variable overheads are arrived at by the ratio of change in expenses to change in output.</li> </ul> $\text{Variable element} = \frac{\text{Change in amount of expenses}}{\text{Change in activity or output}}$ <ul style="list-style-type: none"> <li>• <b>Range method</b> – This method is similar to the previous method except that only the highest and lowest points are considered out of various levels. This method is also designated as ‘high and low’ method.</li> <li>• <b>Degree of variability method</b> – In this method, degree of variability is noted for each item of semi-variable expenses. Some semi-variable items may have 30% variability while others may have 70% variability. The method is easy to apply but difficult is faced in determining the degree of variability.</li> </ul>

<b>Contribution</b>	<ul style="list-style-type: none"> <li>• The difference between selling price and variable cost (i.e. the marginal cost) is known as 'Contribution' or 'Gross Margin'.</li> <li>• The idea is that after deducting the variable costs from sales, the figure remaining is the amount that contributes to fixed costs, and once fixed costs are covered, then to profits.</li> </ul> <p>Contribution = Selling price – Variable cost = Fixed cost + Profit</p>
<b>Profit/Volume Ratio (P/V Ratio)</b>	<ul style="list-style-type: none"> <li>• Profit-volume ratio establishes a relationship between the contribution and the sales value.</li> <li>• It is an indicator of the rate at which profit is being earned.</li> <li>• This ratio can also be called as 'Contribution/Sales' ratio.</li> <li>• This ratio can also be known by comparing the change in contribution to change in sales or change in profit to change in sales.</li> <li>• This ratio would remain constant at different levels of production.</li> </ul> $\text{P/V Ratio} = \frac{\text{Contribution}}{\text{Sales}} = \frac{\text{Sales} - \text{Variable Costs}}{\text{Sales}}$ $= \frac{\text{Change in contribution}}{\text{Change in Sales}} = \frac{\text{Change in profit}}{\text{Change in Sales}}$
<b>Improvement in P/V Ratio</b>	<ul style="list-style-type: none"> <li>• It can be improved by widening the gap between sales and variable cost. This can be achieved by: <ul style="list-style-type: none"> <li>➤ Increasing the selling price</li> <li>➤ Reducing the variable cost</li> <li>➤ Changing the sales mix, i.e., selling more of those products which have larger P/V ratio, thereby improving the overall P/V ratio</li> </ul> </li> </ul>
<b>Break-even Analysis</b>	<ul style="list-style-type: none"> <li>• In its narrow sense it is concerned with finding out the break- even point.</li> <li>• Break-even-point is the point at which total revenue is equal to total cost.</li> <li>• In other words, it is the point of no profit or no loss.</li> <li>• In other words, it is the level at which contribution is just able to recover the fixed cost.</li> <li>• In its broad sense, break-even analysis refers to a system of analysis that can be used to determine the probable profit/loss at any level of production.</li> </ul> $\text{Break-even Point (units)} = \frac{\text{Fixed Cost}}{\text{Contribution per unit}}$ $\text{Break-even Point (in sales value)} = \frac{\text{Fixed Cost}}{\text{P/V Ratio}}$
<b>Assumptions underlying Break-even-analysis</b>	<ul style="list-style-type: none"> <li>• Fixed Costs remain unchanged at all levels of activity.</li> <li>• Variable cost change in direct proportion to the volume of output.</li> <li>• Costs can be classified into fixed and variable elements.</li> <li>• Selling price remains constant irrespective of volume or production or sales changes.</li> <li>• Price of raw materials, labour rate etc., remain constant.</li> </ul>

<b>Cash Break-even Point</b>	<ul style="list-style-type: none"> <li>• It is the level of output or sales where there will be “no cash profit and no cash loss”.</li> <li>• In other words it is that activity level where the cash inflows will be just equal to cash required to meet immediate cash liabilities.</li> <li>• At this point, cash contribution equals the cash fixed cost, i.e. fixed cost excluding depreciation and deferred expenses.</li> <li>• For this purpose, the fixed costs are divided into two categories: (i) Fixed Costs which do not require immediate cash outlay <i>e.g.</i> depreciation, deferred expenses, and (ii) Fixed Costs which require immediate cash outlay, <i>e.g.</i> rent, salaries, etc.</li> </ul> $\text{Cash Break-even Point (units)} = \frac{\text{Cash Fixed Cost}}{\text{Cash Contribution per unit}}$ $\text{Cash Break-even Point (in value)} = \frac{\text{Cash Fixed Cost}}{\text{P/V Ratio}}$
<b>Angle of Incidence</b>	<ul style="list-style-type: none"> <li>• This is the angle formed at the break-even point at which the sales line cuts the total cost line.</li> <li>• This angle of incidence indicates that profits are being made.</li> <li>• Large angle of incidence is an indication that profits are being made of rupee at higher rate.</li> <li>• A small angle of incidence shows a low rate of profit and suggests that variable cost forms the major part of cost of production.</li> <li>• A large angle of incidence with a high margin of safety indicates the most favorite position of a business and even the existence of monopoly conditions.</li> </ul>
<b>Margin of Safety (M/S)</b>	<ul style="list-style-type: none"> <li>• It may be defined as the difference between actual sales and sales at break-even point.</li> <li>• Margin of safety may be expressed in absolute money terms or as a percentage of sales.</li> <li>• The size of the margin of safety indicates soundness of a business.</li> <li>• When margin of safety is large it means the business can still make profits after a serious fall in sales.</li> <li>• When margin of safety is low, any loss of sales may be a matter of serious concern.</li> </ul> $\text{Margin of Safety (in ₹)} = \text{Actual sales} - \text{Break even Sales}$ $\text{Margin of Safety (in units)} = \text{Actual sales} - \text{Break even Sales}$ $\text{Margin of Safety (in ₹)} = \frac{\text{Profit}}{\text{P/V Ratio}}$ $\text{Margin of Safety (in units)} = \frac{\text{Profit}}{\text{Contribution per unit}}$

<b>Application of CVP Analysis in Decision Making</b>	<ul style="list-style-type: none"> <li>• Identification of problem</li> <li>• Identification of options</li> <li>• Evaluation of the options</li> <li>• Selection of the option</li> </ul>
<b>Relevant Cost</b>	<ul style="list-style-type: none"> <li>• A cost is treated as relevant only if it is a future cost and it differs under two options under consideration.</li> </ul>
<b>Example of Relevant and Irrelevant Cost</b>	<ul style="list-style-type: none"> <li>• <b>Historical cost – Irrelevant</b> e.g. book value of machinery</li> <li>• <b>Sunk cost – Irrelevant</b> e.g. cost of drawing, blueprint</li> <li>• <b>Committed cost – Irrelevant</b> e.g. salary cost to employees</li> <li>• <b>Opportunity cost – Relevant</b></li> <li>• <b>Notional or imputed cost – Relevant</b> e.g. notional interest</li> <li>• <b>Shut down cost – Relevant</b></li> </ul>
<b>Key Factor</b>	<ul style="list-style-type: none"> <li>• The factor which may limit the activity level of a firm is known as the 'key factor'.</li> <li>• In most of the cases 'sales' is the key factor. Some other factor such as labour; machine capacity, material, etc. may not be available in requisite quantity will be a key factor as well.</li> <li>• Key factor governs the decision "how much to produce".</li> <li>• The 'maximizing contribution per unit of the limiting factor' rule can be of value, but can only be used where there is a single binding constraint and where the constraint is continuously divisible i.e. it can be altered one unit at a time.</li> </ul>

## PRACTICAL QUESTIONS

- By noting "PV will increase or PV will decrease or PV will not change", as the case may be, state how the following independent situations will affect the PV ratio: [SM]
  - An increase in the physical sales volume
  - An increase in the fixed cost
  - An increase in the variable cost per unit
  - A decrease in the contribution margin
  - An increase in selling price per unit
  - A decrease in the fixed cost
  - A 10% increase in both selling price and variable cost per unit
  - A 10% increase in the selling price per unit and 10% decrease in the physical sales volume.
  - A 50% increase in the variable cost per unit and 50% decrease in the fixed cost
  - An increase in the angle of incidence
- A factory manufacturing sewing machines has the capacity to produce 500 machines per annum. The marginal (variable) cost of each machine is ₹200 and each machine is sold for ₹250. Fixed overheads are ₹12,000 per annum. Calculate the break-even points for output and sales and show what profit will result if output is 90% of capacity?

**Ans.** 240 machines; ₹60,000; Profit = ₹10,500.

3. From the following data, calculate
- P/V Ratio
  - Profit when sales are ₹20,000 and
  - New Break-even point if selling price is reduced by 20%.

Fixed expenses	₹4,000
Break-even point	₹10,000

**Ans.** (a) 40%; (b) ₹4,000; (c) ₹16,000.

4. Given the following information:

Fixed cost	=	₹4,000
Break even sales	=	₹20,000
Profit	=	₹1,000
Selling price per unit	=	₹20

You are required to calculate:

- Sales and marginal cost of sales, and
- New break-even point if selling price is reduced by 10%

**Ans.** (a) ₹25,000; ₹20,000; (b) ₹36,000.

5. The ratio of variable cost to sales is 70%. The break-even point occurs at 60% of the capacity sales. Find the capacity sales when fixed costs are ₹90,000. Also compute profit at 75% of the capacity sales. [SM]

**Ans.** Sales = ₹5,00,000; Profit = ₹22,500.

6. SK Ltd. sold 2,75,000 units of its product at ₹37.50 per unit. Variable costs are ₹17.50 per unit (manufacturing costs of ₹14 and selling cost ₹3.50 per unit). Fixed costs are incurred uniformly throughout the year and amounting to ₹35,00,000 (including depreciation of ₹15,00,000). There is no beginning or ending inventories. [SM]

Required to compute breakeven sales level quantity and cash breakeven sales level quantity.

**Ans.** 1,75,000 units; 1,00,000 units.

7. Following information are available for the year 2013 and 2014 of SK Limited:

Year	2013	2014
Sales	₹32,00,000	₹57,00,000
Profit/(Loss)	(₹3,00,000)	₹7,00,000

Calculate – (a) PV ratio, (b) total fixed cost, and (c) Sales required to earn a profit of ₹12,00,000.

**Ans.** (a) 40%; (b) ₹15,80,000; (c) ₹69,50,000.

8. SK Ltd. sells its product at ₹15 per unit. During the quarter ending on 31<sup>st</sup> March, it produced and sold 8,000 units and suffered a loss of ₹5 per unit. If the volume of sales is raised to 20,000 units, it can earn a profit of ₹4 per unit. **[SM, Similar May 2022]**

You are required to calculate:

- Break-even point in rupees
- Profit if the sale volume is 25,000 units
- Minimum level of production where the company needs not to close the production if unavoidable fixed costs is ₹75,000.

**Ans.** (a) ₹1,80,000; (b) ₹1,30,000; (c) 4,500 units.

9. SK Ltd. maintains margin of safety of 37.5% with an overall contribution to sales ratio of 40%. Its fixed costs amount to ₹5,00,000. Calculate the following: **[SM]**

- Break-even sales
- Total sales
- Total variable cost
- Current profit
- New 'margin of safety' if the sales volume is increased by 7.5%.

