

CVP Analysis & Decision Making

BASIC CONCEPTS & FORMULAE

1. Marginal Costing

According to CIMA, Marginal costing is the system in which variable costs are charged to cost units and fixed costs of the period are written off in full against the aggregate contribution.

Marginal costing is not a distinct method of costing like job costing, process costing, operating costing, etc. but a special technique used for marginal decision making. Marginal costing is used to provide a basis for the interpretation of cost data to measure the profitability of different products, processes and cost centre in the course of decision making.

2. Cost-volume-profit analysis

Cost-volume-profit analysis (as the name suggests) is the analysis of three variable viz., cost, volume and profit. Such an analysis explores the relationship existing amongst costs, revenue, activity levels and the resulting profit. It aims at measuring variations of cost with volume. In the profit planning of a business, cost-volume-profit (C-V-P) relationship is the most significant factor.

3. Important Factors in Marginal Costing Decisions

In all recommendations of marginal costing decisions, the following factors are to be considered:

- (i) Whether the product or production line in question makes a contribution.
- (ii) Where a choice is to be made between two courses of action, the additional fixed overhead, if any, should be taken into account.
- (iii) The continuity of demand after expansion or renovation or installation of the sophisticated machine and its impact on the selling price should also be considered.
- (iv) Cost is not the only criterion for decision making. Non-cost factors like the necessity to retain the experienced employees, etc. should also be considered.

4. Pricing Decisions under Special Circumstances

If goods were sold in the normal circumstances under normal business conditions, the

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price would cover the total cost plus a margin of profit. Selling prices are not always determined by the cost of production. They may be determined by market conditions but in the long run they tend to become equal to the cost of production of marginal firm. Therefore, a business cannot continue to sell below the total cost for a long period. Occasionally, a firm may have to sell below the total cost.

*The **problem of pricing** can be summarised under three heads:*

- (i) Pricing in periods of recession,
- (ii) Differential selling prices, and
- (iii) Acceptance of an offer and submission of a tender.

5. **Make or Buy Decision**

Very often management is faced with the problem as to whether a part should be manufactured or it should be purchased from outside market. Under such circumstances two factors are to be considered:

- (a) whether surplus capacity is available, and
- (b) the marginal cost.

6. **Shut Down or Continue Decision**

Very often it becomes necessary for a firm to temporarily close down the factory due to trade recession with a view to reopening it in the future. In such cases, the decision should be based on the marginal cost analysis. If the products are making a contribution towards fixed expenses or in other words if selling price is above the marginal cost, it is preferable to continue because the losses are minimised. By suspending the manufacture, certain fixed expenses can be avoided and certain extra fixed expenses may be incurred depending upon the nature of the industry, say, for example, extra cost incurred in protecting the machinery. So the decision is based on as to whether the contribution is more than the difference between the fixed expenses incurred in normal operation and the fixed expenses incurred when the plant is shut down.

7. **Export V/S Local Sale Decision**

When the firm is catering to the needs of the local market and surplus capacity is still available, it may think of utilising the same to meet export orders at price lower than that prevailing in the local market. This decision is made only when the local sale is earning a profit, i.e., where its fixed expenses have already been recovered by the local sales. In such cases, if the export price is more than the marginal cost, it is preferable to enter the export market. Any reduction in the price prevailing in the local market to fulfil surplus capacity may have adverse effect on the normal local sales.

Dumping in the export market at a lower price will not, however, have any such adverse effect on local sales.

8. Expand or Contract Decision

Whenever a decision is to be taken as to whether the capacity is to be expanded or not, consideration should be given to the following points:

- (a) Additional fixed expenses to be incurred.
- (b) Possible decrease in selling price due to increase in production.
- (c) Whether the demand is sufficient to absorb the increased production.

9. Product Mix Decision

Many times the management has to take a decision whether to produce one product or another instead. Generally decision is made on the basis of contribution of each product. Other things being the same the product which yields the highest contribution is best one to produce. But, if there is shortage or limited supply of certain other resources which may act as a key factor like for example, the machine hours, then the contribution is linked with such a key factor for taking a decision.

10. Price-Mix Decision

When a firm can produce two or more products from the same production facilities and the demand of each product is affected by the change in their prices, the management may have to choose price mix which will give the maximum profit, particularly when the production capacity is limited. In such a situation, the firm should compute all the possible combinations and select a price-mix which yields the maximum profitability.

