Say, if fixed costs are Rs. 1,00,000 and contribution margin per unit Rs. 10 and the desired profit per unit Rs. 2, then the sales units required to give this profit will be 12500 units, as calculated below:

$$\text{Sales units for desired profit per unit} = \frac{\text{Rs. } 1,00,000}{(\text{Rs. } 10 - \text{Rs. } 2)}$$

$$= \frac{\text{Rs. } 1,00,000}{\text{Rs. } 8}$$

$$= 12500 \text{ units}$$

Similarly, if the desired profit is stated not on a per unit basis, but as a percentage of sales, the relevant formula for calculating the required sales volume is:

$$\text{Sales volume for desired profit (as percentage of sales)} = \frac{\text{Fixed cost}}{(\text{P/V ratio} - \text{proft margin})}$$

Say, if fixed costs are Rs. 1,00,000, P/V ratio 40% and profit margin (percentage of sales) 20%, the required sales revenue will be Rs. 5,00,000 as calculated below:

$$\text{Sales volume (for desired profit margin)} = \frac{\text{Rs. } 1,00,000}{(40\% - 20\%)} = \text{Rs. } 5,00,000$$

IMPROVING PROFIT-VOLUME RATIO

P/V ratio can be improved by the following possible courses of action:

(i) Increase the unit selling price of product.
(ii) Reducing the product unit variable/marginal cost.
(iii) Increasing the share of high contribution margin products in a multiproduct company.
(iv) Reducing the share of low contribution margin products in the total sales.

COST INDIFFERENCE POINT

A cost indifference point is that point at which total costs (fixed cost and variable cost) associated with the two alternatives are equal. There may be two methods or two alternatives of doing a thing, say two methods of production. It is also possible at a particular level of activity, one production method or method of doing a thing is superior to another, and vice versa. Accordingly there is a need to know at which level of production, it will be preferable to shift from one production method to another production method. This level or point is known as cost indifference point and at this point total cost of two production methods are the same.

Cost indifference point is useful in many decision situations, such as quality improvement schemes, different marketing plans, production plans or methods etc.

Cost indifference point should be distinguished from break-even point. Break-even point compares total sales and total cost of a product. Also, at break-even point total cost line intersects total sales line. As stated above, cost indifference signifies equality of total costs of two alternatives or two methods of doing the same thing. At cost indifference point, total cost lines of two alternatives intersect each other.

Example 16.2

A factory is thinking whether to hire a machine at an annual charge of Rs. 12,00,000 to increase the production of a product from current level of 6000 units. It is expected that hiring of new machine will reduce the variable cost per unit by Rs. 100 due to savings in labour cost. Fixed costs of the factory will remain the

same, except the hiring charges of Rs. 12,00,000. The selling price of the product is Rs. 1200 per unit. The present cost breakup of the product is as follows:

Variable cost Rs. 900 per unit
Fixed cost Rs. 100 per unit.

Required: Calculate cost indifference point for the new machine (that is, additional units which must be produced and sold to justify hiring the machine)

Solution:

Contribution Per Unit

	Existing	*New*
Selling price per unit (Rs.)	1,200	1,200
Variable cost per unit (Rs.)	900	800
Contribution per unit	300	400

Total contribution required:

Existing contribution = 6000 units × Rs. 300	=	Rs. 18,00,000
Hiring charges of the machine	=	Rs. 12,00,000
Total contribution required		30,00,000

$$\text{Number of units to be sold} = \frac{\text{Total contribution required}}{\text{Proposed contribution per unit}}$$

$$= \frac{\text{Rs. } 30,00,000}{\text{Rs. } 400}$$

= 7500 units

Additional number of units to be sold = 7500 – 6000 = 1500 units

Thus, 1500 additional units need to be produced and sold to justify hiring of the machine.

Notes: For the new machine indifference point is the point indicating the extra units to be manufactured and sold to achieve the existing level of profit. Production and sale of 7500 units with hiring the new machine will give total contribution of Rs. 30,00,000 and after deducting hiring charges of Rs. 12,00,000 remaining contribution Rs. 18,00,000 will help in maintaining the current level of profit which is also Rs. 18,00,000.

LIMITATIONS OF CVP ANALYSIS

CVP analysis is a useful planning and control device, usually in the form of a chart, showing how revenue, costs, and profit fluctuate with volume. The CVP technique is useful to management in areas of budgeting, cost control and decision making. In spite of CVP being a useful technique, it suffers from some limitations. Some limitations of CVP are as follows:

1. It is difficult to classify exactly all the expenses into fixed and variable category. In fact, most of the expenses are neither totally variable nor wholly fixed in a realistic situation.
2. Contribution itself is not a guide if there is some key or limiting factor. Therefore, contribution needs to be linked with key or limiting factor.
3. Sales staff and marketing personnel may give undue importance to marginal cost as compared to total cost and decide to sell at a price based on marginal cost, which will result in low profits or loss.

4. Fixed overheads cannot altogether be excluded particularly in large contracts while valuing work-in-progress. In other situations or business decisions as well, consideration of fixed overheads becomes necessary to judge the performance and profitability.
5. In a multiproduct situation, different products typically yield different contribution margins and are produced in various volumes with differing costs. As a result, neither the revenue curve nor the cost curve is necessarily straight and the break-even point is difficult to find.

Because of the many assumptions, CVP is only an approximation at best. If prices, unit costs, sales mix, operating efficiency, or other relevant factors change, then the overall CVP analysis and relationships also must be modified. Because of these assumptions, cost data are of limited significance.

Therefore, while preparing or interpreting cost-volume profit analysis, all assumptions and limitations should be carefully considered. A series of CVP analysis based on different sets of assumptions and circumstances may be prepared to reflect situations prevailing in different business enterprises. When circumstances change, CVP analysis should also be revised to reflect the changing situations. It is also necessary to have up-to-date analysis so that it can act as a useful device in profit forecast, budgeting, cost control and managerial decision-making.

Example 16.3

Prepare income statements under marginal costing and absorption costing from the following information for the year 2003–04:

Opening Stock : 500 units valued at Rs. 35,000 including variable cost of Rs. 50 per unit.
Fixed cost : Rs. 1,00,000
Output : 5000 units, variable cost: Rs. 60 per unit
Sales : 3000 units @ Rs. 100 per unit

Closing stock is valued on the basis of FIFO. Also explain the reason for difference in profits in both the cases. *(B.Com. (Hons), Delhi 1998, 2005)*

Solution:

Income Statement

Particulars	*Absorption Costing system*	*Marginal Costing system*
Sales (3000 × Rs. 100)	3,00,000	3,00,000
Less: Cost of manufactured and sold:		
Variable Cost	3,00,000	3,00,000
Fixed Cost	1,00,000	–
Add: Opening Inventory		
Variable Cost	25,000	25,000
Fixed Cost	10,000	–
Cost of goods available for sales	4,35,000	3,25,000
Less: Closing Inventory:		
Variable Cost (for 2,500 units)	(1,50,000)	(1,50,000)
Fixed Cost	(50,000)	–
Cost of manufactured and sold	2,35,000	1,75,000
Gross margin/contribution	65,000	1,25,000
Less: Fixed cost	–	1,00,000
Profit	65,000	25,000

The difference between two profits under two systems is because of Fixed cost charged on opening inventory and closing inventory. Under Absorption system, fixed cost included in opening stock (relating to previous year) is charged to this year sales. While under the marginal cost system, the fixed cost of the whole output is charged to the current sales. Difference in net income in absorption costing and marginal costing is simply due to difference in inventory values in the two costing techniques. This is clear from the following analysis.

Absorption costing profit	= Rs. 65,000
Marginal costing profit	= Rs. 25,000
Difference in net income	= Rs. 40,000
Inventory values	
Absorption costing:	
Opening inventory	Rs. 35,000
Closing inventory	2,00,000
Difference	→ 1,65,000
Marginal costing:	
Opening inventory	25,000
Closing inventory	1,50,000
Difference	→ 1,25,000
Net difference in inventory values	Rs. 40,000

Notes: (i) Variable cost has been assumed as variable production cost.
(ii) Fixed cost has been treated as fixed production cost.

Example 16.4

You are given the following information relating to the year 2005–06 and 2006–07:

	2005–06	*2006–07*
Opening stock (units)	–	300
Production (units)	1200	1400
Fixed cost	Rs. 2,00,000	Rs. 2,10,000
Variable cost	Rs. 1,50,000	Rs. 2,80,000
Sales (units)	900	1100
Selling price (Rs./per unit)	400	500
Closing stock (units)	300	600

Prepare profit and loss account using FIFO under marginal costing and under absorption costing.
(B.Com. (Hons), Delhi, 2007)

Solution:

Profit and Loss A/c (Absorption Costing)

	2005-06	*2006-07*
Sales (Rs.)	3,60,000	5,50,000
Less: Cost of goods sold:		
Opening stock	–	87,500
Variable cost	1,50,000	2,80,000
Fixed cost	2,00,000	2,10,000

(Contd.)

Cost of goods available for sales	3,50,000	5,77,500
Less: Closing inventory	87,500	2,10,000
Cost of goods sold	2,62,500	3,67,500
Net profit	97,500	1,82,500

Valuation of Closing Stock (based on FIFO)

$$2005\text{–}06 = \text{Fixed cost}\left(\text{Rs. } 2{,}00{,}000 \times \frac{300 \text{ units}}{1200 \text{ units}}\right) + \text{Variable cost}\left(\text{Rs. } 1{,}50{,}000 \times \frac{300}{1200}\right)$$

$$= \text{Rs. } 87{,}500$$

$$2006\text{–}07 = \text{Fixed cost}\left(\text{Rs. } 2{,}10{,}000 \times \frac{600}{1400}\right) + \text{Variable cost}\left(\text{Rs. } 2{,}80{,}000 \times \frac{600}{1400}\right)$$

$$= \text{Rs. } 2{,}10{,}000$$

Profit and Loss A/c (Marginal costing) FIFO

	2005–06	*2006–07*
Sales	3,60,000	5,50,000
Less: Cost of goods sold:		
Opening stock	–	37,500
Variable cost	1,50,000	2,80,000
Cost of goods available for sales	1,50,000	3,17,500
Less: Closing stock	37,500	1,20,000
Cost of goods sold	1,12,500	1,97,500
Margin	2,47,500	3,52,500
Less: Fixed cost	2,00,000	2,10,000
Net profit	47,500	1,42,500

Valuation of Closing Stock (FIFO)

$$2005\text{–}06 = \text{Rs. } 1{,}50{,}000 \times \frac{300}{1200} = \text{Rs. } 37{,}500$$

$$2006\text{–}07 = \text{Rs. } 2{,}80{,}000 \times \frac{600}{1400} = \text{Rs. } 1{,}20{,}000$$

Notes: For preparing Profit and Loss A/c, variable cost has been assumed as variable production cost. Further, fixed cost has been assumed as fixed production cost.

Example 16.5

The data given below relate to Modern Garments which produced and sold T-shirts during 2004–05: Opening stock of 500 T-shirts valued at Rs. 1,00,000 including variable cost of Rs. 80 per T-shirt:

Production	5,000 T-shirts
Sales @ Rs. 300 per T-shirt	4,000 T-shirts
Direct material cost	Rs. 2,00,000
Direct labour cost	Rs. 1,00,000

Factory overheads:
- Variable — Rs. 1,00,000
- Fixed — Rs. 6,00,000

Selling and distribution overheads:
- Variable — Rs. 20,000
- Fixed — Rs. 30,000

Closing stock is valued at current cost.

Prepare income statements under (a) absorption costing, (b) marginal costing, and (c) explain the reasons for the difference in profit under the two systems. *(B.Com. (Hons), Delhi, 2005)*

Solution:

(a) Income Statement under Absorption Costing System

		(Rs.)
Sales (4000 × 300)		12,00,000
Less: Cost of production and sold		
Variable production cost:		
Direct Material	2,00,000	
Direct Labour	1,00,000	
Factory overhead	1,00,000	
Fixed:		
Factory overheads	6,00,000	
Cost of production	10,00,000	
Add: Opening Inventory:		
Variable and Fixed Cost	1,00,000	
	11,00,000	
Less: Closing Inventory:		
$\left(\frac{10,00,000}{5,000} \times 1,500\right)$	3,00,000	
	8,00,000	8,00,000
Gross Margin		4,00,000
Less: Selling and Distribution Cost:		
Variable	20,000	
Fixed	30,000	50,000
Profit		3,50,000

Note: Closing inventory (1500 T-shirts) have been costed in terms of only current production cost that is, Rs. 10,00,000 based on FIFO assumption.

(b) Income Statement (Marginal Costing)

			Rs.
	Sales (4000 × 300)		12,00,000
Less :	Variable production cost of goods sold:		
	Direct material	Rs. 2,00,000	
	Direct labour	1,00,000	
	Factory overheads	1,00,000	
		4,00,000	

(Contd.)