**Ans.** (a) ₹12,50,000; (b) ₹20,00,000; (c) ₹12,00,000; (d) ₹3,00,000; (e) 41.86%.

10. SK Ltd. reports the following cost structure at two capacity levels:

	2,000 units (100% capacity)	1,500 units
Production overhead I	₹3 per unit	₹4 per unit
Production overhead II	₹2 per unit	₹2 per unit

If the selling price, reduced by direct material and labour is ₹8 per unit, what would be its break-even point?

**Ans.** 1,000 units.

11. SK Ltd. has furnished the following data for the two years:

	2017	2018
Sales	₹8,00,000	?
Profit/volume ratio (P/V Ratio)	50%	37.5%
Margin of safety sales as % of total sales	40%	21.875%

There has been substantial savings in the fixed cost in the year 2018 due to the restructuring process. The company could maintain its sales quantity level of 2017 in 2018 by reducing the selling price. You are required to calculate the following:

- Sales for 2018 in ₹
- Break-even sales for 2018 in ₹
- Fixed cost for 2018

**Ans.** (a) ₹6,40,000; (b) ₹5,00,000; (c) ₹1,87,500.

12. The following figures are related to SK Limited for the year ending 31st March:

Sales - 24,000 units @ ₹200 per unit;

P/V Ratio 25% and Break-even Point 50% of sales.

You are required to calculate:

- Fixed cost for the year
- Profit earned for the year
- Units to be sold to earn a target net profit of ₹11,00,000 for a year.
- Number of units to be sold to earn a net income of 25% on cost
- Selling price per unit if Break-even Point is to be brought down by 4,000 units.

**Ans.** (a) ₹6,00,000; (b) ₹6,00,000; (c) 34,000 units; (d) 60,000 units; (e) ₹225.

13. A Ltd. manufacture and sales its product R-9. The following figures have been collected from cost records of last year for the product R-9: [RTP May - 2024]

Elements of Cost	Variable Cost Portion	Fixed Cost
Direct Material	30% of Cost of Goods Sold	-
Direct Labour	15% of Cost of Goods Sold	-
Factory Overheads	10% of Cost of Goods Sold	₹2,30,000
General & Administration Overheads	2% of Cost of Goods Sold	₹71,000
Selling & Distribution Overhead	4% of Cost of Sales	₹68,000

Last Year 5,000 units were sold at ₹185 per unit. From the given data find the followings:

- Break-even Sales (in rupees)
- Profit earned during last year
- Margin of safety (in %)
- Profit if the sales were 10% less than the actual sales.

(Assume that administration overheads are related with production activity)

**Ans.** (a) ₹6,90,882; (b) ₹1,25,000; (c) 25.31%; (d) ₹75,600.

14. SK Ltd. manufactures a product "SK". In the month of March, 14,000 units of the product "SK" were sold, the details are as under:

	(₹)
Sale Revenue	2,52,000
Direct Material	1,12,000
Direct Labour	49,000
Variable Overheads	35,000
Fixed Overheads	28,000

A forecast for the month of April, has been carried out by the General manger of SK Ltd. As per the forecast, price of direct material and variable overhead will be increased by 10% and 5% respectively.

Required to calculate:

- (a) Number of units to be sold to maintain the same quantum of profit that made in March.
- (b) Margin of safety in the month of March and April.

**Ans.** (a) 18,212 units; (b) ₹1,26,000; ₹1,63,902.44.

**15.** SK Ltd. is operating at 80 % capacity and presents the following information:

Break-even Sales	₹400 crores
P/V Ratio	30 %
Margin of Safety	₹120 crores

SK's management has decided to increase production to 95 % capacity level with the following modifications:

- (a) The selling price will be reduced by 10%.
- (b) The variable cost will be increased by 2% on sales
- (c) The fixed costs will increase by ₹50 crores, including depreciation on additions, but excluding interest on additional capital.

Additional capital of ₹100 crores will be needed for capital expenditure and working capital.

**Required:**

- (i) Indicate the sales figure, with the working, that will be needed to earn ₹20 crores over and above the present profit and also meet 15% interest on the additional capital.
- (ii) What will be the revised
  - (a) Break-even Sales
  - (b) P/V Ratio
  - (c) Margin of Safety

**Ans.** (i) ₹860.71 crores; (ii) (a) ₹660.71 crores; (b) 28%; (c) ₹200 crores.

**16.** SK Ltd. a chocolate and soft drink company is planning to establish a subsidiary company in India to produce mineral water. Based on the estimated annual sales of 40,000 bottles of the mineral water, cost studies produced the following estimates for the India subsidiary: **[SM]**

	Total Annual Costs (₹)	Per cent of Total Annual cost that is variable
Material	1,93,600	100%
Labour	90,000	70%
Overhead	80,000	64%
Administration	30,000	30%

The Indian production will be sold by manufacturer's representatives who will receive a commission of 8 per cent of the sale price. No portion of the British Office expenses is to be allocated to the Indian subsidiary. It is required to:

- (a) Compute the sale price per bottle to enable management to realize an estimated 10 per cent profit on sale proceeds in India, and;
- (b) Calculate the break-even point in rupee sales for the Indian subsidiary on the assumption that the sale price is ₹11 per bottle.

**Ans.** (a) ₹12; (b) ₹3,84,000.

17. SK Ltd. manufactures only pencils where the marginal cost of each pencil is ₹3. It has fixed costs of ₹25,000 per annum. Present production and sales of pencils is 50,000 units and selling price per pencil is ₹5. Any sale beyond 50,000 pencils is possible only if the company reduces 20% of its current selling price.

However, the reduced price applies only to the additional units. The company wants a target profit of ₹1,00,000. How many pencils must be produced and sold if the target is to be achieved?

**Ans.** 75,000 pencils.

18. A dairy product company manufacturing baby food with a shelf life of one year furnishes the following information: **[RTP Nov.-2023]**

- (i) On 1st January, 2019, the company has an opening stock of 20,000 packets whose variable cost is ₹180 per packet.
- (ii) In 2018, production was 1,20,000 packets and the expected production in 2019 is 1,50,000 packets. Expected sales for 2019 is 1,60,000 packets.
- (iii) In 2018, fixed cost per unit was ₹60 and it is expected to increase by 10% in 2019. The variable cost is expected to increase by 25%. Selling price for 2019 has been fixed at ₹300 per packet.

You are required to calculate the Break-even volume in units for 2019.

**Ans.** 93,600 units.

19. A company has a P/V ratio of 40%. Compute by what percentage must sales be increased to offset: 20% reduction in selling price? Also find the required change in sales quantity level. **[SM]**

**Ans.** 200 units.

20. (a) You are given the following data for the coming year for a factory: **[SM]**

Budgeted output	8,00,000 units
Fixed expenses	₹40,00,000
Variable expenses per unit	₹100
Selling price per unit	₹200

Draw a break-even chart showing the break-even point.

(b) If price is reduced to ₹180, what will be the new break-even point?

**Ans.** (a) 40,000 units; (b) 50,000 units.

21. A company sells two products, S and K. The sales mix is 4 units of S and 3 units of K. The contribution margins per unit are ₹40 for S and ₹20 for K. Fixed costs are ₹6,16,000 per month. Compute the break-even point.

**Ans.** 11,200 units; 8,400 units.

22. CT Ltd. manufactures and sells a single product X whose selling price is ₹100 per unit and the variable cost is ₹60 per unit. [SM]

- (a) If the Fixed Costs for this year are ₹24,00,000 and the annual sales are at 60% margin of safety, Calculate the rate of return on sales, assuming an income tax level of 40%.
- (b) For the next year, it is proposed to add another product line Y whose selling price would be ₹150 per unit and the variable cost ₹100 per unit. The total fixed costs are estimated at ₹28,00,000. The sales mix of X : Y would be 5 : 3. Compute the breakeven sales in units for both the products.

**Ans.** (a) 14.40%; (b) 40,000 units; 24,000 units.

23. Prepare a profit graph for products S, K and M and find break-even point from the following data:

Particulars	S	K	M	Total
Sales (₹)	7,500	7,500	3,750	18,750
Variable cost (₹)	1,500	5,250	4,500	11,250
Fixed cost (₹)	-	-	-	5,000

24. A, B and C are three similar plants under the same management who want them to be merged for better operation. The details are as under:

Plant	A	B	C
Capacity operated	100%	70%	50%
	(₹in lakhs)	(₹in lakhs)	(₹in lakhs)
Turnover	300	280	150
Variable cost	200	210	75
Fixed cost	70	50	62

**Find out:**

- (a) the capacity of the merged plant for break-even  
 (b) the profit at 75% capacity of the merged plant  
 (c) the turnover from the merged plant to give a profit of ₹28 lakhs.

**Ans.** (a) 52%; (b) ₹80,50,000; (c) ₹6,00,00,000.

25. A company can make any one of the 3 products X, Y and Z in a year. It can exercise its option only at the beginning of each year. Relevant information about the products for the next year is given below: [SM]

	X	Y	Z
Selling Price (₹/unit)	10	12	12
Variable costs (₹/unit)	6	9	7
Market Demand (unit)	3,000	2,000	1,000

	X	Y	Z
Production capacity (unit)	2,000	3,000	900
Fixed costs (₹)	30,000		

Required to compute the opportunity costs for each of the products.

**Ans.** ₹6000; ₹8000; ₹8000.

**26.** SK Ltd. has an annual production of 90,000 units for a component. The component cost structure is as below:

Material	₹270 per unit
Labour (25% fixed)	180 per unit
Variable expenses	90 per unit
Fixed expenses	<u>135 per unit</u>
	<u>675 per unit</u>

- (a) The purchase manager has an offer from a supplier, who is willing to supply the component at ₹540. Should the component be purchased and production stopped?
- (b) Assume the resources now used for this component manufacture are to be used to produce another new product for which the selling price is ₹485. In the latter case material price will be ₹200 per unit. 90,000 units of this product can be produced at the same cost basis as above for labour and other expenses. Discuss whether it would be advisable to direct the resources to manufacture the new product, on the footing that the component presently being produced would, instead of being produced, be purchased from the market.

**Ans.** (a) Manufacture; (b) Manufacture new product.

**27.** SK Ltd. manufactures three different products and the following information has been collected from the books of accounts: [SM]

	Products		
	S	T	U
Sales Mix	35%	35%	30%
Selling Price	₹300	₹400	₹200
Variable Cost	₹150	₹200	₹120
Total Fixed Costs	₹18,00,000		
Total Sales			₹60,00,000

The company has currently under discussion, a proposal to discontinue the manufacture of Product U and replace it with Product M, when the following results are anticipated:

	Products		
	S	T	M
Sales Mix	50%	25%	25%
Selling Price	₹300	₹400	₹300

	Products		
	S	T	M
Variable Cost	₹150	₹200	₹150
Total Fixed Costs	₹18,00,000		
Total Sales	₹64,00,000		

Required:

- Compute the PV ratio, total contribution, profit and Break-even sales for the existing product mix.
- Compute the PV ratio, total contribution, profit and Break-even sales for the proposed product mix.
- State whether the proposed sales mix is accepted or not?

**Ans.** (a) BES = ₹38,29,787; (b) BES = ₹36,00,000; (c) Accept.

**28.** The following particulars are obtained from costing records of a factory:

Particulars	Product A (per unit) (₹)	Product B (per unit) (₹)
Selling Price	400	1000
Material (₹40 per litre)	80	320
Labour (₹20 per hour)	100	200
Variable Overhead	40	80

Total fixed overheads = ₹30,000.