BASIC FORMULAS

1. Sales-Variable Cost = Contribution = Fixed Cost + Profit
2. $P/V \text{ ratio (or } C/S \text{ ratio)} = \frac{\text{Contribution}}{\text{Sales}}$
 $= \frac{\text{Contribution per unit}}{\text{Selling price per unit}}$
 $= \frac{\text{Change in Contribution}}{\text{Change in Sales}}$
3. Break-even Point: Point where there is no profit or no loss.
 (i) at BEP, Contribution = Fixed Cost
 Thus, Break Even Sales (in sales value) = Fixed Cost $\div$ P/V ratio
4. Margin of safety = Sales – BEP sales
 $= \text{Contribution} / \text{PV ratio} - \text{Fixed cost} / \text{PV ratio}$
 $= \text{Profit} / \text{PV ratio}$

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5. BEP Calculation in different scenario:
- (i) With out limiting factor (non- attributable to a single product)
BEP in units = $\frac{\text{Fixed cost}}{\text{Average contribution p.u.}}$
(when sales mix in units are given)
BEP in ₹ = $\frac{\text{Fixed cost}}{\text{composite p/v ratio}}$
(when sales mix in rupee are given)
where composite p/v ratio = $\sum [\text{Sales Mix} \times \text{P/V Ratio}]$
 - (ii) With limiting factor (attributable to a single product)
Find contribution per limiting factor & give rank. Find total contribution from 1st rank product. Calculate the amount of fixed cost still to recover. Whether it can be recovered by 2nd rank product or not ?
 - (iii) For Perishable product apply the same concept in case of opening stock with different variable cost.
 - e. BEP in case of process costing is expressed in terms of total raw material input
 - f. In capital budgeting, BEP is that sales volume where $\text{Sdiscounted Cash in flow} = \text{Sdiscounted Cash out flow}$. In case of perpetuity, the financing charge p.a.= CIF pa
 - g. Potential BE: On the basis of sales out of current period production only.
 - h. Multiple BE: Different BE due to change in sales price, variable costs & fixed costs for different production level.
 - i. Cash BEP = $\frac{\text{Cash fixed cost}}{\text{contribution p.u.}}$. So do not consider the sunk cost.
 - j. BEP for decision making purpose: Accept that proposal where BEP is lowest provided the profit can not be calculated.
6. Shut down point = $\frac{\text{Total fixed cost} - \text{Shut down costs}}{\text{Contribution per unit}}$

Question 1

Enumerate the limitations of using the marginal costing technique.

Answer

Marginal costing is defined as the ascertainment of marginal cost and of the effect on profit of changes in volume or type of output by differentiating between fixed costs and variable costs. Limitations of Marginal Costing Techniques:

The limitations of using the marginal costing technique are as follows:

1. It is difficult to classify exactly the expenses into fixed and variable category. Most of the expenses are neither totally variable nor wholly fixed.
2. Contribution itself is not a guide unless it is linked with the key factor.
3. 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.
4. 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.
5. Some of the assumptions regarding the behaviour of various costs are not necessarily true in a realistic situation. For example, the assumption that fixed cost will remain static throughout is not correct.

Question 2

Briefly discuss on curvilinear CVP analysis.

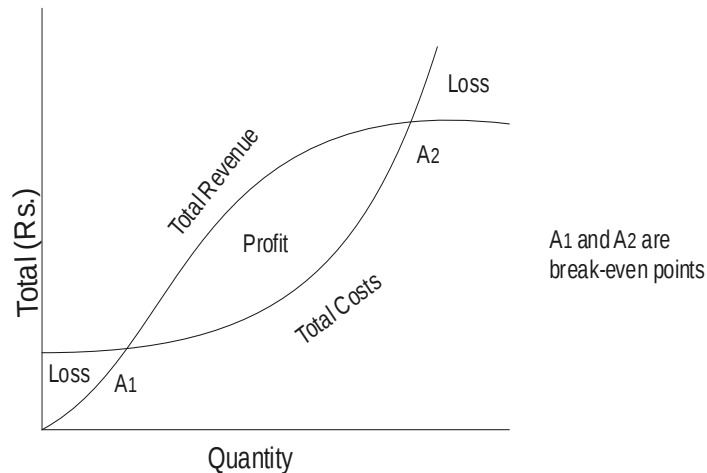
Answer

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

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

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



Question 3

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 the proportion of the numbers of units sold. The budget for 2002, indicates:

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

You are required to advise on the best option among the following, if the company expects that the number of units to be sold would be equal.