Add :	Opening inventory (500 × 80)	40,000	
		4,40,000	
Less :	Closing inventory (1500 × 80)	1,20,000	
	Variable cost of production of goods sold		3,20,000
	Contribution		8,80,000
Less :	(i) Fixed factory overheads		(6,00,000)
	(ii) Variable selling and distribution overheads		(20,000)
	(iii) Fixed selling and distribution overheads		(30,000)
	Net income		2,30,000

(c) The reasons for difference in profit in the two costing techniques is due to differences in inventory values in absorption costing and marginal costing. In absorption costing fixed factory overheads is considered in the valuation of closing stock. But in marginal costing, fixed factory overheads are not charged to inventory but simply written off in the profit and loss account.

Example 16.6

Your company has a production capacity of 12,500 units and normal capacity utilisation is 80%. Opening inventory of finished goods on 1-1-1999 was 1000 units. During the year ending 31-12-1999, it produced 11000 units while it sold only 10000 units.

Standard variable cost per unit is Rs. 6.50 and standard fixed factory cost per unit Rs. 1.50. Total fixed selling and administration overhead amounted to Rs. 10000. The company sells its product at Rs. 10 per unit.

Prepare Income Statements under Absorption Costing and Marginal Costing. Explain the reasons for difference in profit, if any. *(B. Com. (Hons) Delhi, 2000)*

Solution:

Income Statement for the year ended 31st Dec., 1999
(Under Absorption Costing Method)

		Rs.	*Rs.*
Sales:	10000 Units @ Rs. 10 per unit		1,00,000
Less:	Cost of goods sold		
	Variable Production Costs:		
	11,000 units @ Rs. 6.50 per unit	71,500	
	Fixed factory cost @ Rs. 1.50 per unit		
	11000 × 1.50 =	16,500	
		88,000	
Add:	Opening stock: 1000 units		
	@ Rs. 8 per unit (that is, Rs. 6.50 + Rs. 1.50)	8,000	
	Costs of goods available for sales	96,000	
Less:	Closing stock: 2000 units valued at current cost.		
	$\frac{96,000 \times 2,000}{12,000}$	16,000	80,000
	Gross Profit		20,000
Less:	Fixed selling and administrative overhead.		10,000
	Net Profit		10,000

Income Statement for the year ended 31st December, 1999
(Under Marginal Costing Method)

		Rs.	Rs.
Sales:	10,000 units @ Rs. 10 per unit		1,00,000
Less:	Marginal Cost:		
	Variable production cost:		
	11000 units @ Rs. 6.50 per unit	71,500	
	Variable cost of opening stock of finished stock (1000 units @ Rs. 6.50 per unit)	6,500	
	Cost of goods available for sales	78,000	
Less:	Closing stock of finished stock:		
	2000 units @ Rs. 6.50 per unit	13,000	
		65,000	65,000
	Contribution		35,000
Less:	Fixed selling and administrative overhead	10,000	
	Fixed factory cost @ Rs. 1.50 per unit	16,500	26,500
	Net Profit		8,500

Reason for difference The difference in profits, Rs. 1,500 (that is Rs. 10,000 – Rs. 8,500), as arrived at under absorption and marginal costing methods is due to the element of fixed cost included in the valuation of opening and closing stock under the absorption costing method.

Example 16.7

'LMN' Limited sells its product at Rs. 3 per unit. The company uses a First-in, First-out actual costing system. A new fixed manufacturing overhead allocation rate is computed each year by dividing the actual fixed manufacturing overhead cost by the actual production costs. The following simplified data are related to its first two years of operation:

		Year I	*Year II*
Unit Data			
	Sales	1000	1200
	Production	1400	1000
Cost		Rs.	Rs.
	Variable manufacturing	700	500
	Fixed manufacturing	700	700
	Variable marketing and administration	1,000	1,200
	Fixed marketing and administration	400	400

Required:

(i) Prepare income statements based on:
(a) absorption costing and (b) variable costing for each year.
(ii) Give reasons for the differences in the answer. *(B. Com. (Hons) Delhi, 2001)*

Solution:

(i) Income Statement (Absorption Costing)

		Year I (Rs.)	*Year II (Rs.)*
Sales		3000	3600
Less:	Cost of goods sold:		
	Opening stock	Nil	400
	Variable manufacturing	700	500
	Fixed manufacturing	700	700
Cost of goods available for sales		1,400	1,600
Less:	Closing inventory $\frac{400}{1,400}$ × Rs. 1,400 (year I)	400	240*
Cost of goods sold		1,000	1,360
Gross Profit		2,000	2,240
Less:	Variable Marketing and Administration	(1,000)	(1,200)
	Fixed Marketing and Administration	(400)	(400)
Net Income		600	640

Note: In year II, FIFO method of inventory valuation is used. That is, ~~closing~~ inventory ~~of 200 units~~ belong to current production lot. Therefore, value of 200 units will be

$$\frac{200}{1'300} \times \text{Rs. } 1200 = \text{Rs. } 240$$

Income Statement
(Marginal Costing)

		Year I	*Year II*
	Sales	3000	3600
Less:	Cost of goods sold:		
	Opening stock	Nil	200
	Variable manufacturing	700	500
	Cost of goods available for sales	700	700
Less:	Closing stock @ Re 0.50 (400 units, 200 units)	200	100
	Cost of goods sold	500	600
	Contribution margin	2500	3000
Less:	Fixed manufacturing	(700)	(700)
	Variable marketing & Administration	(1000)	(1200)
	Fixed marketing & Administration	(400)	(400)
	Net Income	400	700

(ii) The difference in profit figures between absorption costing and variable costing is due to the factory cost attached to inventory. Difference in Net Income is due to difference in inventory values. This is explained as below:

	Year I (Rs.)	*Year II (Rs.)*
Absorption costing net income	600 ↑	↓ 640
Marginal costing net income	400	700
	200	60
Absorption costing inventory: Opening	Nil	400
Closing	400	240
Difference	400	160
Marginal costing inventory: Opening	Nil	200
Closing	200	100
Difference	200	100
Net difference	200	60

Example 16.8

ABC Motors assembles and sells motor vehicles. It uses an actual costing system, in which unit costs are calculated on a monthly basis. Data relating to March and April, 2000 are:

	March	*April*
Unit data:		
Beginning Inventory	0	150
Production	500	400
Sales	350	520
Variable-cost data:		
Manufacturing Costs per unit produced	Rs. 10,000	Rs. 10,000
Distribution costs per unit sold	3,000	3,000
Fixed-cost data:		
Manufacturing Costs	Rs. 20,00,000	Rs. 20,00,000
Marketing Costs	6,00,000	6,00,000

The selling price per motor vehicle is Rs. 24,000

Required:

(i) Present income statements for *ABC* Motors in March and April of 2000 under (a) variable costing, and (b) absorption costing.

(ii) Explain the differences between (a) and (b) for March and April. *(C.A. Inter, May 2000)*

Solution:

(i) Income Statement (Variable Costing)

	March (Rs.)	*April (Rs.)*
Sales	84,00,000	1,24,80,000
Less: Variable cost of goods sold:		
Opening stock	Nil	15,00,000
Variable manufacturing cost	50,00,000	40,00,000
Cost of goods available for sales	50,00,000	55,00,000
Less: Closing stock	15,00,000	3,00,000
Cost of goods sold	35,00,000	52,00,000
Contribution Margin	49,00,000	72,80,000
Less: Other costs:		
Fixed manufacturing	(20,00,000)	(20,00,000)
Fixed marketing	(6,00,000)	(6,00,000)
Variable distribution	(10,50,000)	(15,60,000)
Net Income	12,50,000	31,20,000

Income Statement (Absorption Costing)

		March (Rs.)	*April (Rs.)*
Sales		84,00,000	1,24,80,000
Less:	Cost of goods sold:		
	Opening stock	Nil	21,00,000
	Variable manufacturing cost	50,00,000	40,00,000
	Fixed manufacturing cost	20,00,000	20,00,000
	Cost of goods available for sales	70,00,000	81,00,000
Less:	Closing stock	21,00,000	4,50,000
	Cost of goods sold	49,00,000	76,50,000
	Gross profit	35,00,000	48,30,000
Less:	Distribution Cost	(10,50,000)	(15,60,000)
	Fixed marketing	(6,00,000)	(6,00,000)
	Net Income	18,50,000	(26,70,000)

Note: The company follows actual costing system and calculates unit costs on monthly basis. Therefore, for April month, inventory of 30 units has been valued as follows:

Variable manufacturing cost 30 × Rs. 10,000 = 30,00,000
Fixed manufacturing cost @ Rs. 5000 × 30 = 15,00,000
(Rs. 20,00,000, Current Production 400 units)
That is, inventory at Rs. 15,000 per unit = 45,00,000

For March month, inventory of 150 units has been calculated as follows:

Variable manufacturing Rs. 10,000 × 150 = Rs. 15,00,000
Fixed manufacturing Rs. 4,000 × 150 = Rs. 6,00,000
That is, inventory at Rs. 14,000 per unit = Rs. 21,00,000

(ii) Difference in Profit

	March	April
Absorption Costing profit	Rs. 18,50,000	Rs. 26,70,000
Variable costing profit	↑ 12,50,000	↓ 31,20,000
	6,00,000	4,50,000

Difference in profit is due to difference in inventory values in the two costing techniques.

	March (Rs.)	*April (Rs.)*
Absorption costing:		
Opening stock	Nil	21,00,000
Closing stock	21,00,000	4,50,000
Difference	21,00,000	16,50,000
Variable costing:		
Opening stock	Nil	15,00,000
Closing stock	15,00,000	3,00,000
Difference	15,00,000	12,00,000
Net difference (effect)	6,00,000	4,50,000

Example 16.9

The directors of a company have been studying the following condensed profit reports for the years 2006 and 2007:

	2006	*2007*
Sales (Rs.)	3,00,000	4,50,000
Profit (or loss) (Rs.)	55,000	35,000

The directors are perturbed over the trend, for a 50% increase in sales resulted in a decrease in profit in 2007. The chief cost accountant explains that unabsorbed overhead was charged to 2007 operations. His statement was based on the following data:

Data	*2006*	*2007*
Sales (units)	20,000	30,000
Production (units)	30,000	20,000
Sales price per unit (Rs.)	15	15
Variable cost per unit (Rs.)	5	5
Fixed factory overhead (Rs.)	1,80,000	1,80,000
Fixed factory overhead per unit (standard)	6	6
Fixed selling and administrative expenses	25,000	25,000

Prepare: (a) income statement by the conventional method to which the chief cost accountant referred; (b) income statements by variable costing method.

Solution:

Income Statement (Absorption Costing)

(Rs.)

		2006	*2007*
	Sales	3,00,000	4,50,000
Less:	Cost of goods sold:		
	Opening stock	–	1,10,000
	Variable production cost	1,50,000	1,00,000
	Fixed production cost	1,80,000	1,20,000
Cost of goods available for sales		3,30,000	3,30,000
Less:	Closing inventory	1,10,000	–
	Cost of goods sold	2,20,000	3,30,000
	+ Amount of under/ – Over-absorption	–	+ 60,000
		2,20,000	3,90,000
	Gross profit	80,000	60,000
Less:	(i) Fixed selling and administrative expenses	(25,000)	(25,000)
	(ii) Variable selling and administrative expenses	NIL	NIL
Net income		55,000	35,000

Income Statement (Variable Costing)

(Rs.)

		2006	2007
	Sales	3,00,000	4,50,000
Less:	Variable cost of good sold:		
	Opening inventory	–	50,000
	Variable production cost	1,50,000	1,00,000
	Cost of goods available for sales	1,50,000	1,50,000
Less:	Closing inventory	50,000	–
	Cost of goods sold	1,00,000	1,50,000
	Margin	2,00,000	3,00,000
Less:	Fixed production cost	(1,80,000)	(1,80,000)
	Fixed selling and administration expenses	(25,000)	(25,000)
	Variable selling and administrative expenses	NIL	NIL
	Net income (Loss)	(5000)	95,000

Notes: Variable cost given in the question has been assumed as variable production cost.

Example 16.10

Using the information given below, calculate the net income for the months of October, November and December and the value of finished goods on hand at the end of period using absorption costing and marginal costing. Also, comment on the differences in profits under these two methods.

	October	November	December
Production units	45000	36000	45000
Sales units	36000	42000	48000
Opening stock	–	9000	3000
Closing stock	9000	3000	–
Additional information:			
Selling price per unit		Rs. 50	
Variable production cost per unit		Rs. 30	
Fixed production cost per unit		Rs. 10	
Total fixed production costs per month		Rs. 3,90,000	
Normal output per month		39000 units	

(CA Inter)

Solution:

Income Statement (Absorption Costing)

(Rs.)