Comment on the profitability of each product when:

- Raw material is in short supply
- Production capacity is limited
- Sales quantity is limited
- Sales value is limited
- Only 1,000 litres of raw material is available for both the products in total and maximum sales quantity of each product is 300 units.

**Ans.** (a) A; (b) B; (c) B; (d) A; (e) A = 300; B = 50.

**29.** SK Ltd. supplies spare parts to an air craft company MK Ltd. The production capacity of SK Ltd. facilitates production of any one spare part for a particular period of time. The following are the cost and other information for the production of the two different spare parts A and B: **[SM]**

Per unit	Part A	Part B
Alloy usage	1.6 Kg	1.6 Kg
Machine Time: Machine A	0.6 hrs.	0.25 hrs.
Per unit	Part A	Part B
Machine Time: Machine B	0.5 hrs.	0.55 hrs.

Per unit	Part A	Part B
Target Price (₹)	145	115
Total hours available	Machine A – 4,000 hours	
	Machine B – 4,500 hours	

Alloy available is 13,000 kg @ ₹12.50 per kg

Variable overheads per machine hours:

Machine A – ₹80

Machine B – ₹100

**Required:**

- Identify the spare part which will optimize contribution at the offered price.
- If MK Ltd. reduces target price by 10% and offers ₹60 per hour of unutilized machine hour, what will be the total contribution from the spare part identified above?

**Ans.** (a) A; (b) ₹1,53,328.

- 30.** An agriculture based company having 210 hectares of land is engaged in growing three different cereals namely, wheat, rice and maize annually. The yield of the different crops and their selling prices are given below: [Nov 2022]

	Wheat	Rice	Maize
Yield (in kgs per hectare)	2,000	500	100
Selling price (₹per kg)	20	40	250

The variable cost data of different crops are given below:

(all figures in ₹per kg)

Crop	Labour charges	Packaging Materials	Other variable expenses
Wheat	8	2	4
Rice	10	2	1
Maize	120	10	20

The company has a policy to produce and sell all the three kinds of crops. The maximum and minimum area to be cultivated for each crop is as follows:

Crop	Maximum Area (in hectares)	Minimum Area (in hectares)
Wheat	160	100
Rice	50	40
Maize	60	10

You are required to:

- Rank the crops on the basis of contribution per hectare
- Determine the optimum product mix considering that all the three cereals are to be produced.
- Calculate the maximum profit which can be achieved if the total fixed cost per annum is ₹21,45,000.

(assume that there are no other constraints applicable to this company)

**Ans.** (a) II, I, III; (b) 50; 10; 150; (c) ₹4,30,000.

31. SK Ltd. manufactures medals for winners of athletic events and other contests. Its manufacturing plant has the capacity to product 10,000 medals each month. The company has current production and sales level of 7,500 medals per month. The current domestic market price of the medal is ₹150. [SM]

The cost data for the month of August is as under:

	(₹)
Variable costs:	
- Direct materials	2,62,500
- Direct labour costs	3,00,000
- Overhead	75,000
Fixed manufacturing costs	2,75,000
Fixed marketing costs	1,75,000
	<b>10,87,500</b>

SK ltd. has received a special one-time order for 2,500 medals at ₹120 per medal. Required:

- (a) Should SK ltd. accept the special order? Why? Explain briefly.  
 (b) Suppose the plant capacity was 9,000 medals instead of 10,000 medals each month. The special order must be taken either in full or rejected totally. Analyse whether SK Ltd. should accept the special order or not.

**Ans.** (a) Accept; (b) Accept.

32. The profit for the year of RJ Ltd. works out to 12.5% of the capital employed and the relevant figures are as under:

Sales	₹5,00,000
Direct Materials	₹2,50,000
Direct Labour	₹1,00,000
Variable Overheads	₹40,000
Capital Employed	₹4,00,000

The new Sales Manager who has joined the company recently estimates for next year a profit of about 23% on capital employed, provided the volume of sales is increased by 10% and simultaneously there is an increase in Selling Price of 4% and an overall cost reduction in all the elements of cost by 2%.

Required to find out by computing in detail the cost and profit for the next year, whether the proposal of Sales Manager can be adopted.

**Ans.** Accept.

33. The following are cost data for three alternative ways of processing the clerical work for cases brought before the LC Court System: [SM]

	[A] Manual (₹)	[B] Semi-Automatic (₹)	[C] Fully-Automatic (₹)
Monthly fixed costs:			
Occupancy	15,000	15,000	15,000
Maintenance contract	-	5,000	10,000
Equipment lease	-	25,000	1,00,000
Unit variable costs (per report):			
Supplies	40	80	20
Labour	(5 hrs × ₹40) = 200	(1 hr × ₹60) = 60	(0.25 hr × ₹80) = 20

**Required:**

- Calculate cost indifference points. Interpret your results.
- If the present case load is 600 cases and it is expected to go up to 850 cases in near future, select most appropriate on cost considerations?

**Ans.** (a) 300; 550; 800.

34. SK Ltd. makes two products S and K, whose respective fixed costs are F1 and F2. You are given that the unit contribution of K is one-fifth less than the unit contribution of S, that the total of F1 and F2 is ₹1,50,000, that the BEP of S is 1,800 units (for BEP of S, F2 is not considered) and that 3,000 units is the indifference point between S and K (i.e. S and K make equal profits at 3,000 units volume, considering their respective fixed costs). There is no inventory build-up as whatever is produced is sold. [SM]

Required to find out the values of F1 and F2 and units contributions of S and K.

**Ans.** F1 = ₹90,000; F2 = ₹60,000; Contr. X = ₹50; Contr. Y = ₹40.

35. SK Ltd. supplies you the following standard cost per unit for one of its products.

Direct material	₹1.60
Direct labour	₹1.50
Variable factory overhead	₹1.20
Fixed factory overhead	₹3.00

Production at normal capacity is 2,00,000 units. Variable selling and administrative overhead per unit is ₹0.50 and fixed selling and administrative overhead were ₹75,000 per year. Production and sales data for the year 2017 and year 2018 are as follows:

Units produced in year 2017	2,00,000
Units sold in year 2017	1,60,000
Inventory – 31st Dec. 2017	68,000

Units produced in year 2018 1,50,000

Units sold in year 2018 1,80,000

Selling price in each year was ₹10.50. Prepare Income Statement for the two years under:

(i) Absorption costing, and (ii) Marginal costing

**Ans.** (i) ₹3,57,000; ₹2,61,000; (ii) ₹2,37,000; ₹3,51,000.

## PRACTICE QUESTIONS

36. You are given the following information:

(i) Fixed cost ₹1,50,000

(ii) Variable cost ₹15 per unit

(iii) Selling price is ₹30 per unit

**Calculate:**

(a) Break-even point

(b) Sales to earn a profit of ₹20,000

**Ans.** (a) 10,000 units; (b) ₹3,40,000.

37. You are required to:

[SM]

(a) Determine profit, when sales = ₹2,00,000

Fixed cost = ₹40,000

BEP = ₹1,60,000

(b) Determine sales, when fixed cost = ₹20,000

Profit = ₹10,000

BEP = ₹40,000

**Ans.** (a) ₹10,000; (b) ₹60,000.

38. You are given the following data:

[SM]

	Sales	Profit
Year 2020-21	₹1,20,000	₹8,000
Year 2021-22	₹1,40,000	₹13,000

**Find out:**

(a) PV ratio

(b) B.E. point

(c) Profit when sales are ₹1,80,000

(d) Sales required to earn a profit of ₹12,000

(e) Margin of safety in year 2021-22.

**Ans.** (a) 25%; (b) ₹88,000; (c) ₹23,000; (d) ₹1,36,000; (e) ₹52,000.

39. The following information is given by SK Ltd: [SM]

Margin of Safety	₹1,87,500
Total cost	₹1,93,750
Margin of Safety	3,750 units
Break-even Sales	1,250 units

Required to calculate profit, P/V ratio, BEP Sales (in ₹) and Fixed cost.

**Ans.** ₹56,250; 30%; ₹62,500; ₹18,750.

40. A company had incurred fixed expenses of ₹4,50,000 with sales of ₹15,00,000 and earned a profit of ₹3,00,000 during the first half year. In the second half, it suffered a loss of ₹1,50,000. [SM]

Calculate:

- (i) The profit-volume ratio, break-even point and margin of safety for the first half year.
- (ii) Expected sales volume for the second half year assuming that selling price and fixed expenses remained unchanged during the second half year.
- (iii) The break-even point and margin of safety for the whole year.

**Ans.** (i) 50%; ₹9,00,000; ₹6,00,000; (ii) ₹6,00,000; (iii) ₹18,00,000; ₹3,00,000.

41. Mr. X has ₹2,00,000 investments in his business firm. He wants a 15% return on his money. From an analysis of recent cost figures, he finds that his variable cost of operating is 60% of sales, his fixed costs are ₹80,000 per year. Show computations to answer the following questions: [SM]

- (i) What sales volume must be obtained to break even?
- (ii) What sales volume must be obtained to get 15 per cent return on investment?
- (iii) Mr. X estimates that even if he closed the doors of his business, he would incur ₹25,000 as expenses per year. At what sales would be better off by locking his business up?

**Ans.** (i) ₹2,00,000; (ii) ₹2,75,000; (iii) ₹1,37,500.

42. A company has fixed costs of ₹90,000, Sales ₹3,00,000 and profit of ₹60,000.

Required to compute:

- (a) Sales volume if in the next period, the company suffered a loss of ₹30,000?
- (b) What is the margin of safety for a profit of ₹90,000?

**Ans.** (a) 50%, ₹1,20,000; (b) ₹1,80,000.

43. A company earned a profit of ₹30,000 during the year. If the marginal cost and selling price of the product are ₹8 and ₹10 per unit respectively, find out the amount of margin of safety. [SM]

**Ans.** 20%; ₹1,50,000.

44. (a) If margin of safety is ₹2,40,000 (40% of sales) and P/V ratio is 30% of SK Ltd., calculate its  
(1) Break even sales, and (2) Amount of profit on sales of ₹9,00,000, [SM]  
(b) SK Ltd. has earned a contribution of ₹2,00,000 and net profit of ₹1,50,000 of sales of ₹8,00,000. What is its margin of safety?

**Ans.** (a) (1) ₹3,60,000; (2) ₹1,62,000; (b) ₹6,00,000.

45. During a particular period, ABC Ltd. has furnished the following data:

[Jan 2021]

Sales ₹10,00,000

Contribution to sales ratio 37% and

Margin of safety is 25% of sales

A decrease in selling price and decrease in the fixed cost could change the "contribution to sales ratio" to 30% and "margin of safety" to 40% of the revised sales. Calculate:

- (i) Revised Fixed Cost
- (ii) Revised Sales and
- (iii) New Break-Even Point

Ans. (i) ₹1,62,000; (ii) ₹9,00,000; (iii) ₹5,40,000.

46. A single product company sells its product at ₹60 per unit. In 2019-20, the company operated at a margin of safety of 40%. The fixed costs amounted to ₹3,60,000 and the variable cost ratio to sales was 80%. [SM]

In 2020-21, it is estimated that the variable cost will go up by 10% and the fixed cost will increase by 5%.

- (i) Find the selling price required to be fixed in 2020-21 to earn the same P/V ratio as in 2019-20.
- (ii) Assuming the same selling price of ₹60 per unit in 2020-21, find the number of units required to be produced and sold to earn the same profit as in 2019-20.