- Due to exchange in a manufacturing process, the joint fixed cost would be reduced by 15% and the variables would be increased by $7\frac{1}{2}\%$.
- Price of A could be increased by 20% as it is expected that the price elasticity of demand would be unity over the range of price.
- Simultaneous introduction of both the option, viz, (i) and (ii) above.

Answer

1. Contribution per unit of each product:

	Product	
	A	B
	₹	₹
Contribution per unit (Sales × P/V ratio)	80 (₹200 × 40%)	60 (₹120 × 50%)

2. Number of units to be sold:

We know that:

Total contribution – Fixed cost = Profit

Let x be the number of units of each product sold, therefore:

$$(80x + 60x) - ₹15,00,000 = ₹1,50,000 + ₹30,000$$

$$\text{or } x = 12,000 \text{ units}$$

- (i) *Option:* Increase in profit when due to change in a manufacturing process there is reduction in joint fixed cost and increase in variable costs.

		₹
Revised contribution from 12,000 units of A due to 7.5% increase in variable cost (12,000 units (₹200 – ₹129))		8,52,000
Revised contribution from 12,000 units of B due to 7.5% increase in variable cost 12,000 units (₹120 – ₹64.50)		6,66,000
Total revised contribution	15,18,000	
Less: Fixed cost (₹15,00,000 – 15% × ₹15,00,000)	12,75,000	
Revised Profit	2,43,000	
Less: Existing profit	1,80,000	
Increase in profit	63,000	

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- (ii) Option: Increase in profit when the price of product A increased by 20% and the price elasticity of its demand would be unity over the range of price.

	₹
Budgeted revenue from Product A (12,000 units × ₹200)	24,00,000
Revised demand (in units) (₹24,00,000 / ₹240)	10,000
Revised contribution (in ₹) [10,000 units × (₹240 – ₹120)]	12,00,000
Less: Existing contribution (12,000 units × ₹80)	9,60,000
Increase in profit (contribution)	2,40,000

*Note: Since price elasticity of demand is 1, therefore the revenue in respect of products will remain same.

- (iii) Option: Increase in profit on the simultaneous introduction of above two options

	₹
Revised contribution from Product A [10,000 units (₹240 – ₹129)]	11,10,000
Revised contribution from Product B [12,000 units (₹120 – ₹64.50)]	6,66,000
Total revised contribution	17,76,000
Less: Revised fixed cost	12,75,000
Revised profit	5,01,000
Less: Existing profit	1,80,000
Increase in profit	3,21,000

Advise: A comparison of increase in profit figures under above three options clearly indicates that the option (iii) is the best as it increases the profit of the concern by ₹3,21,000.

Note: The budgeted profit/(loss) for 2002 in respect of products A and B should be ₹2,10,000 and (₹30,000) respectively instead of ₹1,50,000 and ₹30,000.

Question 4

“Use of absorption costing method for the valuation of finished goods inventory provides incentive for over-production.” Elucidate the statement.

Answer

When absorption costing method is used, production fixed overheads are charged to products and are included in product costs. Consequently, the closing stocks are valued on total cost (including fixed overheads) basis. The net effect is that the charge of fixed overheads to P/L account gets reduced, if the closing stock is greater than the opening stock. This situation has the effect of inflating the profit for the period.

Where stock levels are likely to fluctuate significantly, profits may be distorted if calculated on absorption costing basis. If marginal costing is used, since the fixed costs are charged off to P/L account as period cost, such a situation will not arise. The impact of using absorption costing on profits can be summarised as under:

- When sales are equal to production, profits will be the same under absorption costing and marginal costing.
- If production is higher than sales, the absorption costing will post higher profits than marginal costing.
- If sales are in excess of production, absorption costing will show lower profits than marginal costing.

Since profit calculation in absorption costing can produce strange result, the managers may deliberately alter the stock levels to influence the profits if absorption costing is used. Hence, it is true to say that if absorption costing method is used managers have the incentive to over produce to show better result.

Question 5

A Pharmaceutical company produces formulations having a shelf life of one year. The company has an opening stock of 30,000 boxes on 1st January, 2005 and expected to produce 1, 30,000 boxes as was in the just ended year of 2004. Expected sale would be 1,50,000 boxes. Costing department has worked out escalation in cost by 25% on variable cost and 10% on fixed cost. Fixed cost for the year 2004 is ₹40 per unit. New price announced for 2005 is ₹100 per box. Variable cost on opening stock is ₹40 per box. You are required to compute breakeven volume for the year 2005.