		October	November	December
	Sales:	18,00,000	21,00,000	24,00,000
Less:	Cost of goods sold:			
	Opening stock	–	3,60,000	1,20,000
	Variable production cost	13,50,000	10,80,000	13,50,000
	Fixed production cost	4,50,000	3,60,000	4,50,000
	Cost of goods available for sales	18,00,000	18,00,000	19,20,000

(Contd.)

Less: Closing stock	3,60,000	1,20,000	–
Cost of goods sold	14,40,000	16,80,000	19,20,000
± Capacity variance (Under/over-absorption)	(60,000)	+ 30,000	(60,000)
Cost of goods sold at actual	13,80,000	17,10,000	18,60,000
Less: Fixed and variable administrative and selling overheads	NIL	NIL	NIL
Net Income	4,20,000	3,90,000	5,40,000

Income Statement (Marginal Costing)

(Rs.)

	October	*November*	*December*
Sales	18,00,000	21,00,000	24,00,000
Less: Variable cost of goods sold:			
Opening stock	–	2,70,000	90,000
Variable production cost	13,50,000	10,80,000	13,50,000
Cost of goods available for sales	13,50,000	13,50,000	14,40,000
Less: Closing stock	2,70,000	90,000	–
Cost of goods sold	10,80,000	12,60,000	14,40,000
Margin	7,20,000	8,40,000	9,60,000
Less: (i) Fixed production cost	(3,90,000)	(3,90,000)	(3,90,000)
(ii) Fixed and variable Selling, distributions and administrative overheads	–	–	–
Net income	3,30,000	4,50,000	5,70,000

Difference in Profit (Rs.)

	October	November	December
Absorption costing profit	↑ 4,20,000	↓ 3,90,000	↓ 5,40,000
Marginal costing profit	↑ 3,30,000	↓ 4,50,000	↓ 5,70,000
Difference	90,000	60,000	30,000

Reconciliation Statement

	October	November	December
Inventory values (Rs):			
Absorption costing:			
Opening inventory	—	3,60,000	1,20,000
Closing inventory	3,60,000	1,20,000	—
	3,60,000	2,40,000	1,20,000
Marginal costing:			
Opening inventory	—	2,70,000	90,000
Closing inventory	2,70,000	90,000	—
	2,70,000	1,80,000	90,000
Net difference in income	90,000	60,000	30,000

Thus, difference in net income in the two costing techniques for difference months are due to differences in inventory values for the respective months.

However, total production units of three months (that is, 126,000 units) are equal to total sales units which is also 126000 units. Therefore, total absorption profit of the three months together which is Rs. 13,50,000 is equal to three months total of marginal costing profit which is also Rs. 13,50,000.

Thus, it is proved that when production units equals sales units, absorption costing profit will be equal to marginal costing profit.

Example 16.11

For the coming year, a manufacturing company has budgeted as under:

Contribution/Sales (C/S) Ratio = 45%

Margin of Safety Ratio = $33\frac{1}{2}\%$

Fixed Costs = Rs. 5,85,000

Required: Determine Total Sales-volume for the coming year and Profit thereon. *(B.Com. Delhi, 2005)*

Solution:

$$\text{Break-even sales (Volume)} = \frac{\text{Rs. Fixed cost}}{\text{P/V Ratio or C/S Ratio}}$$

$$\text{Break-even sales} = \frac{\text{Rs. } 5,85,000}{45\%}$$

$$\text{Break-even sales} = \text{Rs. } 5,85,000 \times 100/45$$

$$= \text{Rs. } 13,00,000$$

$$\% \text{ Profit} = \text{P/V Ratio} \times \text{Margin of sales Ratio} \times 100$$

$$\% \text{ Profit} = \frac{45}{100} \times \frac{100}{300} \times 100$$

$$\% \text{ Profit} = 15\%$$

$$\text{Sales Volume (s)} = \frac{\text{Fixed cost + (Profit \% on Sales or S)}}{\text{P/V Ratio}}$$

$$S = \frac{\text{Rs. } 5{,}85{,}000 + 15\%\ S}{45\%}$$

$$45\%\ S = \text{Rs. } 5{,}85{,}000 + 15\%\ S$$

$$30\%\ S = \text{Rs. } 5{,}85{,}000$$

$$S = \text{Rs. } 5{,}85{,}000 \times 100/30$$

$$= \text{Rs. } 1{,}95{,}000$$

Sales = Rs. 19,50,000, Profit = 15% of Rs. 19,50,000 = Rs. 2,92,500.

Example 16.12

A company annually manufactures and sells 20000 units of a product, the selling price of which is Rs. 50 and profit earned is Rs. 10 per unit.

The analysis of cost of 20000 units is:

Materials Cost	Rs. 3,00,000
Labour Cost	Rs. 1,00,000
Overheads	Rs. 4,00,000 (50% variable)

You are required to compute:

(i) Break-even sales in units and in Rupees.
(ii) Sales to earn a profit of Rs. 3,00,000.
(iii) Profit when 15000 units are sold. *(B.Com, Delhi, 2002)*

Solution:

(i) Break-even sales in Rupees $= \dfrac{\text{Fixed cost}}{\text{P/V Ratio}}$

$$\text{P/V Ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100$$

$$\text{Contribution} = \text{Sales} - \text{Variable cost}$$

$$= \text{Rs. } 10{,}00{,}000 - \text{Rs. } 6{,}00{,}000^*$$

$$= \text{Rs. } 4{,}00{,}000$$

$$^*\text{Variable cost} = \text{Material cost + Labour cost + Overheads (variable)}$$

$$= \text{Rs. } 3{,}00{,}000 + \text{Rs. } 1{,}00{,}000 + 50\% \text{ of Rs. } 4{,}00{,}000 = \text{Rs. } 6{,}00{,}000$$

$$\text{P/V Ratio} = \frac{\text{Rs. } 4{,}00{,}000}{\text{Rs. } 10{,}00{,}000} \times 100 = 40\%$$

$$\text{Break-even sales (Rs.)} = \frac{\text{Rs. } 2{,}00{,}000}{\text{Rs. } 40\%}$$

$$= \text{Rs. } 5{,}00{,}000$$

$$\text{Break-even sales (units)} = \frac{\text{Rs. } 5{,}00{,}000}{\text{Rs. } 50} = 10000 \text{ units.}$$

(ii) Sales to earn a profit of Rs. 3,00,000

$$= \frac{\text{Fixed cost + Desired proft}}{\text{P/V ratio}}$$

$$= \frac{\text{Rs. } 2,00,000 + \text{Rs. } 3,00,000}{40\%}$$

$$= \frac{\text{Rs. } 5,00,000 \times 100}{40}$$

$$= \text{Rs. } 12,50,000.$$

(iii) Profit when 15000 units are sold

Profit = (Sales × P/V Ratio) – Fixed cost

= (Rs. 7,50,000 × 40%) – Rs. 2,00,000

= Rs. 3,00,000 – Rs. 2,00,000

= Rs. 1,00,000

*15000 units @ Rs. 50 = Rs. 7,50,000.

Example 16.13

When sales of a company declines from Rs. 9,00,000 to Rs. 7,00,000, its profit of Rs. 50,000 is converted into a loss of Rs. 50,000.

Determine contribution margin ratio. *(B.Com. (Hons), Delhi, 2002)*

Solution:

Sales	Profit
Rs.	Rs.
9,00,000	50,000
7,00,000	(–) (Loss) 50,000
2,00,000	1,00,000

$$\text{P/V Ratio or Contribution Margin Ratio} = \frac{1,00,000}{2,00,000} \times 100$$

$$= 50\%$$

Example 16.14

A company having annual sales of Rs. 10 crores is earning 12% profit before charging interest and depreciation. Interest and depreciation amount to Rs. 60 lakhs and Rs. 100 lakhs respectively. If the contribution/sales ratio of the company is 0.4, calculate its break-even sales. *(B.Com. (Hons), Delhi 2002)*

Solution:

$$\frac{\text{Contribution}}{\text{Sales}} = .4$$

$$\frac{C}{10,00,00,000} = .4$$

$C = 4,00,00,000$

$S - V = C$

$10,00,00,000 - V = 4,00,00,000$

$10,00,00,000 - 4,00,00,000 = V$

$6,00,00,000 = V$

$$\text{Profit @ 12\% on sales before interest and depreciation} = \frac{10,00,00,000 \times 12}{100} = \text{Rs. } 1,20,00,000$$

Less:	Interest	(60,00,000)
	Depreciation	(1,00,00,000)
	Loss	40,00,000

As we know S – V = F + Profit/Loss

10,00,00,000 – 6,00,00,000 = F – 40,00,000

4,00,00,000 + 40,00,000 = F

4,40,00,000 = F

$$\text{B.E.P} = \frac{\text{Fixed Cost}}{\text{P/V Ratio}}$$

$$= \frac{4,40,00,000}{.4}$$

$$= \frac{44,00,00,000}{.4} = \text{Rs. } 11,00,00,000$$

Example 16.15

In a purely competitive market 10,000 units of a product can be manufactured and sold and certain amount of profit is generated. It is estimated that 2,000 units of that product need to be manufactured and sold in a monopoly market to earn the same profit.

Profit under both the market conditions is targeted at Rs. 2,00,000. The variable cost per unit is Rs. 100 and the total fixed cost is Rs. 37,000.

You are required to determine the selling prices under both monopoly and competitive conditions.

(B.Com. (Hons), Delhi, 2002)

Solution:

Under Monopolistic Conditions:

Let x be the selling price per unit.

$\therefore$ Sale = $2000\,x$

Variable cost = $2000 \times$ Rs. 100 = Rs. 2,00,000

Fixed cost = Rs. 37,000

Desired Profit = Rs. 2,00,000

or $2000\,x - 200000 = 37000 + 200000$

$\because$ (S – V = F + P)

or $$x = \frac{4,37,000}{2000} = 218.50 \text{ per unit}$$

Under Competitive Conditions

Let y be the selling price per unit

Sale = $10000\,y$

Variable Cost = $10000 \times$ Rs. 100

= Rs. 10,00,000

Fixed Cost = Rs. 37,000

Desired Profit = Rs. 2,00,000

$10,000\,y - 10,00,000 = 37,000 + 2,00,000$ [$\because$ S – V = F + P]

$$y = \frac{12,37,000}{10,000} = 123.70 \text{ per unit}$$

1. Under Monopolistic conditions selling price per unit is Rs. 218.50
2. Under Competitive conditions selling price per unit is Rs. 123.70.

Example 16.16

A company has a fixed cost of Rs. 20,000. It sells two products *A* and *B*, in the ratio of 2 units of *A* and 1 unit of *B*. Contribution is Re. 1 per unit of *A* and Rs. 2 per unit of *B*. How many units of *A* and *B* would be sold at break-even point? *(B.Com. (Hons), Delhi 2003)*

Solution:

Fixed cost = Rs. 20,000

Contribution is Re. 1 per unit of *A* and units of *A* product sold is 2.

So the contribution of product *A* = 1 × 2 = Rs. 2

Contribution is Rs. 2 per unit of *B* and unit sold is 1.

So the contribution of product *B* = 2 × 1 = Rs. 2

Total contribution of *A* and *B* product = Rs. 2 + Rs. 2 = Rs. 4

$$\text{B.E.P. (in units) } (A \text{ and } B \text{ combined}) = \frac{\text{Fixed cost}}{\text{Contribution of } A \text{ and } B}$$

$$= \frac{20{,}000}{4} = 5000$$

Units of two product *A* and *B* are sold in the ratio of 2 : 1

∴ B.E.P. of *A* product will be = 5000 × 2 = 10000 units

While of *B* product will be = 5000 × 1 = 5000 units

It can be proved:

B.E.P. = C = Fixed Cost

Contribution of *A* = 10,000 units × 1 Re. 1 per unit = Rs. 10,000

Contribution of *B* = 5000 units × Rs. 2 per unit = Rs. 10,000

C = Rs. 20,000

C = Fixed cost

∴ Rs. 20,000 contribution = Rs. 20,000 fixed cost, which is correct

Alternate Method

Contribution of *A* product is Re. 1 per unit but 2 units are sold = 2 × 1 = Rs. 2

Contribution of *B* product is Rs. 2 per unit but 1 unit is sold = 1 × 2 = Rs. 2

We may divide fixed overhead in two products equally, that is Rs. 10,000 for *A* product and Rs. 10,000 for *B* product,

$$\therefore \text{B.E.P. of } A \text{ product (in units)} = \frac{\text{Fixed Overhead or cost}}{\text{Contribution per units}}$$

$$= \frac{\text{Rs. } 10{,}000}{\text{Re. } 1} = 10000 \text{ units}$$

$$\text{B.E.P. of } B \text{ product (in units)} = \frac{\text{Fixed cost}}{\text{Contribution per units}}$$

$$= \frac{\text{Rs. } 10{,}000}{\text{Rs. } 2} = 5000 \text{ units}$$

Example 16.17

The manager of *ABC* Ltd., provides you with the following information:

		Rs.
Sales		4,00,000
Costs:	Rs.	
Variable (60% of sales)	2,40,000	
Fixed	80,000	3,20,000
Profit before tax		80,000
Income tax (60%)		48,000
Net Profit		32,000

The *ABC* Ltd. is thinking of expanding the plant. The fixed costs with plant expansion will be increased by Rs. 40,000. The company also wants to earn additional income after tax of Rs. 3,200 on investment.