Ans. (i) ₹66; (ii) 85,834 units.

47. An automobile manufacturing company produces different models of Cars. The budget in respect of model 007 for the month of March is as under: [SM]

Budgeted Output			40,000 units
		₹ in lakhs	₹ in lakhs
Net Realisation			2,10,000
Variable Costs:			
Materials		79,200	
Labour		15,600	
Direct expenses		<u>37,200</u>	1,32,000
Specific fixed costs		27,000	
Allocated Fixed costs		<u>33,750</u>	60,750
	Total Costs		1,92,750
	Profit		17,250
	Sales		2,10,000

Calculate:

- (i) Profit with 10 percent increase in selling price with a 10 percent reduction sales volume.
- (ii) Volume to be achieved to maintain the original profit after a 10 percent rise in material costs, at the originally budgeted selling price per unit.

Ans. (i) ₹28,350 lakhs; (ii) 44,521 units.

48. The following data are available from the budget records of Finesign Women's Handbag Company for the forthcoming period. [RTP May-2023]

	(₹)
Selling price per unit	1000
Variable cost per unit:	
Cost of material used	750
Sales commission	50
Total variable cost	800
Annual fixed expenses:	
Rent	7,00,000
Salaries	11,00,000
Other fixed expenses	5,00,000
Total Fixed cost	23,00,000

Although the firm manufactures Bags with different styles, they have identical purchase costs and selling price.

**Requirement:**

- What is the annual break-even point both in terms of units and value?
- If the store manager is paid 1 per cent commission on sales, what would be the annual break-even point both in terms of units and value?
- If the firm decides to pay a fixed salary of ₹9,00,000 in lieu of sales commission, what would be the annual break-even point in terms of units and value.
- Considering break-even point in requirement (a), if the store manager is paid 2 per cent commission on each bag sold in excess of the break-even point, what would be the profit if 20,000 bags were sold.

**Ans.** (a) 11,500 units; ₹1,15,00,000; (b) 12,106 units; ₹1,21,05,263; (c) 12,800 units; ₹1,28,00,000; (d) ₹15,30,000]

49. PH Gems Ltd. is manufacturing readymade suits. It has annual production capacity of 2,000 pieces. The Cost Accountant has presented following information for the year to the management:

[May 2018]

Particulars	Amount (₹)	Amount (₹)
Sales 1,500 pieces @ ₹1,800 per piece		27,00,000
Direct Material	5,94,200	
Direct Labour	4,42,600	
Overheads (40% Fixed)	11,97,000	22,33,800
Net Profit		4,66,300

**Evaluate following options:**

- If selling price is increased by ₹200, the sales will come down to 60% of the total annual capacity. Should the company increase its selling price?

- (ii) The company can earn a profit of 20% on sales if the company provide TIEPIN with ready-made suit. The cost of each TIEPIN is ₹18. Calculate the sales to earn a profit of 20% on sales.

**Ans.** (i) Accept; (ii) 1,900 units.

**50.** M/s Gaurav Private Limited is manufacturing and selling two products: **[May 2019]**

'BLACK' and 'WHITE' at selling price of ₹20 and ₹30 respectively.

The following sales strategy has been outlined for the financial year 2019-20:

- (i) Sales planned for the year will be ₹81,00,000 in the case of 'BLACK' and ₹54,00,000 in the case of 'WHITE'.
- (ii) The selling price of 'BLACK' will be reduced by 10% and that of 'WHITE' by 20%.
- (iii) Break-even is planned at 70% of the total sales of each product.
- (iv) Profit for the year to be maintained at ₹8,26,200 in the case of 'BLACK' and ₹745,200 in the case of 'WHITE'. This would be possible by reducing the present annual fixed cost of ₹42,00,000 allocated as ₹22,00,000 to 'BLACK' and ₹20,00,000 to 'WHITE'.

**You are required to calculate:**

- (1) Number of units to be sold of 'BLACK' and 'WHITE' to Break even during the financial year 2019-20.
- (2) Amount of reduction in fixed cost product-wise to achieve desired profit mentioned at (iv) above.

**Ans.** (1) 3,15,000; 1,57,500; (2) ₹2,72,200; ₹2,61,200.

**51.** A company manufactures two types of herbal product A and B. Its budget shows profit figures after apportioning the fixed joint cost of ₹15 lacs in proportion of the numbers of units sold. The budget for 2018, indicates: **[RTP May 2018]**

	A	B
Profit (₹)	1,50,000	30,000
Selling price/unit (₹)	200	120
P/V Ratio (%)	40	50

Required:

Compute the best option among the following, if the company expects that the number of units to be sold would be equal.

- (a) Due to exchange in a manufacturing process, the joint fixed cost would be reduced by 15% and the variables would be increase by 7½%.
- (b) Price of A could be increase by 20% as it is expected that the price elasticity of demand would be unity over the range of price.
- (c) Simultaneous introduction of both the option, viz. (a) and (b) above.

**Ans.** (a) ₹2,43,000; (b) ₹4,20,000; (c) ₹5,01,000.

52. You are given the following data for the current financial year of SK Ltd.: [SM]

Variable cost	60,000	60%
Fixed cost	30,000	30%
Net profit	10,000	10%
Sales	1,00,000	100%

Find out (a) Break-even point; (b) PV Ratio; (c) Margin of safety. Also draw a break-even chart showing contribution and profit.

Ans. (a) 40%; (b) ₹75,000; (c) ₹25,000.

53. A company has three factories situated in north, east and south with its Head Office in Mumbai. The management has received the following summary report on the operations of each factory for a period: [SM]

	Sales		Profit	
	Actual	Over/(Under) Budget	Actual	Over/(Under) Budget
North	1,100	(400)	135	(180)
East	1,450	150	210	90
South	1,200	(200)	330	(110)

Calculate for each factory and for the company as a whole for the period:

(i) The fixed costs.

(ii) break-even sales.

Ans. (i) 360; 660; 330; (ii) ₹800; ₹1,100; ₹600.

54. Top-tech manufacturing company is presently evaluating two possible machines for the manufacture of superior pen-drives. The following information is available: [May 2022]

Particulars	Machine A	Machine B
Selling price per unit	₹400.00	₹400.00
Variable cost per unit	₹240.00	₹260.00
Total fixed costs per year	₹350 lakhs	₹200 lakhs
Capacity (in units)	8,00,000	10,00,000

**Required:**

(i) Recommend which machine should be chosen?

(ii) Would you change your answer, if you were informed that in near future demand will be unlimited and the capacities of the two machines are as follows?

Machine A – 12,00,000 units

Machine B – 12,00,000 units

Why?

55. SK Ltd. manufactures automobiles accessories and parts. The following are the total cost of processing 2,00,000 units: [SM]

Direct material cost	₹375 per unit
Direct labour cost	₹80 per unit
Variable factory overhead	₹16 per unit
Fixed factory overhead	₹500 lakhs

The purchase price of the component is ₹485. The fixed overhead would continue to be incurred even when the component is bought from outside. Required:

- Should the part be made or bought from outside considering that the present facility when released following a buying decision would remain idle?
- In case the released capacity can be rented out to another manufacturer for ₹32,00,000 having good demand. What should be the decision?

Ans. (a) Manufacture; (b) buy from outside.

56. The product mix of SK Ltd. is as under: [SM]

	Product M	Product N
Units	54,000	18,000
Selling price	₹7.50	₹15.00
Variable cost	₹6.00	₹4.50

Find the break-even point in units, if the company discontinues product 'M' and replace with product 'O'. The quantity of product 'O' is 9,000 units and its selling price and variable costs respectively are ₹18 and ₹9. Fixed cost is ₹15,000.

Ans. BEP of N = 1,000; BEP of O = 500 units.

57. SK Ltd. produces products 'X', 'Y' and 'Z' and has decided to analyse its production mix in respect of these three products - 'X', 'Y' and 'Z'. [SM, Nov 2020]

You have the following information:

	X	Y	Z
Direct materials ₹(per unit)	160	120	80
Variable overheads ₹(per unit)	8	20	12

Direct Labour:

Departments	Rate per Hour (₹)	Hours per unit X	Hours per unit Y	Hours per unit Z
Department A	4	6	10	5
Department B	8	6	15	11

From the current budget, further details are as below:

	X	Y	Z
Annual production at present (in units)	10,000	12,000	20,000

Estimated selling price per unit (₹)	312	400	240
Sales department estimate of possible sales in the coming year (in units)	12,000	16,000	24,000

There is a constraint on supply of labour in Department-A and its manpower cannot be increased beyond its present level. Required:

- Identify the best possible product mix of SK Ltd.
- Calculate the total contribution form the best possible product mix.

**Ans.** (i) X; Y; Z; (ii) ₹28,48,000.

**58.** SK Ltd. produces and sells two product X and Y. The product is highly demanded in the market. Following information relating to both the products are given as under: **[SM]**

	Per Unit (₹)	
	X	Y
Direct Materials	140	180
Direct Wages	60	100
Variable Overheads (₹5 per machine hour)	20	40
Selling Price	300	450

The company is facing scarcity of machine hours for working. The availability of machine hours are limited to 60,000 hours in a month. At present, the monthly demand of product X and product Y is 8,000 units and 6,000 units respectively. The fixed expenses of the company are ₹2,25,000 per month. You are required to:

Determine the product mix that generates maximum profit to the company in the given situation and also calculate the profit of the company.

**Ans.** Profit = ₹8,70,000.

**59.** RPP Manufacturers is approached by an international customer for one-time special order similar to one offered to its domestic customers. Per unit data for sales to regular customers is provided below: **[RTP Nov 2022]**

Direct material	₹693
Direct labour	₹315
Variable manufacturing support	₹504
Fixed manufacturing support	<u>₹1092</u>
Total manufacturing costs	₹2604
Markup (50%)	<u>₹1302</u>
Targeted selling price	<u>₹3906</u>

It is provided that RPP Manufactures has excess capacity.

**Required:**

- What is the full cost of the product per unit?
- What is the contribution margin per unit?

- (c) Which costs are relevant for making the decision regarding this one-time special order? Why?
- (d) For RPP Manufactures, what is the minimum acceptable price of this one-time-special order only
- (e) For this one-time-only special order, should RPP Manufactures considers a price of ₹2100 per unit? Why or why not?

**Ans.** (a) ₹2,604; (b) ₹2,394; (c) ₹1,512; (d) ₹1,512; (e) Accept.

- 60.** LR Ltd. is considering two alternative methods to manufacture product it intends to market. The two methods have a maximum output of 50,000 units each and produce identical items with a selling price of ₹25 each. The costs are: **[July 2021]**

	Method - I Semi-Automatic (₹)	Method - II Fully automatic (₹)
Variable cost per unit	15	10
Fixed costs	1,00,000	3,00,000

You are required to calculate:

- (i) Cost Indifference Point in units. Interpret your results.
- (ii) The Break-even point of each method in terms of units

**Ans.** (i) 40,000 units; (ii) 10,000; 20,000.

- 61.** SK Ltd. has a production capacity of 2,00,000 units per year. Normal capacity utilization is reckoned as 90%. Standard variable production costs are ₹11 per unit. The fixed costs are ₹3,60,000 per year. Variable selling costs are ₹3 per unit and fixed selling costs are ₹2,70,000 per year. The unit selling price is ₹20. **[SM]**

In the year just ended on 31<sup>st</sup> March, 2019, the production was 1,60,000 units and sales were 1,50,000 units. The closing inventory on 31<sup>st</sup> March was 20,000 units. The actual variable production costs for the year were ₹35,000 higher than the standard.