Answer

Shelf life is one year hence opening stock of 30,000 boxes is to be sold first. Contribution on these boxes is $30,000(100 - 40) = ₹18,00,000$.

In the question production of 2004 is same as in 2005. Hence fixed cost for the year 2004 is ₹ 52, 00,000 (1, 30,000×40). Therefore fixed cost for the year 2005 is ₹57, 20,000 (52, 00,000 + 10% of 52, 00,000).

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Variable Cost for the year 2005 (₹40 + 25% of ₹40) = ₹50 per Unit

Hence Contribution per unit during 2005 is ₹50 (100 – 50)

Break even volume is the volume to meet the fixed cost i.e. fixed cost equals to contribution. Therefore, remaining fixed cost of ₹39, 20,000 (57, 20,000 – 18, 00,000) to be recovered from production during 2005.

Production in 2005 to reach BEP = 3920000 / 50 = 78,400 units

Therefore BEP for the year 2005 is 1, 08,400 boxes (30000 + 78400)

Question 6

Jay Kay Limited is a single product manufacturing company. The following information relates to the months of May and June, 2003:

		May	June
		₹	₹
(i)	Budgeted Costs and Selling prices:		
	Variable manufacturing cost per unit	2.00	2.20
	Total fixed manufacturing cost (based on budgeted output of 25,000 units per month)	40,000	44,000
	Total fixed marketing cost	14,000	15,400
	Selling price per unit	5.00	5.50
(ii)	Actual production and sales:		
		Units	Units
	Production	24,000	24,000
	Sales	21,000	26,500

(iii) There was no stock of finished goods at the beginning of May, 2003. There was no wastage or loss of finished goods during May or June, 2003.

(iv) Actual costs incurred corresponded to those budgeted for each month.

You are required to calculate the relative effects on the monthly operating profits of applying:

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

Answer

(a) Quantity tally:

		May 2003	June 2003
Opening Stock	units	-	3,000
Production	units	24,000	24,000
Total	units	24,000	27,000

Sales	units	21,000	26,500
Closing Stock	units	3,000	500
Fixed manufacturing overheads	₹	40,000	44,000
Budgeted output	units	25,000	25,000
Fixed overheads absorption rate per unit	₹	1.60	1.76

(i) Profitability based on absorption costing:

	May 2003	June 2003
	₹	₹
Sales:		
May: 21,000 units @ ₹ 5.00	1,05,000	
June: 26,500 units @ ₹ 5.50		1,45,750
Production Costs:		
Variable: May 24,000 units @ ₹ 2.00	48,000	
June 24,000 units @ ₹ 2.20		52,800
Fixed: May 24,000 units @ ₹ 1.60	38,400	
June 24,000 units @ ₹ 1.76		42,240
Total production costs	86,400	95,040
Add: Opening stock		
May Nil		
June 3,000 units @ ₹ 3.60*		10,800
Total	86,400	1,05,840
Less: Closing stock		
May 3,000 units @ ₹ 3.60*	10,800	
June 500 units @ ₹ 3.96*		1,980
Production cost of goods sold	75,600	1,03,860
Marketing fixed costs	14,000	15,400
Total cost of goods sold	<u>89,600</u>	<u>1,19,260</u>
Profit (Sales – COGS)	15,400	26,490
Budgeted output 25,000 units		
Actual output 24,000 units		
Shortfall 1,000 units		
Under recovery of fixed overheads		
May 1,000 units @ ₹ 1.60	1,600	
June 1,000 units @ ₹ 1.76		1,760
Net profit	<u>13,800</u>	<u>24,730</u>

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*Total cost = VC + FC

May $2.00 + 1.60 = 3.60$

June $2.20 + 1.76 = 3.96$

(ii) Profitability based on marginal costing:

	May 2003	June 2003
	₹	₹
Sales	1,05,000	1,45,750
Production cost – variable	48,000	52,800
Add: Opening stock		
May Nil		
June 3,000 units @ ₹ 2.00		<u>6,000</u>
Total	48,000	58,800
Less: Closing stock		
May 3,000 units @ ₹ 2.00	6,000	
June 500 units @ ₹ 2.20		1,100
Variable cost of goods sold	42,000	57,700
Contribution	63,000	88,050
Fixed costs:		
Production	40,000	44,000
Marketing	14,000	15,400
Net profit	9,000	28,650

Question 7

X Ltd. manufactures a semiconductor for which the cost and price structure is given below:

	₹ per unit
Selling price	500
Direct material	150
Direct labour	100
Variable overhead	50
Fixed cost = ₹ 2 lakhs.	