(B.Com. (Hons), Delhi 2004)

Solution:

	Rs.
Sales	**4,00,000**
***Less:* Variable cost (60% of sales)**	**2,40,000**
Marginal cost of Contribution	**1,60,000**

$$\text{PV ratio} = \frac{C}{S} \times 100$$

$$= \frac{1,60,000 \times 100}{40,000} = 40\%$$

Required sales with increased expansion, fixed cost of Rs. 40,000 and additional income after tax of Rs. 3,200 on investment.

$$\text{Sales} = \frac{\text{Fixed cost + Profit}}{\text{PV Ratio}}$$

$$= \frac{\text{Rs. } 80,000 + \text{Rs. } 40,000 + \text{Rs. } 80,000 + \text{Rs. } 3,200}{40\%}$$

$$= \frac{2,03,200 \times 100}{40} = \text{Rs. } 5,08,000$$

If company makes the sales more than Rs. 5,08,000 then expansion will be able to derive additional income.

Example 16.18

ABC Ltd. manufactures three products, *P*, *Q* and *R*. The unit selling prices of these products are Rs. 100, Rs. 80 and Rs. 50 respectively. The corresponding unit variable costs are Rs. 50, Rs. 40 and Rs. 20. The proportions (quantity-wise) in which these products are manufactured and sold are 20%, 30% and 50% respectively. The total fixed costs are Rs. 14,80,000.

Given the above information, you are required to work out the overall break-even quantity and the product-wise break-up of such quantity. *(B.Com. (Hons), Delhi 2004)*

Solution:

Product	Sales Price per unit	Variable cost per unit	Contribution per unit	Ratio of contribution per unit	Ratio of sales	Ratio of contribution
P	100	50	50	5	2	10
Q	80	40	40	4	3	12
R	50	20	30	3	5	15
					Total	37

$$\text{Composite B.E.P. (in Units)} = \frac{\text{Fixed cost}}{\text{Ratio of contribution per unit}}$$

$$= \frac{14,80,000}{37} = 40000 \text{ units}$$

Product mix break up

$$P = 40000 \times \frac{2}{10} = 8000 \text{ units}$$

$$Q = 40000 \times \frac{3}{10} = 12000 \text{ units}$$

$$R = 40000 \times \frac{5}{10} = 20000 \text{ units}$$

Verification

Product	Unit	Sales Price per unit	Sales value	Variable cost per unit	Variable cost	Contribution
P	8000	100	8,00,000	50	4,00,000	4,00,000
Q	12000	80	9,60,000	40	4,80,000	4,80,000
R	20000	50	1,00,0000	20	4,00,000	6,00,000
Total	40000		27,60,000		12,80,000	14,80,000

As we know that at BEP

Sales – Variable costs = Fixed costs

Rs. 27,60,000 – Rs. 12,80,000 = Rs. 14,80,000

Fixed cost is Rs. 14,80,000 (given in the question)

Example 16.19

A producer of Ladies purses is earning a monthly post tax profit of Rs. 60,000 when income tax rate is 40%. Selling price of a purse is Rs. 50 and per unit variable cost is Rs. 30. How many more purses he should sell to earn same monthly post tax profit, if the tax rate goes up to 50%? *(B.Com. (Hons), 2005)*

Solution:

Contribution per unit

= Sale Price – V/C per unit

= 50 – 30 = Rs. 20

Computation of Pre Tax Profits when Tax rate is 40% and 50%

	40%	50%
After Tax Profits	60,000	60,000
Add: Tax $\left(\frac{40}{100-40}\right), \frac{50}{(100-50)}$	40,000	60,000
Pre Tax Profits	100,000	120,000

Computation of No. of more purses to be sold to earn the same monthly Post Tax Profits

$$= \frac{\text{Increase in pre tax profit}}{\text{Contribution per unit}}$$

$$= \frac{20000}{20} = 1000 \text{ units}$$

Example 16.20

The following is cost data relating to two alternative machines:

	Inferior Machines	*Superior Machine*
Fixed cost	Rs. 5,00,000	Rs. 8,00,000
Variable cost per unit	Rs. 30	Rs. 25
Selling price	Rs. 50	Rs. 55

Calculate the level of output at which you are indifferent about the two machines and beyond which the superior machine should be preferred. *(B.Com. (Hons), 2005)*

Solution:

To calculate the level of output at which we are indifferent about the two machines
Computation of Contribution per unit

	Inferior Machine	*Superior Machine*
Sales price	50	55
Less: Variable Cost	30	25
Contribution	20	30
Fixed Cost	5,00,000	8,00,000

Let the amount of profit at which we will be indifferent to both of the machines = Rs. x

$$\frac{5,00,000 + x}{20} = \frac{8,00,000 + x}{30}$$

$$15,00,000 + 3x = 16,00,000 + 2x$$

$$x = 1,00,000$$

Hence the level of output for indifference at a profit of Rs. 1,00,000 will be:

$$\text{Inferior Machine} = \frac{\text{FC + Des. profit}}{\text{Contribution per unit}} = \frac{5,00,000 + 1,00,000}{20}$$

$$= 30,000 \text{ units}$$

$$\text{Superior Machine} = \frac{\text{Rs } 8,00,000 + \text{Rs } 1,00,000}{30}$$

$$= 30,000 \text{ units}$$

Example 16.21

Calculate break-even for a train journey between Delhi–Bangalore where cost of an Engine is Rs. 1,00,000 and of a bogie Rs. 20,000. Capacity of a bogie is 80 passengers and each ticket for the journey is Rs. 600. There is no variable cost per passenger. *(B.Com. (Hons), 2005)*

Solution:

Calculation of Contribution per Bogie:

Sales of Tickets (600 × 80)	48,000
Less: Cost of bogie	20,000
Contribution per bogie	28,000

Calculation of break-even for one train journey

$$= \frac{\text{Cost of Engine (As Fixed)}}{\text{Contribution Ratio}}$$

$$= \frac{1,00,000}{\frac{28,000}{48,000}} = 1,00,000 \times \frac{48,000}{28,000}$$

$$= \text{Rs. } \frac{12,00,000}{7} = \text{Rs. } 1,71,429 \text{ approximately}$$

Example 16.22

M/s Natraj Stationers manufactures plastic files for office use. The break-up of its cost and sales is as follows:

Variable Cost per file	:	Rs. 40
Fixed cost	:	Rs. 60,000 per year
Production capacity	:	3,000 files per year
Selling price	:	Rs. 100 per file.

You are required to compute the following:

(i) Break-even point;
(ii) Number of files to be sold to earn a net profit of Rs. 30,000.
(iii) If the firm manufactures and sells 500 files more per year with an additional fixed cost of Rs. 2,000, what should be the selling price to earn the same amount of profit per file as in (ii) above?
(B.Com. (Hons), Delhi 2005)

Solution:

(1) Calculation of cost per unit and P/V Ratio

	Rs.
(a) Sales per unit	100
Less: Variable cost	40
Contribution	60

(b) Calculation of P/V Ratio

$$= \frac{\text{Contribution}}{\text{Sales}} = \frac{60}{100} \times 100 = 60\%$$

(2) Calculation of BEP

$$= \frac{\text{FC}}{\text{P/V Ratio}} = \frac{60,000}{60\%} = \text{Rs. } 1,00,000$$

(3) No. of files to be sold to earn a net profit of Rs. 30,000

$$= \frac{\text{FC} + \text{Des. profit}}{\text{Contribution per file}} = \frac{60,000 + 30,000}{60}$$

$$= \frac{90,000}{60} = 1,500.$$

Profit per file = Rs. 30,000 ÷ 1500 files = Rs. 20

(4) Selling Price to earn the same of amount of profit per file as in (2) above

Desired Profit (2000 × 20)	40,000
Fixed Cost (60,000 + 2,000)	62,000
Cost	102,000
Variable cost (2000 × 40)	80,000
Sales Desired	1,82,000

$$\text{Sales Price per file} = \frac{1,82,000}{2,000} = \text{Rs. } 91$$

Example 16.23

Workwell Ltd. is a single product producer with P/V ratio of 40% for the product during the current year. Due to increasing competition it is believed that the price will have to be reduced by 10% in the next year. By what percentage sales value and sales quantity should increase so that Workwell Ltd. earns same profit in the next year also?

(B.Com. (Hons), Delhi, 2007)

Solution:

Assume old price Rs. 100, contributions Rs. 40

Therefore variable cost = Rs. 100 – 40 = Rs. 60

With 10% price decrease, new P/V ratio will be $\frac{90-60}{90} = \frac{1}{3}$

(i) New desired sale to earn same contribution of Rs. 40 = $\frac{40}{1/3}$ = Rs. 120 that is. 20% increase in sales value

(ii) New quantity for same profit = $120 \times \frac{100}{90} = 133\frac{1}{3}$ that is $33\frac{1}{3}$ % increase in quantity sold

Example 16.24

ZED Ltd. produces two products, *P* and *Q*. The budgeted selling price per unit for *P* and *Q* are Rs. 3,600 and Rs. 4,320 respectively. Variable costs of production and sales for *P* and *Q* are Rs. 1,800 and 3,600 respectively. Annual fixed costs of the company amounts to Rs. 1,76,000. The company has two different production/sales options as under:

Option 1—A mix of 2 units of *P* for every 3 units of *Q*
Option 2—A mix of 1 unit of *P* for every 2 units of *Q*

Find out the combined Break-even Point under each option and the optimal mix that the company should adopt. *(ICWA, Stage 2, Dec. 2005)*

Solution:

Contribution per unit of product	*Product P*	*Product Q*
Budgeted Selling Price	3600	4320
Less variable cost	1800	3600
Contribution	1800	7 20

Option—1 (2 units of *P* and 3 units of *Q*)

Total contribution = Rs. 1,800 × 2 + Rs. 720 × 3 = Rs. 3,600 + Rs. 2,160 = Rs. 5,760

Break-even Point = (Fixed Cost × Total sales)/Contribution

Total sales value of 2 units of *P* and 3 units of *Q* = Rs. (2 × 3,600 + 3 × 4,320)
= Rs. 20,160

Combined Break-even Point = Rs. 1,76,000/5,760 × 20,160 = Rs. 6,16,000

Option—2 (1 unit of *P* and 2 units of *Q*)

Total contribution = Rs. 1,800 × 1 + Rs. 720 × 2 = Rs. 1,800 + Rs. 1,440 = Rs. 3,240

Total sales value = Rs. 3,600 × 1 + Rs. 4,320 × 2 = Rs. 3,600 + Rs. 8,640 = Rs. 12,240

Combined Break-Even Point = Rs. 1,76,000/3,240 × 12,240 = Rs. 6,64,889

Conclusion:

As Option—1 results in lower BEP and in this option average contribution per total number of units is higher, the company should adopt this option.

Example 16.25

A Ltd. has been offered a choice to buy a machine between *M*1 and *M*2. The following data are provided:

	*M*1	*M*2
Annual output in units	10000	10000
Fixed Cost	Rs. 60,000	Rs. 32,000
Profit at above level	Rs. 60,000	Rs. 48,000

The market price of the product is expected to be Rs. 20 per unit.

You are required to compute:

(i) Break-Even Point of each machine
(ii) the level of sales at which both the machines earn equal profit
(iii) the range of sales at which one is more profitable from the other.

(ICWA Inter, Dec. 1997, ICWA, Stage 2, June 2006)

Solution:

(i)

A Ltd.	Machines	
	*M*1	*M*2
	Rs.	Rs.
Sales value 10000 × Rs. 20	2,00,000	2,00,000
Contribution (Fixed Cost + Profit)	1,20,000	80,000
Variable Cost	80,000	1,20,000
P/V Ratio (Contribution/Sales)	60%	40%
Break Even Point (Fixed Cost/PV ratio)	1,00,000	80,000
Break-Even Point (Units)	5,000	4,000
Contribution per unit (Rs.)	12	8
Variable Cost per unit	8	12

(ii) Since the selling price of the product produced by machine *M*1 and *M*2 are same, the machine will earn equal profit when the total costs of operation of both the machines are same.
If x be the output at which total cost of the machines are same we have total cost of

$$\text{Machine } M1 = 8x + 60{,}000$$
$$\text{And Machine } M2 = 12x + 32{,}000$$
$$\text{Therefore, } 8x + 60{,}000 = 12x + 32{,}000$$
$$\text{or, } 4x = 28{,}000$$
$$\text{or, } x = 7000$$

At a production level of 7000 units the profits made by *M*1 and *M*2 would be same.