- (a) Calculate the profit for the year
- (i) By absorption costing method and
- (ii) By marginal costing method
- (b) Explain the difference in the profits

**Ans.** (a) (i) ₹2,59,375; (ii) ₹2,39,375.

- 62.** SK Ltd. manufactures a single product, SK. The following figures relate to SK for a one-year period. **[SM]**

Activity Level	50%	100%
Sales and production (units)	400	800
	(₹)	(₹)
Sales	8,00,000	16,00,000

Production costs:		
- Variable	3,20,000	6,40,000
- Fixed	1,60,000	1,60,000
Selling and distribution costs:		
- Variable	1,60,000	3,20,000
- Fixed	2,40,000	2,40,000

The normal level of activity for the year is 800 units. Fixed costs are incurred evenly throughout the year, and actual fixed costs are the same as budgeted. There were no stocks of SK at the beginning of the year.

In the first quarter, 220 units were produced and 160 units were sold. Required:

- Compute the fixed production costs absorbed by SK if absorption costing is used.
- Calculate the under/over recovery of overheads during this period?
- Calculate the profit using absorption costing?
- Calculate the profit using marginal costing?

**Ans.** (a) ₹44,000; (b) ₹4,000; (c) ₹40,000; (d) ₹28,000.

- 63.** AB Ltd produces a single product V2 and sells it at a fixed price of ₹2,050 per unit. The production and sales data for first quarter of the year 2023-24 are as follows: **[MTP May 2024]**

	April	May	June
Sales in units	4,200	4,500	5,200
Production in units	4,600	4,400	5,500

Actual/budget information for each month was as follows:

Direct materials	4 kilograms at ₹ 120 per kilogram
Direct labour	6 hours at ₹ 60 per hour
Variable production overheads	150% of direct labour
Fixed production overheads	₹ 5,00,000
Fixed selling overheads	₹ 95,000

There was no opening inventory at the start of the quarter. Fixed production overheads are budgeted at ₹ 60,00,000 per annum and are absorbed into products based on a budgeted normal output of 60,000 units per annum.

Required:

- Prepare a profit statement for each of the three months using absorption costing principles.
- Prepare a profit statement for each of the three months using marginal costing principles.
- Present a reconciliation of the profit or loss figures given in your answer to (i) and (ii).

- 64.** A meeting of the heads of departments of the Arnav Ltd. has been called to review the operating performance of the company in the last financial year. The head of the production department appraised that during the last year the company could operate at 70% capacity level but in the coming financial year 95% capacity level can be achieved if an additional amount of ₹100 Crore on capex and working capital is incurred.

The head of the finance department has presented that during the last financial year the company had a P/V ratio of 40%, margin of safety and the break-even were ₹50 crore and ₹200 crore respectively.

To the reply to the proposal of increasing the production capacity level to 95%, the head of the finance department has informed that this could be achieved if the selling price and variable cost are reduced by 8% and 5% of sales respectively. Fixed cost will also increase by ₹20 crore due to increased depreciation on additional assets. The additional capital will be arranged at a cost of 15% p.a. from a bank.

In the coming financial year, it has been aimed to achieve an additional profit of ₹10 crore over and above the last year's profit after adjusting the interest cost on the additional capital.

The following points are required to be calculated on urgent basis to put the same in the meeting. You being an assistant to the head of finance, has been asked the followings:

**(i)** What will be the revised sales for the coming financial year?

- |                    |                    |
|--------------------|--------------------|
| (a) ₹ 322.22 Crore | (b) ₹ 311.11 Crore |
| (c) ₹ 300.00 Crore | (d) ₹ 324.24 Crore |

**(ii)** What will be the revised break-even point for the coming financial year?

- |                    |                    |
|--------------------|--------------------|
| (a) ₹ 222.22 Crore | (b) ₹ 252.22 Crore |
| (c) ₹ 244.44 Crore | (d) ₹ 255.56 Crore |

**(iii)** What will be the revised margin of safety for the coming financial year?

- |                   |                   |
|-------------------|-------------------|
| (a) ₹ 100 Crore   | (b) ₹ 58.89 Crore |
| (c) ₹ 55.56 Crore | (d) ₹ 66.66 Crore |

**(iv)** The profit of the last year and for the coming year are:

- |  |   |
|--|---|
| (a) ₹ 50 Crore & ₹95 Crore respectively  | (b) ₹ 20 Crore & ₹ 65 Crore respectively    |
| (c) ₹ 20 Crore & ₹ 30 Crore respectively | (d) ₹ 45 Crore & ₹ 66.66 Crore respectively |

**(v)** The total cost of the last year and for the coming year are:

- |                                 |                                 |
|---------------------------------|---------------------------------|
| (a) ₹ 230 Crore & ₹292.22       | (b) ₹ 230 Crore & ₹275 Crore    |
| (c) ₹ 220 Crore & ₹282.22 Crore | (d) ₹ 220 Crore & ₹292.22 Crore |

**Ans.** (i) - (a), (ii) - (d), (iii) - (d), (iv) - c, (v) - (a)

## SOLUTION OF PRACTICE QUESTIONS

**36.**

$$(a) \text{ Break-even point (BEP)} = \frac{\text{Fixed cost}}{\text{Contribution per unit}} = \frac{1,50,000}{(30-15)} = 10,000 \text{ units}$$

$$(b) \text{ PV Ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{(30-15)}{30} \times 100 = 50\%$$

$$\text{Required sales} = \frac{\text{Fixed cost} + \text{Required profit}}{\text{PV Ratio}} = \frac{1,50,000 + 20,000}{50\%} = ₹3,40,000$$

**37.**

$$(i) \text{ Break-even sales} = \frac{\text{Fixed cost}}{\text{PV Ratio}}$$

$$1,60,000 = \frac{40,000}{\text{PV Ratio}}$$

$$\text{PV Ratio} = \frac{40,000}{1,60,000} = 0.25 = 25\%$$

$$\text{Profit} = \text{Contribution} - \text{Fixed cost} = (2,00,000 \times 25\%) - 40,000 = ₹10,000$$

$$(ii) \text{ Break-even sales} = \frac{\text{Fixed cost}}{\text{PV Ratio}}$$

$$40,000 = \frac{20,000}{\text{PV Ratio}}$$

$$\text{PV Ratio} = \frac{20,000}{40,000} = 0.50 = 50\%$$

$$\text{Contribution} = \text{Fixed cost} + \text{Profit}$$

$$(\text{Sales} \times 50\%) = 20,000 + 10,000$$

$$\text{Sales} = \frac{30,000}{50\%} = ₹60,000$$

**38.**

$$(a) \text{ P/V Ratio} = \frac{\text{Change in Profit}}{\text{Change in Sales}} \times 100 = \frac{13,000 - 8,000}{1,40,000 - 1,20,000} \times 100 = \frac{5,000}{20,000} \times 100 = 25\%$$

$$(b) \text{ Contribution for Year 2021-22} = 1,20,000 \times 25\%$$

$$\text{Fixed cost} + \text{Profit} = 30,000$$

$$\text{Fixed cost} + 8,000 = 30,000$$

$$\text{Fixed cost} = ₹22,000$$

$$\text{Break-even sales} = \frac{\text{Fixed Cost}}{\text{P/V Ratio}} = \frac{22,000}{25\%} = ₹88,000$$

$$(c) \text{ Profit} = \text{Contribution} - \text{Fixed cost} = (1,80,000 \times 25\%) - 22,000 = ₹23,000$$

$$(d) \text{ Desired sales (in ₹)} = \frac{\text{Fixed Cost} + \text{Desired Profit}}{\text{P/V Ratio}} = \frac{22,000 + 12,000}{25\%} = ₹1,36,000$$

$$(e) \text{ Margin of Safety} = \text{Actual sale} - \text{Break-even sales} = 1,40,000 - 88,000 = ₹52,000$$

$$39. \text{ Margin of safety (\%)} = \frac{\text{MOS units}}{\text{Total units}} \times 100 = \frac{3,750}{(3,750 + 1,250)} \times 100 = 75\%$$

$$\text{Total sales} = \frac{\text{MOS}}{\text{MOS \%}} = \frac{1,87,500}{75\%} = ₹2,50,000$$

$$\text{Profit} = \text{Sales} - \text{Total cost} = 2,50,000 - 1,93,750 = ₹56,250$$

$$\text{PV Ratio} = \frac{\text{Profit}}{\text{MOS}(\times)} \times 100 = \frac{56,250}{1,87,500} \times 100 = 30\%$$

$$\text{Break-even sales} = \text{Total sales} \times \text{Breakeven sales \%} = 2,50,000 \times (100 - \text{MOS}\%) = 2,50,000 \times 0.25 = ₹62,500$$

$$\text{Fixed cost} = \text{Contribution} - \text{Profit} = (2,50,000 \times 30\%) - 56,250 = ₹18,750$$

40.

(i) In the First half year

$$\text{Contribution} = \text{Fixed cost} + \text{profit} = 4,50,000 + 3,00,000 = ₹7,50,000$$

$$\text{P/V ratio} = \frac{C}{S} = \frac{7,50,000}{15,00,000} = 50\%$$

$$\text{Break-even point} = \frac{\text{Fixed cost} - \text{Loss}}{\text{P/V ratio}} = \frac{4,50,000}{50\%} = ₹9,00,000$$

$$\text{Margin of safety} = \text{Actual sales} - \text{Break-even point} = 15,00,000 - 9,00,000 = ₹6,00,000$$

(ii) In the second half year

$$\text{Contribution} = \text{Fixed cost} - \text{loss} = 4,50,000 - 1,50,000 = ₹3,00,000$$

$$\text{Expected sales volume} = \frac{\text{Fixed cost} - \text{loss}}{\text{P/V ratio}} = \frac{3,00,000}{50\%} = ₹6,00,000$$

(iii) For the whole year

$$\text{B.E point} = \frac{\text{Fixed Cost}}{\text{P/V ratio}} = \frac{4,50,000 \times 2}{50\%} = ₹18,00,000$$

$$\text{Margin of safety} = \frac{\text{Profit}}{\text{P/V ratio}} = \frac{30,00,000 - 1,50,000}{50\%} = ₹3,00,000$$

41. P/V ratio = 100 - 60% = 40%

(i) B.E. Point =  $\frac{F}{P/V \text{ ratio}} = \frac{80,000}{40\%} = ₹2,00,000$

(ii) Return of 15% on ₹2,00,000 = ₹30,000

Add: Fixed cost 80,000

Contribution required 1,10,000

Sales required =  $\frac{F + P}{P / V \text{ ratio}} = \frac{1,10,000}{40\%} = ₹2,75,000$

(iii) When business in lock

Fixed cost ₹25,000

Minimum sales =  $\frac{\text{Avoidable FC}}{\text{PV Ratio}} = \frac{(80,000 - 25,000)}{40\%} = ₹1,37,500$

Thus Mr. S will be better off if sales are more than ₹1,37,500.

42.