The product is manufactured by a machine, whose spare part costing ₹ 2,000 needs replacement after every 100 pieces of output. This is in addition to the above costs. Assume that no defectives are produced and that the spare part is readily available in the market at all times at ₹ 2,000.

- (i) Prepare the profitability statement for production levels of 2,000 units and 3,000 units, when fixed cost = ₹1 lakhs.
- (ii) What is the break-even point (BEP) for the above data?
- (iii) Comment on the BEP, if the fixed cost can be reduced to ₹1,80,000 from the existing level of 2 lakhs.

Answer**(i) X Ltd. Profitability Statement:**

Particulars	Volume Level	
	2000 units	3000 units
	₹'000	
Sales	1,000	1,500
Variable costs		
Direct Material	300	450
Direct Labour	200	300
Variable overhead	100	150
Part costs*	40	60
Fixed cost	100	100
Total cost	740	1,060
Profit	260	440

$$\text{*Part cost: } \frac{2,000}{100} \times 2,000 = 40,000 \quad \frac{3,000}{100} \times 60,000 = 2,000$$

- (ii) **For computing the BEP:** Parts cost although a step fixed cost can be considered as variable for the limited purpose of computing the range in which BEP occurs. The variable parts cost per unit is ₹ 20 $\frac{2,00,000}{100}$

$$\text{Range in which the BEP occur} \quad \frac{1,00,000}{(200 - 20)} = 555.55 \quad \frac{2,00,000}{(200 - 20)} = 1,111.11$$

$$\text{Range} \quad 501- 600 \quad 1,101- 1,200$$

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General Fixed Cost	1,00,000*	2,00,000
Parts cost	(6 ´ 2,000) = 12,000	(12 ´ 2,000) = 24,000
Total Fixed Cost	1,12,000	2,24,000
Gross Contribution/unit**	200	200
BEP	560 units	1,120 units

**Gross Contribution per unit

Sales – Direct Material – Direct Labour – Variable Overheads

₹ 500 – ₹ 150 – ₹ 100 – ₹ 50 = ₹ 200

- (iii) When fixed cost is ₹ 1,80,000. Range of BEP will be $\frac{1,80,000}{180} = 1,000$ (901 - 1,000)

Since the BEP of 1,000 falls on the upper most limits in the range 901 – 1,000 there will be one more BEP in the subsequent range in 1,001 – 1,100.

Range	901 – 1,000	1,001 – 1,100
	₹	₹
Gross fixed cost	1,80,000	1,80,000
Parts cost	20,000	22,000
	10 ´ 2,000	11 ´ 2,000
Total fixed cost	2,00,000	2,02,000
Gross contribution/unit	200	200
BEP	1,000 units	1,010 units

Question 8

A company has produced 1,500 units against a budgeted quantity of 2,000 units. Actual sales were 1,300 units. The company's policy is to value stocks at standard absorption cost.

Other data are:

Direct material	₹ 100 per unit
Direct labour	₹ 100 per unit at normal efficiency
Variable OH	₹ 50 per unit
Fixed OH at budgeted capacity	₹ 1,00,000
Variable selling OH	₹ 26,000

Budgeted fixed selling OH	₹ 30,000
Actual fixed selling OH	₹ 25,000
Selling price	₹ 400 per unit

There was no opening stock.

- (i) Present the profitability statement under absorption costing system.
- (ii) Assuming actual labour was 25% below normal efficiency and that 100 units of production had to be scrapped after complete manufacture, compute the actual profit or loss.
- (iii) Reconcile the profits under (i) and (ii) above.