(iii) The Break-Even Point of *M*1 is 5000 units as compared to that of 4000 units in case of *M*2 and at a production level of 7000 units they earn equal profits. Therefore, *M*2's profit earning capacity is more in the region 4000 to 6999 units because it starts earning profit at a lower point as BEP is lower here. Beyond 7000 units *M*1 will earn more profits because it has a higher P/V ratio which enables it to earn more contribution of the increasing sales.

Example 16.26

A company has a contribution/sales ratio of 40%. It maintains a margin of safety of 20%. If its annual fixed cost amount to Rs. 24 lakhs, calculate its

(i) Break-even sales,
(ii) Margin of safety,
(iii) Total sales,
(iv) Total variable costs and
(v) Profit

(ICWA, Inter, Dec. 1998, ICWA, Inter, Stage 1, June 2007)

Solution:

(i) $$\text{Break-Even sales} = \frac{\text{Fixed Cost}}{\text{Contribution / Sales}} = \frac{24{,}00{,}000}{0.4} = \text{Rs. 60 lakhs}$$

(ii) Margin of Safety = Sales – Break-Even Sales
= Rs. 75 lakhs – 60 lakhs
= Rs. 15 lakhs

(iii) Total Sales = Break-Even Sales + Margin of Safety

$$\text{Sales} = 60 + 0.2 \text{ Sales} = \frac{60}{0.8} = \text{Rs. 75 lakhs}$$

= Rs. 60 lakhs + Rs. 15 lakhs = Rs. 75 lakhs

$\therefore$ S = Rs. 75 lakhs

(iv) Total variable costs $= \text{Sales}\left(1 - \frac{\text{Contribution}}{\text{Sales}}\right)$
= Rs. 75 lakhs $\left(1 - \frac{4}{10}\right)$
= Rs. 45 lakhs

(v) Profit = Sales – (Variable cost + Fixed cost)
= Rs. 75 lakhs – (Rs. 45 lakhs + Rs. 24 lakhs)
= Rs. 6 lakhs

Example 16.27

A company sells its product at Rs. 15 per unit. In a period, if it produces and sells 8000 units, it incurs a loss of Rs. 5 per unit. If the volume is raised to 20000 units, it earns a profit of Rs. 4 per unit.

Calculate break-even point in terms of rupees as well as in units.

(B. Com. (Hons,) Delhi 2001, CA Inter Nov. 1996)

Solution:

I. Sales = 8000 Units × Rs. 15 per Unit = Rs. 1,20,000
Loss = 8000 Units × Rs. 5 per Unit = Rs. 40,000

II. Sales = 20,000 Units × Rs. 15 per Unit = Rs. 3,00,000
Profit = 20,000 Unit × Rs. 4 per Unit = Rs. 80,000

	Sales	*Profit/Loss*
I.	1,20,000	(–) 40,000
II.	3,00,000	(+) 80,000

$$\text{P/V Ratio} = \frac{\text{Change in Profit}}{\text{Change in Sales}}$$

$$= \frac{1,20,000}{1,80,000} = \frac{2}{3} \text{ or } 66\frac{2}{3}\%$$

Sales at Break even point (in Rs.)

Fixed Cost = S × P/V Ratio – Profit

(On the basis raised volume II)

$$\text{Fixed Cost} = \text{Rs. } 3,00,000 \times \frac{2}{3} - 80,000$$

Fixed Cost = Rs. 2,00,000 – Rs. 80,000 = Rs. 1,20,000

$$\text{B.E.P.} = \frac{\text{F}}{\text{P/V Ratio}} = \frac{1,20,000 \times 3}{2} = \text{Rs. } 1,80,000$$

$$\text{Sales at Break-even point (in units)} = \frac{\text{Sales in Rs.}}{\text{Selling price per unit}}$$

$$= \frac{\text{Rs. } 1,80,000}{15} = 12,000$$

Note: (1) Rs. 5 per unit loss is given is the question, in the indirect way it is a variable cost per unit.
(2) Change in Profit is computed by adding loss of Rs. 40,000 in the profit of Rs. 80,000 because loss of Rs. 40,000 has also been covered in the second period of time or in the second option if the volume is raised to 20000 units.

Example 16.28

A Company manufactures radios, which are sold at Rs. 1,600 per unit. The total cost is composed of 30% for direct materials, 40% for direct wages and 30% for overheads. An increase in material price by 30% and in wage rates by 10% is expected in the forthcoming year, as a result of which the profit at current selling price may decrease by 40% of the present profit per unit. You are required to prepare a statement showing current and future profit at present Selling Price.

How much Selling Price should be increased to maintain the present rate of profit?

(CA Inter May 2001)

Solution:

Let X be the cost, Y be the profit and Rs. 1,600 selling price per unit of radio manufactured by a company. Hence

$$X + Y = \text{Rs. } 1,600 \qquad \text{(i)}$$

Statement of Present and Future Cost of a Radio

Particulars	*Present cost (Rs.)*	*Increase in cost (Rs.)*	*Anticipated future cost (Rs.)*
	(a)	*(b)*	*(c) = (a) + (b)*
Direct material	$0.3X$	$0.09X$	$0.39X$
Direct labour	$0.4X$	$0.04X$	$0.44X$
Overheads	$0.3X$	–	$0.30X$
Total	X	$0.13X$	$1.13X$

An increase in material price and wage rates resulted into a decrease in current profit by 40 percent at present selling price; therefore we have:

$$1.13X + 0.6Y = 1,600 \qquad \text{(ii)}$$

On solving (i) and (ii) we get:

$X =$ Rs. 1,207.55
$Y =$ Rs. 392.45

Current profit Rs. 392.45 or 32.5% of cost
Future profit Rs. 235.47

Statement of Revised Selling Price to Maintain the Present Rate of Profit

	Rs.
Direct material cost 0.39 × Rs. 1,207.55	470.94
Direct labour cost (0.44 × Rs. 1207.55)	531.32
Overheads 0.30 × Rs. 1,207.55	362.27
Total cost	1,364.53
Profit (32.5% of total cost)	443.47
Revised selling price	1,808.00

Example 16.29

Raj Ltd. manufactures three products *X*, *Y* and *Z*. The unit selling prices of these products are Rs. 100. Rs. 160 and Rs. 75 respectively. The corresponding unit variable costs are Rs. 50, Rs. 80 and Rs. 30. The proportions (quantity-wise) in which these products are manufactured and sold are 20%, 30% and 50% respectively. The total fixed costs are Rs. 14,80,000.

Calculate overall break-even quantity and the product-wise break up of such quantity.

(C.A. Inter May 1999)

Solution:

Overall Break-Even Quantity

Products	*X*	*Y*	*Z*
Selling Price per unit (Rs.)	100	160	75
Less: Variable Cost per unit (Rs.)	50	80	30
Contribution per unit (Rs.)	50	80	45
Share in Total Sales	20%	30%	50%
Proportionate Contribution per unit	10	24	22.50

Composite Contribution per unit = 56.5

$$\text{Composite Break-even Point} = \frac{\text{Total Fixed Cost}}{\text{Composite Contribution per unit}}$$

$$= \frac{\text{Rs. } 14,80,000}{\text{Rs. } 56.5} = 26{,}195 \text{ units.}$$

Product-wise break-up of overall break-even quantity:

Product *X*: 26195 units × 20/100 = 5239 units

Product *Y*: 26195 units × 30/100 = 7858 units

Product *Z*: 26195 units × 50/100 = 13098 units

Example 16.30

A single product company sells its products at Rs. 60 per unit. In 1996, the company operated at a margin of safety of 40%. The fixed costs amounted to Rs. 3,60,000 and the variable cost ratio to sales was 80%.

In 1997, it is estimated that the variable cost will go up by 10% and the fixed costs will increase by 5%. Find the selling price required to be fixed in 1997 to earn the same P/V ratio as in 1996.

Assuming the same selling price of Rs. 60 per unit in 1997, find the number of units required to be produced and sold to earn the same profit as in 1996.

(CA Inter May 1998)

Solution:

Basic Calculations

1. P/V Ratio in 1996

$$\text{P/V Ratio} = \frac{\text{Selling Price per unit} - \text{Variable Cost per unit}}{\text{Selling Price per unit}} \times 100$$

$$= \frac{\text{Rs. } 60 - \text{Rs. } 48}{\text{Rs. } 60} \times 100 = \frac{\text{Rs. } 12}{\text{Rs. } 60} \times 100 = 20\%$$

2. *Number of units sold (in 1996)*

$$\text{Break-even Point} = \frac{\text{Fixed cost}}{\text{Contribution per unit}} = \frac{\text{Rs. } 3,60,000}{\text{Rs. } 12} = 30000 \text{ units}$$

The margin of safety is 40%. Hence break-even point is at 60% of units sold.

or $$\text{No. of units sold} = \frac{\text{Break-even point}}{60\%} = \frac{30,000 \text{ units}}{60} \times 100 = 50000 \text{ units}$$

3. Profit earned in 1996

Profit = Units sold in 1996 × Contribution per unit – Fixed costs
= 50,000 units × Rs. 12 – Rs. 3,60,000
= Rs. 6,00,000 – Rs. 3,60,000 = Rs. 2,40,000

Fixation of Selling Price in 1997

Variable Cost per unit in 1997 = Rs. 48 + Rs. 4.80 = Rs. 52.80
Fixed cost in 1997 = Rs. 3,60,000 + Rs. 18,000 = Rs. 3,78,000
P/V Ratio in 1996 = 20%

Since P/V ratio is 20%. Hence, Variable cost is 80%

$$\text{Hence, the required selling price} = \frac{\text{Rs. } 52.80}{80\%} = \text{Rs } 66$$

Number of units to be produced and sold in 1997 to earn the same profit as in 1996

Profit in 1996 = Rs. 2,40,000
Fixed cost in 1997 = Rs. 3,78,000
Desired contribution in 1997 = (Rs. 2,40,000 + Rs. 3,78,000)
= Rs. 6,18,000
Contribution per unit in 1997 = Selling price per unit – Variable cost per unit
= Rs. 60 – Rs. 52.80 = Rs. 7.20

$$\text{Number of units to be produced and sold in 1997} = \frac{\text{Fixed cost in 1997}}{\text{Contribution per unit in 1997}}$$

$$= \frac{\text{Rs. } 6,18,000}{\text{Rs. } 7.20} = 85,833 \text{ units.}$$

Example 16.31

A producer installed a machine which can produce product '*A*' as well product '*B*'. Annual maximum machine running capacity is 4000 hours. Cost details about the products are as follows:

	Product A	*Product B*
Selling price per unit	Rs. 50	Rs. 20
Variable cost per unit	Rs. 30	Rs. 12
Machine hours required per unit of product	10 hrs.	2 hrs.
Annual demand	300 Units	1,600 Units

Annual fixed cost: Rs. 10,000.

Calculate optimum product-mix showing annual contribution and profit. Give necessary explanation. Also show that a product-mix other than that suggested by you will affect the profits.

(B.Com. (Hons), Delhi 2005)

Solution:

Calculation of Contribution per hour

	A	*B*
Sales	50	20
Less: Variable Cost	30	12
Contribution	20	8
Machine hours.	10	2
Contribution per machine hour $\left(\frac{\text{Contribution}}{\text{Machine hour}}\right)$	2	4

Since the contribution per machine hour is more in case of product *B*. Hence, product *B*, should be produced in maximum.

Calculation of No. of units to be produced (optimum product mix)

Total machine hours.	4000
Less: Machine hours for *B* (1600 × 2)	3200
Machine Hours for *A*	800

$\therefore$ No. of units of *A* should be $= \frac{800}{10}$

$= 80$ units

No. of units of *B* should be = 1600 units

Calculation of Annual Contribution and Profit

	A	*B*	*Total*
Sales ($A = 80 \times 50$)	4,000	32,000	36,000
($B = 1{,}600 \times 20$)			
Less: Variable Cost			
A 80×30	2,400	19,200	21,600
B $1{,}600 \times 120$			
Contribution	1,600	12,800	14,400
Less: Fixed Cost			10,000
Profit			4,400

Any product mix other than suggested above will reduce the profits as is clear from the following example:

	A	*B*	*Total*
Sales units	100	1,500	1,600
Sales	5,000	30,000	35,000
Less: Variable Cost	3,000	18,000	21,000
Contribution	2,000	12,000	14,000
Less: Fixed Cost Profit			10,000
Profit			4,000

Example 16.32

An exporter of garments is earning a profit of Rs. 1,00,000 on a sale of Rs. 12,00,000. Selling price is Rs. 40 per garment and variable cost is Rs. 30 per garment. The exporter incurs an additional fixed cost of Rs. 3,00,000 on product improvement which also enables him to economise Rs 5 in per garment variable cost. As per trade agreements, the sale of his garments is restricted to the old value of Rs. 12,00,000. What should be the selling price per garment so that the exporter earns the same profit at the same sales value?