(a) P/V Ratio =  $\frac{\text{Fixed Cost} + \text{Profit}}{\text{Sales}} \times 100 = \frac{90,000 + 60,000}{3,00,000} \times 100 = 50\%$

Desired sales (in ₹) =  $\frac{\text{Fixed Cost} + \text{Desired Profit}}{\text{P/V Ratio}} \times 100$   
 $= \frac{90,000 + (-30,000)}{50\%} \times 100 = ₹1,20,000$

(b) Margin of safety =  $\frac{\text{Profit}}{\text{P/V Ratio}} = \frac{90,000}{50\%} = ₹1,80,000$

43. PV Ratio =  $\frac{\text{Contribution}}{\text{Selling price}} \times 100 = \frac{(10 - 8)}{10} \times 100 = 20\%$

Margin of safety =  $\frac{\text{Profit}}{\text{PV Ratio}} = \frac{30,000}{20\%} = ₹1,50,000$

44.

(a) (1) Margin of safety = 40% of sales

2,40,000 = 40% of sales

Sales = 2,40,000 ÷ 40% = ₹6,00,000

Break-even sales = Sales - Margin of Safety = 6,00,000 - 2,40,000 = ₹3,60,000

(b) Break-even sales =  $\frac{\text{Fixed Cost}}{\text{P/V Ratio}}$

$$3,60,000 = \frac{\text{Fixed Cost}}{30\%}$$

$$\text{Fixed Cost} = ₹1,08,000$$

$$\text{Given Sales} = ₹9,00,000$$

$$\text{Profit} = \text{Contribution} - \text{Fixed Cost} = (9,00,000 \times 30\%) - 1,08,000 = ₹1,62,000$$

$$(b) \text{ PV Ratio} = \frac{\text{contribution}}{\text{Sales}} \times 100 = \frac{2,00,000}{8,00,000} \times 100 = 25\%$$

$$\text{Margin of safety} = \frac{\text{Profit}}{\text{PV Ratio}} = \frac{1,50,000}{25\%} = ₹6,00,000$$

45. Existing variable cost ratio = 100 - Contribution to sales ratio = 100 - 37% = 63%

$$\text{Existing variable cost} = 10,00,000 \times 63\% = ₹6,30,000$$

$$\text{New variable cost} = \text{Existing variable cost} = ₹6,30,000$$

$$\text{New variable cost ratio} = 100 - 30\% = 70\%$$

$$\text{New sales} = \frac{6,30,000}{70\%} = ₹9,00,000$$

$$\text{New Margin of safety} = 9,00,000 \times 40\% = ₹3,60,000$$

$$\text{New Break-even point} = 9,00,000 - 3,60,000 = ₹5,40,000$$

$$\text{New Fixed cost} = \text{New Break-even point} \times \text{PV Ratio} = 5,40,000 \times 30\% = ₹1,62,000$$

46.

(i) Contribution per unit = Sale price - VC per unit = 60 - (60 × 80%) = ₹12

$$\text{P/V Ratio} = \frac{\text{Contribution per unit}}{\text{Selling price per unit}} \times 100 = \frac{12}{60} \times 100 = 20\%$$

$$\text{BEP} = \frac{\text{Fixed Cost}}{\text{Contribution per unit}} = \frac{3,60,000}{12} = 30,000 \text{ units}$$

Margin of safety is 40%. Therefore, break-even sales will be 60% of units sold.

$$\text{No. of units sold} = \text{BEP (in units)} \div 60\% = 30,000 \div 60\% = 50,000 \text{ units}$$

$$\text{Profit earned (in year 2010)} = \text{Total contribution} - \text{Fixed cost} = (50,000 \times 12) - 3,60,000 = ₹2,40,000$$

$$\text{Revised variable cost} = ₹48 + 10\% = ₹52.80$$

$$\text{Revised fixed cost} = ₹3,60,000 + 5\% = ₹3,78,000$$

$$\text{Required P/V ratio (same as of 2018)} = 20\%$$

$$\text{Thus, variable cost ratio} = 100 - 20\% = 80\%$$

$$\text{Revised selling price} = ₹52.80 \div 80\% = ₹66$$

(ii) Required sales volume (for year 2019)

$$= \frac{\text{Fixed cost} + \text{desired profit}}{\text{Contribution per unit}} = \frac{3,78,000 + 2,40,000}{60 - 52.80} = 85,834 \text{ units}$$

47.

$$(i) \text{ Budgeted selling price} = \frac{2,10,000 \text{ lakhs}}{40,000 \text{ units}} = ₹5,25,000 \text{ per unit}$$

$$\text{Budgeted variable cost} = \frac{1,32,000 \text{ lakhs}}{40,000 \text{ units}} = ₹3,30,000 \text{ per unit}$$

$$\text{Increased selling price} = ₹5,25,000 + 10\% = ₹5,77,500 \text{ per unit}$$

$$\text{New volume} = 40,000 - 10\% = 36,000 \text{ units}$$

**Statement of Calculation of Profit**

Particulars	(₹in lakhs)
Sales (36,000 units × ₹5,77,500)	2,07,900
Less: Variable cost (36,000 units × ₹3,30,000)	1,18,800
Contribution	89,100
Less: Fixed costs	60,750
Profit	28,350

$$(ii) \text{ Budgeted Material cost} = 79,200 \text{ lakhs}, 40,000 \text{ units} = ₹1,98,000 \text{ per unit}$$

Particulars	(₹in lakhs)
Increased material cost (1,98,000 + 10%)	2,17,800
Labour cost (15,600 lakhs ÷ 40,000 units)	39,000
Direct expenses (37,200 lakhs ÷ 40,000 units)	93,000
Variable cost per unit	3,49,800
Budgeted selling price per unit	5,25,000
Contribution per unit (5,25,000 – 3,49,800)	1,75,200

$$\text{Sales volume} = \frac{\text{fixed cost} + \text{profit}}{\text{contribution per unit}} = \frac{(60,750 \text{ lakhs} + 17,250 \text{ lakhs})}{1.752 \text{ lakhs}} = 44,521 \text{ units}$$

48.

$$(a) \text{ PV Ratio} = \frac{\text{Contribution per unit}}{\text{Selling price per unit}} \times 100 = \frac{(1000 - 800)}{1000} \times 100 = 20\%$$

$$\text{Annual BEP in units} = \frac{\text{Fixed cost}}{\text{Contribution per unit}} = \frac{23,00,000}{200} = 11,500 \text{ units}$$

$$\text{Annual BEP in value} = \frac{\text{Fixed cost}}{\text{PV Ratio}} = \frac{23,00,000}{20\%} = ₹1,15,00,000$$

$$(b) \text{ Commission on sale per unit} = 1\% \times 1000 = ₹10$$

$$\text{Revised PV Ratio} = \frac{(1,000 - 750 - 50 - 10)}{1000} \times 100 = \frac{190}{1000} \times 100 = 19\%$$

$$\text{Annual BEP in units} = \frac{\text{Fixed cost}}{\text{Contribution per unit}} = \frac{23,00,000}{190} = 12,106 \text{ units}$$

$$\text{Annual BEP in value} = \frac{\text{Fixed cost}}{\text{PV Ratio}} = \frac{23,00,000}{19\%} = ₹1,21,05,263$$

$$(c) \text{ PV Ratio} = \frac{\text{Contribution per unit}}{\text{Selling price per unit}} \times 100 = \frac{(1000 - 800)}{1000} \times 100 = 20\%$$

$$\text{Revised fixed cost} = 23,00,000 + 9,00,000 = ₹32,00,000$$

$$\text{Annual BEP in units} = \frac{\text{Fixed cost}}{\text{Contribution per unit}} = \frac{32,00,000}{200} = 12,800 \text{ units}$$

$$\text{Annual BEP in value} = \frac{\text{Fixed cost}}{\text{PV Ratio}} = \frac{32,00,000}{20\%} = ₹1,28,00,000$$

(d) Annual BEP under requirement (a) is 11,500 units

$$\text{Margin of safety} = 20,000 - 11,500 = 8,500 \text{ units}$$

$$\text{Manager's commission} = 8,500 \times 1,000 \times 2\% = ₹1,70,000$$

$$\text{Profit} = \text{Sales} - \text{Cost} = (20,000 \times 1,000) - (20,000 \times 800) - 1,70,000 - 23,00,000 \\ = ₹15,30,000$$

49.

(i) Evaluation of option (i)

$$\text{New Selling price} = 1,800 + 200 = ₹2,000$$

$$\text{New Sales Quantity} = 2,000 \times 60\% = 1,200 \text{ Pieces}$$

Particulars	Amount (₹)
Sales (1,200 × ₹2,000)	24,00,000
Less: Direct Material $\left(\frac{5,94,200}{1,500} \times 1,200\right)$	4,75,360
Less: Direct Labour $\left(\frac{4,42,600}{1,500} \times 1,200\right)$	3,54,080
Less: Variable Overheads $\left(\frac{11,97,000 \times 60\%}{1,500} \times 1,200\right)$	5,74,560
Contribution	9,96,000
Less: Fixed Costs (11,97,000 × 40%)	4,78,000
Profit	5,17,200

If the price is increased by ₹200 than quantity is reducing by 20% (300 on 1,500). Through this step, the profit of the firm will rise by ₹50,900 from the existing level. Since there is increase in profit, thus it may be recommended to accept this policy.

(ii) Evaluation of option (ii)

Calculation of P/V Ratio

$$\text{Selling price per unit} \quad 1,800.00$$

$$\text{Less: Direct material per unit} \left(\frac{5,94,200}{1,500}\right) \quad 396.13$$

Less: cost of Tie pin	18.00
Less: Direct labour per unit $\left(\frac{4,42,600}{1,500}\right)$	295.07
Less: Variable Overheads $\left(\frac{11,97,000 \times 60\%}{1,500}\right)$	<u>478.80</u>
Contribution	<u>612.00</u>

$$P/V \text{ Ratio} = \frac{612}{1,800} \times 100 = 34\%$$

Let sales required to earn profit of 20% = y

$$\text{Desired sales} = \frac{\text{Fixed Cost} + \text{Desired Profit}}{P/V \text{ Ratio}}$$

$$y = \frac{4,78,800 + 0.20y}{34\%}$$

$$0.34y = 4,78,800 + 0.2y$$

$$y = ₹34,20,000$$

Thus, sales required to earn a profit of 20% on sales = ₹34,20,000

$$\text{Sales units required to earn a profit of 20\% of sales} = \frac{34,20,000}{1,800} = 1,900 \text{ units}$$

50.

**(i) Statement showing Break Even Sales**

Particulars	BLACK	WHITE
Sales Planned (in ₹)	81,00,000	54,00,000
Break-even sales %	70%	70%
Break-even sales (in ₹) (A)	56,70,000	37,80,000
Selling price per unit (in ₹) (B)	18	24
Break-even sales (in units) (A ÷ B)	3,15,000	1,57,500

**(ii) Statement Showing Fixed Cost Reduction**

Particulars	BLACK	WHITE
Profit to be maintained (₹) (A)	8,26,200	7,45,200
Margin of Safety (30% × Sales) (B)	24,30,000	16,20,000
P/V Ratio (A ÷ B)	34%	46%
Desired Contribution (Sales × P/V Ratio)	27,54,000	24,84,000
Less: Desired Profit	8,26,200	7,45,200
Target Fixed Cost	19,27,800	17,38,800
Present Fixed Cost	22,00,000	20,00,000
Required reduction in fixed cost	2,72,200	2,61,200

51.