Answer

(i & ii) Profitability under absorption costing system Actual profit and loss account

Particulars	₹ 000's	Particulars	₹ 000's
Sales (1,300 ÷ 400)	520	Sales (1,300 ÷ 400)	520
Absorption costs		Closing Stock (100 ÷ 300)	30
Opening Stock	Nil	Total	550
Cost of production		Cost	
1,500 units ÷ 300	450	Direct materials (1,500 ÷ 100)	150
Less: Closing stock (200 ÷ 300)	60	Direct labour	200
		(1,500 ÷ 100/75%)	
Net Absorption costs	390	Variable overhead	75
		(1,500 ÷ 50)	
Add: Under-absorption	25	Fixed manufacturing	100
(500 ÷ 50)		overhead	
Total absorption costs	415	Fixed Selling overhead	25
Gross profit	105	Variable selling overhead	26
Less: Selling overhead variable	26	Total costs	576
Selling overhead fixed	25		
Profit/(loss)	54	Profit / (Loss)	(26)

Working Notes:

	₹		Units
Absorption cost per unit		Budgeted capacity	2,000

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Direct materials	100	Production	1,500
Direct labour	100	Under-absorption	500
Variable overhead	50	Sales	1,300
Fixed Overhead (1,00,000 / 2,000)	50	Closing stock	200
Total	300		

(iii) Reconciliation

	₹ 000's
Profit under absorption costing	54
Less: Labour inefficiency**	(50)
Less: Value of units scrapped	(30)
Actual profit / (loss)	(26)

** $(1,500 \times (133 \frac{1}{3} - 100))$

Note: In case budgeted fixed selling overheads are considered while arriving at absorption profit a saving of ₹ 5,000 shall need to be identified as part of reconciliation.

Question 9

The following information of a company is available for the year 2006:

	₹
Sales	40,000
Raw materials	20,000
Direct wages	6,000
Variable and fixed OH	10,000
Profit	4,000
Units sold	200 Nos.

In the year 2007, wages rate will increase by 50% and fixed cost will decrease by ₹ 600. If 300 units are sold in 2007, the total fixed and variable OH will be 11,400. How many units should be sold in 2007, so that the same amount of profit per unit as in year 2006 may be earned?

Answer

Particulars (Data per unit)	2006	2007
	₹	₹
Selling price (40,000 / 200)		200

Raw materials (20,000 /200)		100
Direct wages (6,000 /200)	30	(30 ´ 150%) 45
Variable overhead		20
Total variable cost		165
Contribution		35
Profit per unit (4,000 /200)		20
Net contribution per unit to cover fixed overheads		15
Fixed overheads	6,000	5,400
No. of units		5,400/15 = 360 units

Working Notes:

No. of units sold	200	300
Total variable and fixed overheads	10,000	11,400 + 600 = 12,000
Differential cost in 2007		100 units ₹ 2,000
Variable overhead per unit		2,000 / 100 = 20
Total variable cost	4,000	6,000
Total fixed cost	6,000	(6,000 – 600) 5,400

Question 10

A company makes 1,500 units of a product for which the profitability statement is given below:

			₹
Sales			1,20,000
Direct materials	30,000		
Direct labour	36,000		
Variable OH	<u>15,000</u>		
Subtotal variable cost		81,000	
Fixed cost		<u>16,800</u>	
Total cost			<u>97,800</u>
Profit			<u>22,200</u>

After the first 500 units of production, the company has to pay a premium of ₹ 6 per unit towards overtime labour. The premium so paid has been included in the direct labour cost of ₹ 36,000 given above.

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You are required to compute the Break-even point.

Answer

Data / Unit	1 – 500 ₹	501 – 1,500 ₹
Sales (1,20,000 / 1,500)	80	80
Direct material (20,000 / 1,000)	20	20
Direct labour	20	26
Variable overheads 15,000 / 1,500	10	10
Contribution	30	24
No. of units	500	
Total contribution	15,000	
Fixed costs	16,800	
Shortfall	1,800	
No. of units required above 500 to recover shortfall		$1,800 / 24 = 75$
Break even point		$(500 + 75) = 575$ units

Let X be the Direct Labour per unit upto 500 units.

Total Direct Labour $500X + 1,000 (X + 6) = 36,000$

$$1,500X + 6,000 = 36,000$$

$$X = 20.$$

Therefore, up to 500 units the Direct Labour is ₹ 20. After 500 units it is ₹ 26.

Question 11

A Ltd. Makes and sells a single product. The company's trading results for the year are:

	Figs. – ₹'000 (Year 2007)	
Sales		3,000
Direct materials	900	
Direct labour	600	
Overheads	<u>900</u>	<u>2,400</u>
Profits		<u>600</u>

For the year 2008, the following are expected:

- (i) Reduction in the selling price by 10%.
- (ii) Increase in the quantity sold by 50%.
- (iii) Inflation of direct material cost by 8%.
- (iv) Price inflation in variable overhead by 6%.
- (v) Reduction of fixed overhead expenses by 25%.