(B.Com. (Hons), 2005)

Solution:

$$\text{Units sold} = \frac{\text{Sales}}{\text{Selling Price per unit}} = \frac{\text{Rs.12,00,000}}{\text{Rs. 40}}$$

$$= 30{,}000 \text{ units}$$

Computation of fixed cost before incurring additional fixed cost

	Sales	40	12,00,000
Less:	Variable cost	30	9,00,000
	Contribution	10	3,00,000
Less:	Profits		100,000
	Fixed Cost		200,000

Hence, total fixed cost in the new case

$$= 200{,}000 + \text{Rs. } 300{,}000 = \text{Rs. } 500{,}000$$

Contribution in the New Case = New Fixed Cost + Profits

$$= 5{,}00{,}000 + 1{,}00{,}000 = \text{Rs. } 6{,}00{,}000$$

Since as per agreement the sale value is restricted to the old value that is. Rs. 12,00,000. Hence P/V Ratio will be:

$$= \frac{6,00,000}{12,00,000} \times 100 = 50\%$$

The variable cost in the new case = Rs. 30 – 5 = Rs. 25
Variable Cost Ratio = 100 – P/V Ratio = 100 - 50 = 50%

Computation of New Selling Price:

If VC is 50, then SP = Rs. 100

If VC is 1, then SP = $\frac{100}{50}$

If VC is 25, then SP = $\frac{100}{50} \times 25$ = Rs. 50 per unit

Example 16.33

A factory engaged in manufacturing plastic buckets is working at 40% capacity and produces 10000 buckets per annum. The present cost break-up for one bucket is as under:

Material	Rs. 10
Labour	Rs. 3
Overheads	Rs. 5 (60% fixed)

The selling price is Rs. 20 per bucket. In case it is decided to work the factory at 50% capacity, the selling price falls by 3%. At 90% capacity the selling price falls by 5% accompanied by a similar fall in the price of material.

Calculate the profit at 50% and 90% capacities and also the break-even points for the same capacities.

(B.Com. Delhi, 2004, B.Com. (Hons), Delhi 2007)

Salution:

Statement showing profit and Break-even Point at Different Capacity Lavels

Capacity lavels		*50%*		*90%*
Production (units)		*12,500*		*22,500*
	Per unit	*Total*	*Per unit*	*Total*
(i) Sales	Rs. 19.40	Rs. 2,42,500	Rs. 19.00	Rs. 4,27,500
Variable cost:				
Materials	10.00	1,25,000	9.50	2,13,750
Wages	3.00	37,500	3.00	67,500
Variable overheads	2.00	25,00	2.00	45,000
(ii) Total variable cost	15.00	1,87,500	14.50	3,26,250
(iii) Contribution (i – ii)	4.40	55,000	4.50	1,01,250
(iv) Fixed costs		30,000		30,000
(v) Net profit (iii – iv)		25,000		71,250

Break-even point;	at 50% capacity	at 90% capacity
	$\frac{\text{Fixed Cost}}{\text{Contribution per unit}}$	$\frac{\text{Fixed Cost}}{\text{Contribution per unit}}$
In Units	$\frac{30,000}{4.40}$ = 6,818 units	$\frac{30,000}{4.50}$ = 6,667 units
In Sales value	Rs. 1,32,270	Rs. 1,26,673

Example 16.34

(a) A company has a project to install a new machine exclusively for the manufacture of a new product which is expected to have good demand and reasonably high margin. Maximum possible annual sales may not exceed Rs. 50 lakhs and if there is competition it may fall considerably. The company has obtained quotations and short listed two offers for the new machine. Details in respect of the two models are given below:

	Machine models	
Maximum possible sales per year	Rs. 50 lakhs	Rs. 50 lakhs
Fixed costs per year	5 lakhs	8 lakhs
Estimated profit for maximum sales	15 lakhs	17 lakhs

You are required to calculate:

(i) Break-even sales of each machine.
(ii) Sales at which both models will give the same profit;
(iii) Range of sales over which one model is better than the other.

(b) For the final assembly of a product in an engineering company, a certain component is required. The company has the options either to produce the component itself or purchase it from the market. The production department which can make the component is currently working to full capacity and earning a contribution of Rs. 10 per hour on an order which will last for another ten months. Repeat orders are very likely. Variable cost of making the component is Rs. 42 and it takes one hour per unit. Market price of the component is Rs. 45 per unit.

What advice will you give to the management of the company? *(ICWA, Inter Stage 1, June 2004)*

Solution:

(a) Statement showing parameters of two machines

(Rs. in lakhs)

	Type of machines	*Model M1*	*Model M2*
1.	Maximum possible sales per year	50	50
2.	Fixed costs per year	5	8
3.	Estimated profit for maximum sales	15	17
4.	Total contribution based on max. sales (2 + 3)	20	25
5.	P/V Ratio (Contribution/Sales) (4/1).	0.40	0.50
	(i) Break-even sales FC ÷ P/V	12.50	16.00
	(ii) Sales at which both models will give the same profit [Ref. Working Note 1]	30.00	30.00
	Profit	7.00	7.00

Working Note 1:

Let S be the sales at which profit will be the same for both models.

	M1	*M2*
Sales = $[F + P] + C/S$	$[5 + P]/0.40$	$[8 + P]/0.50$

where, F = fixed costs; P = Profit; C = Contribution; S = Sales.

Accordingly to given expression,

$$\frac{5+P}{0.40} = \frac{8+P}{0.50} = 2.5 + 0.50P = 3.20 + 0.40P = 0.10P = 0.70 = P = 7$$

Substituting,

$$S = \frac{5+7}{0.4} \Rightarrow \frac{8+7}{0.50} \text{ Rs. 30 lakhs}$$

(iii) *RANGE of sales over which one model is better than the other:*
In the light of Supra-Comparative parameters, up to Rs. 30 lakhs annual sales *M*odel *M*1 will be more profitable than Model *M*2, since it (*M*1) has lower Fixed Cost and a lower Break-even Point and, at an annual sale of Rs. 30 lakhs both will have the same profit of Rs. 7 lakhs.
Model *M*2 having higher Fixed Cost and a higher Break-Even Point will be more profitable than Model *M*1 when the annual sale for the product exceeds Rs. 30 lakhs.

(b) If the company makes the component now, the effective cost would be Rs. 52 per unit that is, variable cost of Rs. 42 plus contribution of Rs. 10 foregone for the one hour diverted from current production.

Since it is available at Rs. 45 in the market, purchase from the market may be made. Since repeat orders are very likely, purchase from the market may continue.

If the capacity becomes available in the factory and the market price and variable cost of making continue to be Rs. 45 and Rs. 42 respectively, the component may be made in the company since it is cheapter to make. Similarly if the market price rises above Rs. 52 then also it is cheaper to make the component curtailing current production.

Example 16.35

The comparative profit statement of two quarters of a firm is as under:

	Quarter I	*Quarter II*
Units sold	2,500	3,750
	Rs.	Rs.
Direct materials	87,500	?
Direct wages	62,500	?
Fixed and variable Factory overheads	75,000	95,000
Sales	2,75,000	?
Profit	50,000	66,250

In the second quarter, the direct material price has increased by 20%. There was a saving of Rs. 5,000 in fixed overheads in the second quarter. The other costs and selling price remained the same. Determine the quantity that should have been sold in the second quarter to maintain the same amount of profit per unit as in the first quarter. *(CA Inter, May 2000)*

Solution:

Working Notes:

1. *Direct material, Direct wages, Selling price and Profit per unit*

$$\text{Direct material (p.u)} = \frac{\text{Rs. } 87,500}{2500 \text{ units}} = \text{Rs. } 35$$

$$\text{Direct wages (p.u)} = \frac{\text{Rs. } 62,500}{2500 \text{ units}} = \text{Rs. } 25$$

$$\text{Selling price (p.u)} = \frac{\text{Rs. } 2,75,000}{2500 \text{ units}} = \text{Rs. } 110$$

$$\text{Profit (p.u)} = \frac{\text{Rs. } 50{,}000}{2500 \text{ units}} = \text{Rs. } 20$$

2. *Variable factory overhead per unit and Fixed factory overheads for II Quarter*

$$\text{Variable factory overhead (p.u)} = \frac{\text{Changes in semi-variable overheads}}{\text{Changes in production volume}}$$

$$= \frac{\text{Rs. } 1{,}00{,}000^{**} - \text{Rs. } 75{,}000}{3750 \text{ units} - 2500 \text{ units}}$$

$$= \frac{\text{Rs. } 25{,}000}{1250 \text{ units}} = \text{Rs. } 20/-$$

Fixed factory overheads for II Quarter

	Rs.
Total factory overheads of II quarter	1,00,000
Less: Variable factory overheads (3,750 units × Rs. 20)	75,000
Total fixed factory overheads for II quarter	25,000
Less: Saving of fixed factory overheads	5,000
Net fixed factory overheads for II quarter	20,000

Statement of quantity of units to be sold in second quarter to maintain same amount of profit per unit as in the first Quarter

	Rs	*Rs*
Selling price per unit: (A) *(Refer to Working Note 1)*		110
Variable costs: (per unit):		
Direct materials $\left(\text{Rs. } 35 \times \frac{120}{100}\right)$	42	
Direct wages	25	
Variable factory overheads *(Refer to Working Note 2)*	20	
Total variable cost: (B)		87
Contribution per unit: {(A – D)}		23
Less: Profit per unit *(Refer to Working Note 1)*		20
Balance for fixed cost per unit		3
Total fixed cost		20,000

Hence the number of units to be sold in the second quarter to maintain the same amount of profit p.u. as in the first quarter

$$= \frac{\text{Total fixed cost}}{\text{Balance for fixed cost p.u.}}$$

$$= \frac{\text{Rs. } 20{,}000}{\text{Rs. } 3 \text{ per unit}} = 6667 \text{ units (Approx.)}$$

** In fact the fixed and variable factory overheads during the quarter (II) were Rs. 1,00,000 but due to saving of Rs. 5,000 the balance amount of Rs. 95,000 was paid.

Example 16.36

A Company manufactures a product, currently utilising 80% capacity with a turnover of Rs. 8,00,000 at Rs. 25 per unit. The cost data are as under:

Material cost Rs. 7.50 per unit, Labour cost Rs. 6.25 per unit.

Semi-variable cost (Including variable cost of Rs. 3.75 per unit) Rs. 1,80,000.

Fixed cost Rs. 90,000 upto 80% level of output, beyond this an additional Rs. 20,000 will be incurred.

Calculate:

(i) Activity level at Break-Even-Point

(ii) Number of units to be sold to earn a net income of 8% of sales

(iii) Activity level needed to earn a profit of Rs. 95,000

(iv) What should be the selling price per unit, if break-even-point is to be brought down to 40% activity level? *(C.A. Inter Nov. 2000)*

Solution:

Working Notes:

1. (i) *Number of units sold at 80% capacity*

$$= \frac{\text{Turnover}}{\text{Selling price p.u}} = \frac{\text{Rs. 80,000}}{\text{Rs. 25}} = \text{Rs. 32,000 units}$$

(ii) *Number of units sold at 100% capacity*

$$= \frac{32000 \text{ units}}{80} \times 100 = 40000 \text{ units}$$

2. *Component of fixed cost included in semi-variable cost of 32000 units*

Fixed cost = {Total semi-variable cost – Total variable cost}

= Rs. 1,80,000 – 32,000 units × Rs. 3.75

= Rs. 1,80,000 – Rs. 1,20,000

= Rs. 60,000

3. (i) *Total fixed cost beyond 80% capacity*

= Fixed cost + Component of fixed cost included in semi-variable cost *(Refer to Working Note 2)*

= Rs. 90,000 + Rs. 60,000 = Rs. 1,50,000

(ii) *Total fixed cost beyond 80% capacity*

= Total fixed cost at 80% capacity + Additional fixed cost to be incurred

= Rs. 1,50,000 + Rs. 20,000 = Rs. 1,70,000

4. *Variable cost and contribution per unit*

Variable cost per unit = Material cost + Labour cost + Variable cost component in semi-variable cost

= Rs. 7.50 + Rs. 6.25 + Rs. 3.75 = Rs. 17.50

Contribution per unit = Selling price per unit – Variable cost per unit

= Rs. 25 – Rs. 17.50 = Rs. 7.50

5. *Profit at 80% capacity level*

= Sales revenue – Variable cost – Fixed cost

= Rs. 8,00,000 – Rs. 5,60,000 (32,000 units × Rs. 17.50) – Rs. 1,50,000 = Rs. 90,000

(i) *Activity level at Break – Even-Point*

$$\text{Break-even point (units)} = \frac{\text{Fixed cost}}{\text{Contribution per unit}} = \frac{\text{Rs. 1,50,000}}{\text{Rs. 7.50}} = 20000 \text{ units}$$

(Refer to Working Notes 3 & 4)

$$\text{Activity level at Break-Even-Point} = \frac{\text{Break-Even point (units)}}{\text{No. of units at 100\% capcity level}} \times 100$$

(Refer to Working Note 1(ii))

$$= \frac{20000 \text{ units}}{40000 \text{ units}} \times 100 = 50\%$$

(ii) *Number of units to be sold to earn a net income of 8% of sales*

Let x be the number of units sold to earn a net income of 8% of sales.