**Working Notes:**

- (1) Contribution per unit of A =  $200 \times 40\% = ₹80$   
 $\therefore$  Variable cost per unit of A =  $200 - 80 = ₹120$   
 Contribution per unit of B =  $120 \times 50\% = ₹60$   
 $\therefore$  Variable cost per unit of A =  $120 - 60 = ₹60$
- (2) Let units sold of A & B = y  
 Contribution = Fixed cost + Profit  
 $80y + 60y = 15,00,000 + 1,50,000 + 30,000$   
 $140y = 16,80,000$   
 $y = 12,000$   
 $\therefore$  Units sold of each product = 12,000

**(a) Statement of Profit**

Particulars	Amount (₹)
Contribution of A [ $\{200 - (120 + 7.5\%)\} \times 12,000$ ]	8,52,000
Contribution of B [ $\{120 - (60 + 7.5\%)\} \times 12,000$ ]	6,66,000
Total contribution	15,18,000
Less: Fixed Cost (15,00,000 - 15%)	12,75,000
Profit	2,43,000

- (b) Existing total sales of A =  $12,000 \times 200 = ₹24,00,000$   
 New Selling price of A =  $200 + 20\% = ₹240$   
 New quantity of A =  $24,00,000 \div 240 = 10,000$  units

**Statement of Profit**

Particulars	Amount (₹)
Contribution of A [ $(240 - 120) \times 10,000$ ]	12,00,000
Contribution of B [ $(120 - 60) \times 12,000$ ]	7,20,000
Total contribution	19,20,000
Less: Fixed Cost	15,00,000
Profit	4,20,000

**(c) Statement of Profit**

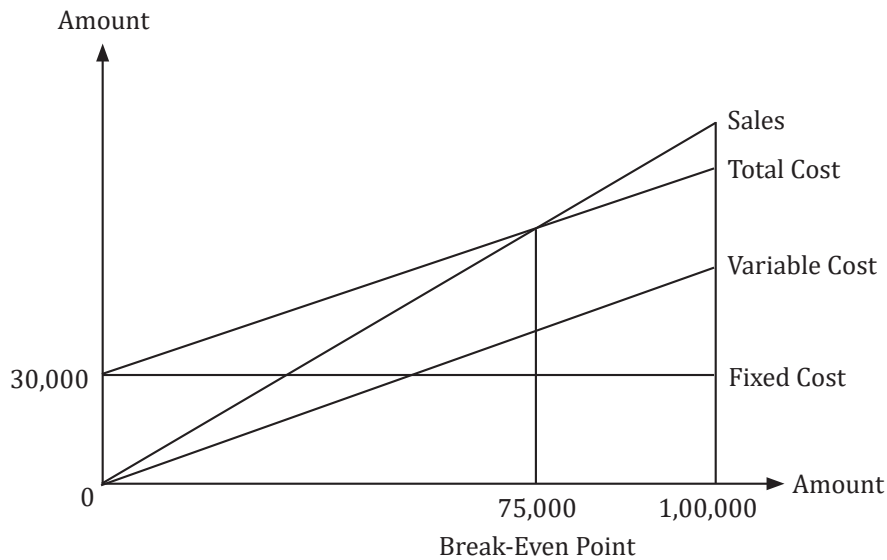
Particulars	Amount (₹)
Contribution of A [ $\{240 - (120 + 7.5\%)\} \times 10,000$ ]	11,10,000
Contribution of B [ $\{120 - (60 + 7.5\%)\} \times 12,000$ ]	6,66,000
Total contribution	17,76,000
Less: Fixed Cost (15,00,000 - 15%)	12,75,000
Profit	5,01,000

A comparison of increase in profit figures under above three options clearly indicates that the option (c) is the best as it has the highest profit of ₹5,01,000.

$$52. \text{ P/V Ratio} = \frac{\text{₹ } 1,00,000 - \text{₹ } 60,000}{\text{₹ } 1,00,000} = 40\%$$

$$\text{Break Even Point} = \frac{\text{Total fixed cost}}{\text{P/V Ratio}} = \frac{30,000}{40\%} = \text{₹ } 75,000$$

$$\text{Margin of safety} = 1,00,000 - 75,000 = \text{₹ } 25,000$$



53.

	North		East		South	
	Sales	Profit	Sales	Profit	Sales	Profit
Actual	1,100	135	1,450	210	1,200	330
Add: Under/(Over) budgeted	400	180	(150)	(90)	200	110
Budget	1,500	315	1,300	120	1,400	440
P/V Ratio $\left[ \frac{\text{Difference in Profit}}{\text{Difference in Sales}} \right]$	$\frac{315 - 135}{1500 - 1100} \times 100 = 45\%$		$\frac{120 - 210}{1450 - 1300} \times 100 = 60\%$		$\frac{440 - 330}{1400 - 1200} \times 100 = 55\%$	
Fixed cost $[(\text{Sales} \times \text{P/v}) - \text{Profit}]$	$(1100 \times 45\%) - 135 = 360$		$(1450 \times 60\%) - 210 = 660$		$(1200 \times 55\%) - 330 = 330$	
B.E. Sales $\left[ \frac{\text{Fixed cost}}{\text{P/V ratio}} \right]$	$\frac{360}{45\%} = \text{₹ } 800$		$\frac{660}{60\%} = \text{₹ } 1,100$		$\frac{330}{55\%} = \text{₹ } 600$	

54.

**(i) Statement of Profit**

Particulars	Machine A	Machine B
Contribution per unit (₹)	400 - 240 = 160	400 - 260 = 140
Capacity (units)	8 lakhs	10 lakhs
Total contribution (₹)	1,280 lakhs	1,400 lakhs
Less: Fixed cost (₹)	350 lakhs	200 lakhs
Profit	930 lakhs	1,200 lakhs

Machine B should be chosen as it gives more profit than Machine A.

**(ii) Statement of Profit**

Particulars	Machine A	Machine B
Contribution per unit (₹)	400 - 240 = 160	400 - 260 = 140
Capacity (units)	12 lakhs	12 lakhs
Total contribution (₹)	1,920 lakhs	1,680 lakhs
Less: Fixed cost (₹)	350 lakhs	200 lakhs
Profit	1,570 lakhs	1,480 lakhs

Machine A should be chosen as it gives more profit than Machine B.

55.

(a) The decision shall be made comparing the marginal cost of making and buying the component. Here the variable cost of making the component is ₹471 as compared to buying cost of ₹485. The component shall be made by using own production facility as it would save the company ₹14 per unit.

(b) If by releasing the production facility the company can earn a rental income of ₹32,00,000, then the additional cost of buying from outside and the rental income from releasing the capacity shall be compared for making decision.

Additional cost of buying = ₹14 × 2,00,000 units = ₹28,00,000

Rental income to be received = ₹32,00,000

Additional benefit = ₹4,00,000

The component should be bought from outside as it would save the company ₹4,00,000 in fixed cost.

$$56. \text{ Overall contribution per unit} = \frac{\text{Total contribution}}{\text{Total units}} = \frac{(18-9)(9000) + (15-4.50)(18000)}{27000} = ₹10$$

$$\text{Overall BEP} = \frac{\text{Fixed cost}}{\text{Overall contribution per unit}} = \frac{15,000}{10} = 1,500 \text{ units}$$

$$\text{BEP of O} = 1,500 \times \frac{9000}{27,000} = 500 \text{ units}$$

$$\text{BEP of N} = 1,500 \times \frac{18000}{27,000} = 1,000 \text{ units}$$

57.

**(i) Statement of Contribution per unit and Ranking**

Particulars	X (₹)	Y (₹)	Z (₹)
Selling price (A)	312	400	240
(-) Direct material	160	120	80
(-) Direct labour of Dept. A	24	40	20
(-) Direct labour of Dept. B	48	120	88
(-) Variable overheads	8	20	12
Contribution per unit	72	100	40
Hours in Dept. A	6	10	5
Contribution per hour	12	10	8
Ranking	I	II	III

**(ii) Statement of Product Mix and Profit**

Product	Units	Hours per unit	Material consumed	Contribution
X	12,000	6	72,000	12,000 × 72 = 8,64,000
Y	16,000	10	1,60,000	16,000 × 100 = 16,00,000
Z	48,000 ÷ 5 = 9,600	5	(Bal. fig.) 48,000	9,600 × 40 = 3,84,000
	37,600		2,80,000	28,48,000

58.

**Statement of Contribution per unit and Ranking**

Particulars	X (₹)	Y (₹)
Selling price	300	450
(-) Direct material	140	180
(-) Direct wages	60	100
(-) Variable overheads	20	40
Contribution per unit	80	130
Machine hours per unit	4	8
Contribution per machine hour	20	16.25
Ranking	I	II

**Statement of Product Mix and Profit**

Product	Units	Machine hour per unit	Material consumed	Contribution
X	8,000	4	32,000	8,000 × 80 = 6,40,000

Y	$28,000 \div 8 = 3,500$	8	(Bal. fig.) 28,000	$3,500 \times 130 = 4,55,000$
	11,500		60,000	10,95,000
			(-) Fixed Cost	2,25,000
			Profit	8,70,000

59.

- (a) Full cost of the product per unit = ₹2,604
- (b) Selling price ₹3,906  
 (-) Direct material ₹693  
 (-) Direct labour ₹315  
 (-) Variable support cost ₹504  
 Contribution per unit ₹2,394
- (c) Costs for decision making are those costs that differ between alternatives, which in this situation are the incremental costs.  
 Direct material ₹693  
 Direct labour ₹315  
 Variable support cost ₹504  
 Total incremental costs ₹1,512
- (d) Minimum acceptable price would be the incremental costs in the short term i.e. ₹1,512
- (e) Yes, RPP Manufactures may consider a price of ₹2100 per unit because this price is greater than the minimum acceptable price.

60.

- (i) Let cost indifference units = y

Thus, Total cost of Method - I = Total cost of Method - II

$$1,00,000 + 15y = 3,00,000 + 10y$$

$$5y = 2,00,000$$

$$y = 40,000$$

At y = 40,000 units, cost of the two methods will be equal.

If quantity produced is more than 40,000 units than option where variable cost per unit is low i.e. Method - II will have greater benefits in term of cost. If quantity produced is less than 40,000 units than option with lowest fixed cost i.e. Method - I will have greater benefits in terms of total cost.

**(ii) Statement of Break-even point**

Particulars	Method - I	Method - II
Contribution per unit (A)	$25 - 15 = 10$	$25 - 10 = 15$
Fixed cost (B)	1,00,000	3,00,000
Break-even point (in units) (B÷A)	10,000	20,000

61.