Mathematically, it means that:

(Sales revenue of x units) = Variable cost of x units + Fixed cost + Net income

or $\text{Rs. } 25x = \text{Rs. } 17.5x + \text{Rs. } 1,50,000 + \frac{8}{100} \times (\text{Rs. } 25x)$

or $\text{Rs. } 25x = \text{Rs. } 17.5x + \text{Rs. } 1,50,000 + \text{Rs. } 2x$

or $x = (\text{Rs. } 1,50,000 / \text{Rs. } 5.5) \text{ units}$

or $x = 27273 \text{ units.}$

(iii) *Activity level needed to earn a profit of Rs. 95,000*

The profit at 80% capacity level, is Rs. 90,000 which is less than the desired profit of Rs. 95,000. Therefore the needed activity level would be more than 80%. Thus the fixed cost to be taken to determine the activity level needed should be Rs. 1,70,000 *(Refer to Working Note 3(ii))*

$$\text{Units to be sold to earn a profit of Rs. 95,000} = \frac{\text{Fixed cost + Desired profit}}{\text{Contribution per unit}}$$

$$= \frac{\text{Rs. } 1,70,000 + \text{Rs. } 95,000}{\text{Rs. } 7.5}$$

$$= 35333.33 \text{ units}$$

$$\text{Activity level needed to earn a profit of Rs. 95,000} = \frac{35333.33}{40000 \text{ units}} \times 100$$

$$= 88.33\%$$

(iv) *Selling price per unit, if break-even-point is to be brought down to 40% (16000 units) activity level*

Let x be the selling price per unit

Units at Break-even-point $= 16000 \text{ units}$

$$\text{Break-even-point} = \frac{\text{Fixed cost}}{\text{Contribution per unit}}$$

$$\text{At 16000 units} = \frac{\text{Rs. } 1,50,000}{(x - \text{Rs. } 17.50)}$$

or $$(x - \text{Rs. } 17.50) = \frac{\text{Rs. } 1,50,000}{16000 \text{ units}}$$

or $$(x - \text{Rs. } 17.50) = \frac{\text{Rs. } 75}{8 \text{ units}}$$

or	$8x - 8 \times$ Rs. 17.50	= Rs. 75
or	$8x$ – Rs. 140	= Rs. 75
or	$8x$	= Rs. 215
or	x	= Rs. 26.875
	Hence, Selling price (per unit)	= Rs. 26.875

Example 16.37

Fill in the blanks for each of the following independent situations:

	A	*B*	*C*	*D*	*E*
Selling Price per unit	...	Rs. 50	Rs. 20	–	Rs. 30
Variable Cost as % of Selling Price	60	–	75	75	–
No. of units sold	10,000	4,000	–	6,000	5,000
Marginal contribution	Rs. 20,000	Rs. 80,000	–	Rs. 25,000	Rs. 50,000
Fixed Costs	Rs. 12,000		Rs. 1,20,000	Rs. 10,000	–
Profit/Loss	–	Rs. 20,000	Rs. 30,000	–	Rs. 15,000

(CA Inter May 2001)

Solution:

Independent situation	*Blank space to be filled*	*Figure of blank*
A	Profit/(Loss) *[Refer to Working Note 1(i)]*	Rs. 8,000
	Selling price per unit *[Refer to Working Note 1(ii)]*	Rs. 5
B	Fixed costs *[Refer to Working Note 2(i)]*	Rs. 60,000
	Variable cost as % of selling price *[Refer to Working Note 2(ii)]*	60%
C	No. of units sold *[Refer to Working Note 3(ii)]*	30000 units
	Marginal contribution *[Refer to Working Note 3(i)]*	Rs. 1,50,000
D	Selling price per unit *[Refer to Working Note 4(ii)]*	Rs. 16.66
	Profit/(Loss) *[Refer to Working Note 4(i)]*	Rs. 15,000
E	Variable cost as % of selling price *[Refer to Working Note 5(ii)]*	66.66%
	Fixed costs *[Refer to Working Note 5(i)]*	Rs. 35,000

Working Notes:

1. (i) Profit/(Loss) = Contribution – Fixed costs
   = Rs. 20,000 – Rs. 12,000 = Rs. 8,000

   (ii) Let selling price per unit be (x)
   (Selling price per unit – Variable cost per unit) No. of units sold = Marginal contribution

or $\left(x - \frac{3}{5}x\right) \times 10{,}000 \text{ units}$ = Rs. 20,000

or $\frac{2}{5}x$ = Rs. 2

or x = Rs. 5

2. (i) Fixed costs = Marginal contribution – Profit

= Rs. 80,000 – Rs. 20,000 = Rs. 60,000

(ii) Variable Cost as % of selling price

$$= \frac{\text{Selling price per unit} - \text{Marginal contribution per unit}}{\text{Selling price per unit}} \times 100$$

$$= \frac{\text{Rs. } 50 - \text{Rs. } 20}{\text{Rs. } 50} \times 100 = 60\%$$

3 (i) Marginal contribution = Fixed costs + Profit

= Rs. 1,20,000 + Rs. 30,000 = Rs. 1,50,000

(ii) No. of units sold $= \frac{\text{Marginal Contribution}}{\text{Contribution per unit}}$

$$= \frac{\text{Rs. } 1{,}50{,}000}{(\text{Rs. } 20 - \text{Rs. } 15)} = \frac{\text{Rs. } 1{,}50{,}000}{\text{Rs. } 5}$$

= 30000 units

4 (i) Profit/(Loss) = Marginal contribution – Fixed costs

= Rs. 25,000 – Rs. 10,000 = Rs. 15,000

(ii) Selling price per unit (x)

(Selling price per unit – Variable cost per unit) No. of units sold = Marginal contribution

or $\left(x - \frac{3}{4}x\right) 6{,}000 \text{ units}$ = Rs. 25,000

or $\frac{x}{4} \times 6{,}000$ = Rs. 25,000

or x = Rs. 16.66 per unit

5 (i) Fixed costs = Marginal contribution – Profit

= Rs. 50,000 – Rs. 15,000 = Rs. 35,000

(ii) Variable cost per unit = Selling price – Marginal contribution per unit

= (Rs. 30 – Rs. 50,000/5,000)

= Rs. 20

Variable costs as % of selling price $= \frac{\text{Variable cost per unit}}{\text{Selling price per unit}} \times 100$

$$= \frac{\text{Rs. } 20}{\text{Rs. } 30} \times 100 = 66.66$$

Example 16.38

ABC Ltd. which produces three products furnishes the following data for the year 1998.

	Products		
	Alfa	*Beta*	*Gamma*
Selling Price per unit	Rs. 100	75	50
Profit/Volume Ratio	10%	20%	40%
Maximum Sales Potential (units)	40,000	25,000	10,000
Raw Material as % of Variable Cost	50%	50%	50%

The company uses the same raw material for all the three products. Raw material is in short supply and the company has a quota for supply of raw material of the value of Rs. 18,00,000 for the year 1998 for manufacture of its products to meet its sales. Total fixed cost is Rs. 6,80,000.

You are required to:

(a) Determine a sales mix which will give the maximum overall profit keeping in view the short supply of raw material.

(b) Compute the maximum profit.

Solution:

Particulars		*Products*		
		Alfa	*Beta*	*Gamma*
Selling Price per unit	Rs.	100	75	50
Profit Volume Ratio		10%	20%	40%
Contribution per unit	Rs.	10	15	20
Variable Cost per unit	Rs.	90	60	30
Raw Material per unit	Rs.	45	30	15
Contribution per rupee of raw material	=	10/45	15/30	20/15
	=	2/9	1/2	4/3
Ranking		3	2	1

(a) Computation of Sales Mix

Product	*Units* Rs.	*Sales* Rs.	*Raw Material used*
Gamma	10,000	5,00,000	1,50,000
Beta	25,000	18,75,000	7,50,000
Alfa	20,000	20,00,000	9,00,000
Balance	55,000	43,75,000	18,00,000

(b) Computation of Profit

Product	*Sales* Rs.	*P/V Ratio*	*Contribution*
Gamma	5,00,000	40	2,00,000
Beta	18,75,000	20	3,75,000
Alfa	20,00,000	10	2,00,000
			7,75,000
	Less: Fixed Cost		6,80,000
	Net Profit		95,000

Example 16.39

An automobile manufacturing company produces different models of cars .The budget in respect of model 118 for the month of September, 1996 is as under:

Budgeted Output	*(Rs. in lakhs)*	*40,000 units (Rs. in lakhs)*
Net Realisation		700
Variable Costs:		
Materials	264	
Labour	52	
Direct Expenses	124	
Specific Fixed Costs	90	440
Allocated Fixed Costs	112.50	202.50
Total Costs		642.50
Profit		57.50
Sales		700.00

Calculate:

(i) Profit with 10 per cent increase in selling price with a 10 per cent reduction in sales volume.

(ii) Volume to be achieved to maintain the original profit after a 10 per cent rise in material costs, at the originally budgeted selling price per unit. *(C.A. Inter Nov. 1996)*

Solution:

(i) Statement of Profit

(with 10 per cent increase in selling price along with a 10 per cent reduction in sales-volume)

	(Rs. in Lakhs)
Sale Revenue: (A) *(See WN 1)*	693
Less: Variable Costs: (B) *(See WN 2)*	396
Contribution [(A) – (B)]	297
Less: Total Fixed Costs	202.5
Profit	94.5

Working Notes:

1. Selling Price (per unit) $= \frac{\text{Rs. } 7,00,00,000}{40000 \text{ units}}$ = Rs. 1,750

   New Selling Price (per unit) = Rs. 1,750 + Rs. 175 = Rs. 1,925

   Reduced Sales Volume = 36000 units

   Total Sales Revenue = Rs. 1,925 × 36,000 = Rs. 693 lakhs

2. (i) *Variable Costs per Unit*

	Rs.
Materials Cost	= 660
Labour Cost	= 130
Direct Expenses	= 310
Total Variable Cost	= 1,100

(ii) *Volume to be achieved to maintain original profit*

	Rs.	Rs.
Selling Price (per unit) (as per Working Note)		1,750
Less: Variable Costs		
Material Cost (Rs. 660 + Rs. 66)	726	
Labour Cost	130	
Direct Expenses	310	1,166
Contribution per unit		584

Desired Contribution = Fixed Cost + Original Profit

= Rs. 202.50 + Rs. 57.50

= Rs. 260 lakhs

$$\text{No. of cars to be sold to maintain original profit at original sales price} = \frac{\text{Rs. 260 lakhs}}{\text{Rs. 584}}$$

= 44,520.547 or say 44,521 cars.

Example 16.40

(a) A Company had incurred fixed expenses of Rs. 4,50,000, with sales of Rs. 15,00,000 and earned a profit of Rs. 3,00,000 during the first half year. In the second half, it suffered a loss of Rs. 1,50,000.

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.

(b) A company manufactures and markets three products *X*, *Y* and *Z*. All the three products are made from the same set of machines. Production is limited by machine capacity. From the data given below, indicate priorities for Products *X*, *Y* and *Z* with a view to maximising profits:

Particulars		*Products*		
		X	*Y*	*Z*
Raw Material Cost per unit	(Rs.)	11.25	16.25	21.25
Direct Labour Cost per unit	(Rs.)	2.50	2.50	2.50
Other Variable Cost per unit	(Rs.)	1.50	2.25	3.55
Selling Price per unit	(Rs.)	25.00	30.00	35.00
Standard Machine time required per unit in minutes		39	20	28

(C.A. Inter May 1996)

Solution:

(a) (i) *Computation of Profit-Volume Ratio, Break-even Point and Margin of Safety: (for the first half year)*

$$\text{Profit-volume Ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100$$

$$= \frac{\text{Fixed Expenses + Profit}}{\text{Sales}} \times 100$$

$$= \frac{\text{Rs. 4,50,000 + Rs. 3,00,000}}{\text{Rs. 15,00,000}} \times 100$$

$$= 50\%$$

Break-even Point $$= \frac{\text{Fixed Expenses}}{\text{P/V Ratio}}$$

$$= \frac{\text{Rs. 4,50,000}}{50\%}$$

$$= \text{Rs. 9,00,000}$$

Margin of Safety = Actual Sales – Break-even Sales

= Rs. 15,00,000 – Rs. 9,00,000

= Rs. 6,00,000

(ii) *Computation of Expected Sales Volume*

Expected Sales Volume $$= \frac{\text{Fixed Expenses + Loss}}{\text{P/V Ratio}}$$

$$= \frac{\text{Rs. 4,50,000 –Rs. 1,50,000}}{50\%}$$

$$= \text{Rs. 6,00,000}$$

(iii) *Computation of Break-even Point and Margin of Safety (for the whole year)*

Break-even Point $$= \frac{\text{Fixed Expenses for the whole year}}{\text{P/V Ratio}}$$

$$= \frac{\text{Rs 9,00,000}}{50\%} = \text{Rs. 18,00,000}$$

Margin of Safety $$= \frac{\text{Profit for the year}}{\text{P/V Ratio}}$$

$$= \frac{\text{Rs. 3,00,000 – Rs. 1,50,000}}{50\%}$$

$$= \text{Rs. 3,00,000}$$

(b) Statement showing Priorities for Products X, Y and Z to Maximise Profits

Products			*X*	*Y*	*Z*
Selling Price per unit	(Rs.)		25.00	30.00	35.00
Less: Variable Cost per unit (*See working note*)	(Rs.)		15.25	21	27.30
Contribution per unit	(Rs.)	(A)	9.75	9	7.70
Std. Machine time required in minutes per unit		(B)	30	20	28
Contribution per minute	(Rs.)	(A)/(B)	0.25	0.45	0.275
Priorities for Products			III	I	II

Working Note:

Computation of Variable Cost per Unit

Particulars	*Products*		
	X	*Y*	*Z*
	Rs.	Rs.	Rs.
Raw Material Cost	11.25	16.25	21.25
Direct Labour Cost	2.50	2.50	2.50
Other Variable Cost	1.50	2.25	3.55
Total Variable Cost per unit	15.25	21.00	27.30

Example 16.41

A manufacturing company has an installed capacity of 1,20,000 units per annum. The cost structure of the product manufatured is as under:

	Rs.
(i) Variable cost per unit—	
Materials	8
Labour (Subject to a minimum of Rs. 56,000 per month)	8
Overheads	3

(ii) Fixed overheads — Rs. 1,68,750 per annum.

(iii) Semi-variable overheads Rs. 48,000 per annum at 60% capacity, which increase by Rs. 6,000 per annum for increase of every 10% of the capacity utilisation or any part thereof for the year as a whole.

The capacity utilisation for the next year is estimated at 60% for two months, 75% for six months and 80% for the remaining part of the year. If the company is planning to have a profit of 25% on the selling price, calculate the selling price per unit. Assume that there are no opening and closing stocks.

(C.A. Inter Nov. 1997)

Solution:

Statement of Selling Price and Profit

	Rs.
Materials 89,000 units × Rs. 8 per unit (WN 1)	7,12.000
Labour Cost (WN 2)	7,28,000
Variable Overheads (89,000 units × Rs. 3)	2,67,000
Semi-variable overheads (WN 3)	60,000
Fixed Overheads	1,68,750
Total Cost	19,35,750
Add: Profit @ 25% of selling price or $33\frac{1}{3}$% on cost	6,45,250
Total Sales Value	25,81,000
Selling Price per unit (Rs. 25,81,000/89,000 units)	29,00

Working Notes:

1. *Computation of Capacity Utilisation (for the next year):*

60% of capacity for first two months	= 2 months × 6,000 units	= 12,000 units
75% of capacity for next six months	= 6 months × 7,500 units	= 45,000 units
80% of capacity for the remaining four months	= 4 months × 8,000 units	= 32,000 units
Total capacity utilisation		= 89,000 units

$$\text{Capacity utilisation} = \frac{89,000 \text{ units}}{1,20,000 \text{ units}} \times 100 = 74\frac{1}{6}\%$$

2. *Computation of labour cost (subject to a minimum of Rs. 56,000 p.m.)*

	Rs.
Labour Cost of first two months	
12,000 units × Rs. 8 = Rs. 96,000	1,12,000
However Minimum is 56,000 × 2	
Labour cost of next six months	3,60,000
45,000 units × Rs. 8	
Labour cost of last four months	2,56,000
32,000 units × Rs. 8	
Total Labour Cost	7,28,000

3. *Computation of semi-variable overheads (per annum):*

	Rs.
Semi-variable Overheads (at 60% capacity)	48,000
Semi-variable Overheads for additional	
(14 – 1/6% capacity are the same as that for	
20% of the capacity utilisation for the entire year)	12,000
	60,000

Example 16.42

A company has annual fixed costs of Rs. 14,00,000. In 1996 sales amounted to Rs. 60,00,000 as compared with Rs. 45,00,000 in 1995 and profit in 1996 was Rs. 4,20,000 higher than in 1995.

(i) At what level of sales does the company break-even?

(ii) Determine profit or loss on a forecast sales volume of Rs. 80,00,000.

(iii) If there is a reduction in selling price in 1997 by 10% and the company desires to earn the same profit as in 1996, what would be the required sales volume? *(B.Com. (Hons) Delhi 1997)*

Solution:

$$\text{P/V Ratio} = \frac{\text{Increase in Profit}}{\text{Increase in Sales}} \times 100$$

$$= \frac{4,20,000}{15,00,000} \times 100 = 28\%$$

(i) Break-even Sales $= \dfrac{\text{Fixed Cost}}{\text{PV Ratio}}$

$= \dfrac{14,00,000}{28\%}$

$=$ Rs. 50,00,000

(ii) Profit on sales of Rs. 80,00,000

Total Contribution 80,00,000 × 28/100	= 22,40,000
Less: Fixed Cost	14,00,000
Profit	8,40,000

(iii) If Present Selling Price is Rs. 100

Variable Cost is (100 – 28) Rs. 72

New Selling Price (100 – 10) Rs. 90

New Contribution Rs. 18

New P/V Ratio $\dfrac{18}{90} \times 100 = 20\%$

Profit in 1996:

Contribution 60,00,000 × 28/100 =	16,80,000
Less: Fixed Cost	14,00,000
Profit	2,80,000

Sales for Desired Profit of Rs. 2,80,000 $= \dfrac{\text{Fixed Cost + Desired Profit}}{\text{New P/V Ratio}}$

$= \dfrac{14,00,000 + 2,80000}{20\%}$

$= \dfrac{16,80,000}{20\%} =$ Rs. 84,00,000

Example 16.43

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:

Particulars	*(Rs. in '000)*			
	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) Fixed Costs.

(ii) Break-even Sales *(CA Inter Nov. 1996)*

Solution:

Computation of Profit Volume Ratio

(Rs. '000)

	Sales			*Profit*			*P/V Ratio*
	Actual	*Over/ (Under) Budget*	*Budgeted Sales*	*Actual*	*Over/ (Under) Budget*	*Budgeted Profit*	*(Diff. between Profit) (Diff. between Sales)*
North	1,100	(400)	1,500	135	(180)	315	45% (180/400 × 100)
East	1,450	150	1,300	210	90	120	60% (90/150 × 100)
South	1,200	(200)	1,400	330	(110)	440	55% (110/200 × 100)

(i) Computation of Fixed Costs

(Rs. '000)

Particulars	*Actual sales*	*P/V Ratio %*	*Contribution*	*Actual Profit*	*Fixed Cost*
	(1)	*(2)*	*(3) = (1) × (2)*	*(4)*	*(5) = (3) – (4)*
North	1,100	45	495	135	360
East	1,450	60	870	210	660
South	1,200	55	660	330	330
Total	3,750	54	2,025	675	1,350

(ii) Computation of Break-Even Sales

(Rs. ('000)

Particulars	*Fixed Cost*	*P/V Ratio %*	*Break-even Sales*
	(a)	*(b)*	*(a)/(b)*
North	360	45	800
East	660	60	1,100
South	330	55	600
			2,500

Break-even Sales (company as whole): $\frac{\text{Fixed Cost}}{\text{Composite P/V Ratio}} = \frac{1,350}{54} = 2,500$ (in Rs. '000).

Example 16.44

The variable cost structure of a product manufactured by a company during the current year is as under:

	Rs. per unit
Material	120
Labour	30
Overheads	12

The selling price per unit is Rs. 270 and the fixed cost and sales during the current year are Rs. 14 lakhs and Rs. 40.5 lakhs respectively.

During the forthcoming year, the direct workers will be entitled to a wage increase of 10% from the beginning of the year and the material cost, variable overhead and fixed overhead are expected to increase by 7.5%, 5% and 3% respectively.

The following are required to be computed:

(a) New sale price in the forthcoming year if the current P/V ratio is to be maintained.

(b) Number of units that would require to be sold during the forthcoming year so as to yield the same amount of profit in the current year, assuming that selling price per unit will not be increased.

(I.C.W.A. Inter June 1997)

Solution:

Current Year's Statement of Profitability

Units sold 15000

Particulars		*Rs.*	*Total*
Selling Price per unit (Rs.)		270	
Less: Variable Cost per unit:			
Material	120		
Labour	30		
Overheads	12		
		162	
Contribution per unit		108	
Total Contribution (15,000 units × Rs. 108)			16,20,000
Less: Fixed Cost			14,00,000
Profit			2,20,000
P/V Ratio (108/270)			40%

(a) Statement Showing New Selling Price for the Forthcoming Year (Retaining Current Year's P/V Ratio)

Particulars		*Rs.*
(1) Variable Cost per unit:		
Material	129.00	
Labour	33.00	
Overhead	12.60	
		174.60
(2) Selling Price (174.60 × 100/60)		291.00
(3) Contribution (2) – (1)		116.40
(4) P/V Ratio		40%

(b) Computation of Number of Units to be Sold during Forthcoming Year (Maintaining the Current Year's Profit)

Particulars	*Rs.*	*Rs.*
(i) Current Year Profit	2,20,000	
(ii) Revised Fixed Cost	14,42,000	16,62,000
(iii) Required Contribution (Rs. 270 – Rs. 174.60)		95.40
(iv) Number of Units to be sold (16,62,000/95.40)		17,422 units

Solution:

Working Note:

Computation of Variable Cost per Unit

	Current Year	*Forthcoming Year*	
	Rs.	*Increase %*	*Total (Rs.)*
Material	120.00	7.5 (120 × 1.075)	129.00
Labour	30.00	10 (30 × 1.10)	33.00
Overhead	12.00	5 (12 × 1.05)	12.60
	162.00		174.60
Fixed Cost	Rs. 14,00,000	3 (14,00,000 × 1.03)	14,42,000

Example 16.45

A company manufactures a single product with a capacity of 1,50,000 units per annum. The summarised profitability statement for the year is as under:

	Rs.	Rs.
Sales: 1,00,000 units @ Rs. 15 per unit		15,00,000
Cost of Sales:		
Direct Materials	3,00,000	
Direct Labour	2,00,000	
Production Overhead: Variable	60,000	
Fixed	3,00,000	
Administration Overheads (Fixed)	1,50,000	
Selling and Distribution Overheads: Variable	90,000	
Fixed	1,50,000	12,50,000
Profit		2,50,000

You are required to evaluate the following options:

(i) What will be the amount of sales required to earn a target profit of 25% on Sales, if the packing is improved at a cost of Re. 1 per unit?

(ii) There is an offer from a large retailer for purchasing 30,000 units per annum, subject to providing a packing with a different brand name at a cost of Rs. 2 per unit. However, in this case there will be no selling and distribution expenses. Also this will not, in any way, affect the company's existing business. What will be the break-even price for this additional offer?

(iii) If an expenditure of Rs. 3,00,000 is made on advertising, the sales would increase from the present level of 1,00,000 units to 1,20,000 units at a price of Rs. 18 per unit. Will that expenditure be justified?

(iv) If the selling price is reduced by Rs. 2 per unit, there will be 100% capacity utilisation. Will the reduction in selling price be justified? *(C.A. Inter May 2001)*

Solution:

Working Notes:

	Rs.
(1) *Contribution per unit:*	
Selling price per unit: (A)	15.00