**Working Note:**

Particulars	Year 2019
Opening stock	(Bal. fig.) 10,000
(+) Production	1,60,000
(-) Sales	1,50,000
Closing Stock	20,000

**(a) Income Statement under Absorption Costing**

Particulars	Amount
Sales (A)	$1,50,000 \times 20 = 30,00,000$
Variable Production Cost	$1,60,000 \times 11 = 17,60,000$
Under Recovered Variable Prod. Cost	35,000
Fixed Production	$\frac{3,60,000}{2,00,000 \times 90\%} \times 1,60,000 = 3,20,000$
GFC/NFC/COP	21,15,000
(+) Op. Stock FG	$10,000 \times (11 + 2) = 1,30,000$
(-) Cl. Stock FG	$\frac{21,15,000}{1,60,000} \times 20,000 = 2,64,375$
COGS	19,80,625
(+) Variable Selling Cost	$1,50,000 \times 3 = 4,50,000$
(+) Fixed Selling Cost	2,70,000
COS	27,00,625
(+) Under Recovered Fixed Prod. Cost	$3,60,000 - 3,20,000 = 40,000$
Total Cost (B)	27,40,625
Profit (A - B)	2,59,375

**Income Statement under Marginal Costing**

Particulars	Year 2019
Sales (A)	$1,50,000 \times 20 = 30,00,000$
Variable Production Cost	$1,60,000 \times 11 = 17,60,000$
Under recovered variable Prod. Cost	35,000
Variable GFC/NFC/COP	17,95,000
(+) Op. Stock FG	$10,000 \times 11 = 1,10,000$
(-) Cl. Stock FG	$\frac{17,95,000}{1,60,000} \times 20,000 = 2,24,375$
Variable COGS (B)	16,80,625
(+) Variable Selling cost	$1,50,000 \times 3 = 4,50,000$

Variable COS (B)	21,30,625
Contribution (A – B)	8,69,375
(-) Fixed Production Cost	3,60,000
(-) Fixed Selling Cost	2,70,000
Profit	2,39,375

**(b) The reasons for difference in profit are**

Particulars	Year 2019
Profit as per absorption costing	2,59,375
Add: Opening stock under-valued (1,30,000 – 1,10,000)	20,000
Less: Closing stock under-valued (2,64,375 – 2,24,375)	(40,000)
Profit as per marginal costing	2,39,375

62.

(a) Budgeted fixed production costs = ₹1,60,000

$$\text{Recovery rate} = \frac{\text{Budgeted overheads}}{\text{Normal level of activity}} = \frac{1,60,000}{800} = ₹200 \text{ per unit}$$

$$\text{Fixed overheads absorbed} = 220 \text{ units} \times ₹200 = ₹44,000$$

(b) Actual production overheads = ₹40,000

$$\text{Fixed overheads recovered} = ₹44,000$$

$$\text{Over recovered overheads} = 44,000 - 40,000 = ₹4,000$$

**(c) Profit statement as per Absorption Costing**

Particulars	₹
Sales revenue (160 units × ₹2,000) (A)	3,20,000
Variable cost (220 units × ₹800)	1,76,000
Fixed overheads recovered (220 units × ₹200)	44,000
Total production cost	2,20,000
Add: Opening stock	-
Less: Closing stock $\left( \frac{2,20,000}{220} \times 60 \right)$	(60,000)
Cost of goods sold	1,60,000
Less: Adjustment for over recovery of fixed overheads	(4,000)
Add: Variable selling & distribution overheads (160 × ₹400)	64,000
Add: Fixed selling & distribution overheads (2,40,000 × ¼)	60,000
Cost of Sales (B)	2,80,000
Profit (A – B)	40,000

**(d) Profit statement as per Marginal Costing**

Particulars	₹
Sales revenue (160 units × ₹2,000) (A)	3,20,000
Variable cost (220 units × ₹800)	1,76,000
Variable production cost	1,76,000
Add: Opening stock	-
Less: Closing stock $\left(\frac{1,76,000}{220} \times 60\right)$	(48,000)
Variable cost of goods sold	1,28,000
Add: Variable selling & distribution overheads (160 × ₹400)	64,000
Variable cost of sales (B)	1,92,000
Contribution (A – B)	1,28,000
Less: Fixed production cost	(40,000)
Less: Fixed selling & distribution cost	(60,000)
Profit	28,000

**63. (i) Statement of Profit under Absorption Costing**

Particulars	April (₹)	May (₹)	June (₹)
Sales (A)	4,200 × 2,050 = 86,10,000	4,500 × 2,050 = 92,25,000	5,200 × 2,050 = 1,06,60,000
Direct material	4,600 × 4 × 120 = 22,08,000	4,400 × 4 × 120 = 21,12,000	5,500 × 4 × 120 = 26,40,000
Direct labour	4,600 × 6 × 60 = 16,56,000	4,400 × 6 × 60 = 15,84,000	5,500 × 6 × 60 = 19,80,000
Variable production overheads	16,56,000 × 150% = 24,84,000	15,84,000 × 150% = 23,76,000	19,80,000 × 150% = 29,70,000
Fixed production overheads	4,600 × 100 = 4,60,000	4,400 × 100 = 4,40,000	5,500 × 100 = 5,50,000
Production cost	68,08,000	65,12,000	81,40,000
Add: Opening stock	-	5,92,000	4,44,000
Less: Closing stock	$\frac{65,12,000}{4,400} \times 300$ = 5,92,000	$\frac{65,12,000}{4,400} \times 300$ = 4,44,000	$\frac{81,40,000}{5,500} \times 600$ = 8,88,000
COGS	62,16,000	66,60,000	76,96,000
Add: Fixed selling OHs	95,000	95,000	95,000
Under/(Over) recovery	5,00,000 – 4,60,000 = 40,000	5,00,000 – 4,40,000 = 60,000	5,00,000 – 5,50,000 = (50,000)
Total Cost (B)	63,51,000	68,15,000	77,41,000
Profit (A – B)	22,59,000	24,10,000	29,19,000

## (ii) Statement of Profit under Marginal Costing

Particulars	April (₹)	May (₹)	June (₹)
Sales (A)	$4,200 \times 2,050 = 86,10,000$	$4,500 \times 2,050 = 92,25,000$	$5,200 \times 2,050 = 1,06,60,000$
Direct material	$4,600 \times 4 \times 120 = 22,08,000$	$4,400 \times 4 \times 120 = 21,12,000$	$5,500 \times 4 \times 120 = 26,40,000$
Direct labour	$4,600 \times 6 \times 60 = 16,56,000$	$4,400 \times 6 \times 60 = 15,84,000$	$5,500 \times 6 \times 60 = 19,80,000$
Variable production overheads	$16,56,000 \times 150\% = 24,84,000$	$15,84,000 \times 150\% = 23,76,000$	$19,80,000 \times 150\% = 29,70,000$
Variable Production cost	63,48,000	60,72,000	75,90,000
Add: Opening stock	-	5,52,000	4,14,000
Less: Closing stock	$\frac{63,48,000}{4,600} \times 400 = 5,52,000$	$\frac{75,90,000}{5,500} \times 600 = 4,14,000$	$\frac{75,90,000}{5,500} \times 600 = 8,28,000$
Variable Cost (B)	57,96,000	62,10,000	71,76,000
Contribution (A - B)	28,14,000	30,15,000	34,84,000
Less: Fixed Production OHs	5,00,000	5,00,000	5,00,000
Less: Fixed selling OHs	95,000	95,000	95,000
Profit	22,19,000	24,20,000	28,89,000

## (iii) Reconciliation Statement

Particulars	April (₹)	May (₹)	June (₹)
Profit as per Absorption Costing	22,59,000	24,10,000	29,19,000
Add: opening stock overvalued in absorption	-	$5,92,000 - 5,52,000 = 40,000$	$4,44,000 - 4,14,000 = 30,000$
Less: Closing stock overvalued in absorption	$5,92,000 - 5,52,000 = 40,000$	$4,44,000 - 4,14,000 = 30,000$	$8,88,000 - 8,28,000 = 60,000$
Profit as per Marginal Costing	22,19,000	24,20,000	28,89,000

## Working Note- 1

Particulars	April	May	June
Opening Stock	-	400	300
Add: Production	4,600	4,400	5,500
Less: Sales	4,200	4,500	5,200
Closing stock	400	300	600

$$64. (i) \quad A \text{ Revised Sale} = \frac{\text{Revised Fixed Cost} + \text{Expected Profit}}{\text{P/V Ratio}}$$

$$= \{₹115 + (20 + 10)\} \div 45\% = ₹322.22 \text{ crores}$$

$$(ii) \text{ D Revised Break - even Point} = \frac{\text{Fixed Cost}}{\text{P/V Ratio}}$$

$$= ₹115 \text{ Crore} \div 45\% = ₹255.56 \text{ Crore (Refer working notes)}$$

$$\text{iii. D Revised Margin of Safety} = \text{Revised Sales} - \text{Revised Breakeven Sales}$$

$$= ₹322.22 \text{ Crores} - ₹255.56 \text{ Crores} = ₹66.66 \text{ Crores.}$$

$$(iv) \text{ C } ₹20 \text{ Crore \& } ₹30 \text{ Crore respectively (Refer working note)}$$

$$(v) \text{ A Total cost in last year} = ₹230 \text{ Crore}$$

$$\text{Total cost in coming year} = \text{Variable Cost} + \text{Fixed Cost}$$

$$\text{Revised sales} \times 55\% + 115 \text{ Crore} = ₹322.22 \text{ Crore} \times 55\% + ₹115 \text{ Crore} = ₹292.22 \text{ Crore}$$

### Working Note

Present Sales and Profit

$$\begin{aligned} \text{Total Sales} &= \text{Break-even Sales} + \text{Margin of Safety} \\ &= ₹200 \text{ Crores} + ₹50 \text{ Crores} \\ &= ₹250 \text{ Crores} \end{aligned}$$

### Working Note

Present Sales and Profit

$$\begin{aligned} \text{Total Sales} &= \text{Break-even Sales} + \text{Margin of Safety} \\ &= ₹200 \text{ Crores} + ₹50 \text{ Crores} \\ &= ₹250 \text{ Crores} \end{aligned}$$

$$\text{PN Ratio} = 40\%$$

$$\begin{aligned} \text{Variable Cost} &= 60\% \text{ of Sales} \\ &= ₹250 \text{ Crores} \times 60\% \\ &= ₹150 \text{ Crores} \end{aligned}$$

$$\begin{aligned} \text{Fixed Cost} &= \text{Break - even Sales} \times \text{P/N Ratio} \\ &= ₹200 \text{ Crores} \times 40\% \\ &= ₹80 \text{ Crores} \end{aligned}$$

$$\begin{aligned} \text{Total Cost} &= ₹150 \text{ Crores} + ₹80 \text{ Crores} \\ &= ₹230 \text{ Crores} \end{aligned}$$

$$\begin{aligned} \text{Profit} &= \text{Total Sales} - \text{Total Cost} \\ &= ₹250 \text{ Crores} - ₹230 \text{ Crores} \end{aligned}$$

$$\begin{aligned} \text{Profit} &= \text{Total Sales} - \text{Total Cost} \\ &= ₹250 \text{ Crores} - ₹230 \text{ Crores} \\ &= ₹20 \text{ Crores} \end{aligned}$$

<b>Revised Sales</b>	<b>(₹ in Crores)</b>
Present Fixed Cost	80.00
Increase in Fixed Cost	20.00
Intrest at 15 percent on Additional Capital (₹100 Crores × 15%)	15.00
Total Revised Fixed Cost (in crore)	115.00
Assuming that the Present Selling Price is ₹100	
Revised Selling Price will be (8% Less)	92.00
New Variable Cost (reduced from 60% to 55%) of Sales (₹92 × 55%)	50.60
Contribution (₹92.00 – ₹50.60)	41.40

$$\begin{aligned} \text{New P/V Ration} &= \frac{\text{₹ } 41.40}{\text{₹ } 92.00} \times 100 \\ &= 45\%. \end{aligned}$$