It is also known that:

- (a) In 2006, overhead expenditure totalled to ₹8,00,000.
- (b) Total overhead cost inflation for 2007 has been 5% more than 2006.
- (c) Production and sales volumes have been 25% higher in 2007 than in 2006.

The high-low method is being used by the company to estimate overhead expenditure.

You are required to:

- (i) Prepare a statement showing the estimated trading results for 2008.
- (ii) Calculate the Break-even point for 2007 and 2008.
- (iii) Comment on the BEP and profits of the years 2007 and 2008.

Answer

(a) (i) Trading Results

				Figures ₹'000
	2006	2007	2008	Workings
Sales:		3,000	4,050	(3,000 × 1.5 × .9)
			(Refer to Note 1)	
Direct Material		900	1,458	(900 × 1.5 × 1.08)
Direct Labour		600	900	(600 × 1.5 × 1)
Variable Overhead		<u>300*</u>	<u>477</u>	(300 × 1.06 × 1.5)
		(Refer Note 2)		
Total Variable Cost		<u>1,800</u>	<u>2,835</u>	Total variable cost
Contribution		1,200	1,215	
Fixed Overhead		600	450	(600 × .75)
		(Refer to Note 3)		
Total Overhead	800	<u>900</u>	<u>927</u>	

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Total Cost		2,400	3,285	
Profits		600	765	

(ii) P/V Ratio Contribution/ Sales 40% 30%

$$\text{BEP Fixed Cost/PV Ratio} \frac{600}{40\%} = 1,500 \quad \frac{450}{30\%} = 1,500$$

(Note 1) 3,000 × 1.5 × 0.9

(Note 2) Overhead Cost in 2006 = 800

Increase in price = 5%

∴ Overhead cost for same production 800 × 5% + 800 = 840.

Overhead increase due to quantity = 900 – 840 = ₹ 60

₹ 60 represents increase in variable Overhead in 2007 due to increase in quantity by 25%.

∴ Variable Overhead amount in 2007 = $1\frac{1}{4}$ times

$$\text{i.e. } \frac{5}{4} = 5 \text{ times } \frac{1}{4} \text{ th quantity } \frac{60}{4} = 5 \times 60 = 300$$

(Note 3)

In 2007 Total Overhead	900
Variable Overhead (Refer to Note 2)	<u>300</u>
Fixed Overhead	<u>600</u>

(iii)

	2007	2008	Difference	%
BEP	1,500	1,500	0	
Fixed Overhead	600	450	150	25%
PV Ratio	40%	30%	10%	25% $\frac{10}{40}$
Profit	600	765	165	27.5%

$$\text{BEP} = \frac{\text{Fixed Cost}}{\text{P/V ratio}}$$

Both Fixed Cost and P/V ratio have declined by 25% equally. So BEP sales remains the same.

The contribution is only ₹ 1,215 in 2008 though quantity is increased by 50%. This is due to increase in production cost and decrease in selling price. This is more than made up by decrease in fixed cost so that overall profit has increased by 27.5%.

Alternative Solution (for identifying variability and fixedness of overheads):

$V_1 q_1$ = Variable Overhead / unit in 2007 × quantity in 2007

$V_2 q_2$ = Variable Overhead / unit in 2008 × quantity in 2008

$$V_2 q_2 = V_1 (1.06) (1.5) q_1 = 1.59 V_1 q_1$$

$$V_0 q_0 + F_0 = 800$$

$$V_1 q_0 + F_0 = \underline{840} \text{ where } q_0 \times 1.25 = q_1$$

$$V_1 q_0 - V_0 q_0 = 40$$

$$V_0 q_0 = V_1 q_0 - 40$$

$$V_1 q_0 + F_1 - (V_0 q_0 + F_0) = \frac{5}{100} \times 800 = 40$$

$$\text{i.e. } V_1 q_0 + F_1 = 840$$

$$V_1 q_1 + F_1 = \underline{900}$$

$$V_1 (q_0 - q_1) = -60$$

$$V_1 (q_1 - 1.25 q_0) = -60 \times 1.25$$

$$V_1 (-.25) q_1 = -75$$

$$V_1 q_1 = \frac{-75}{-.25} = 300$$

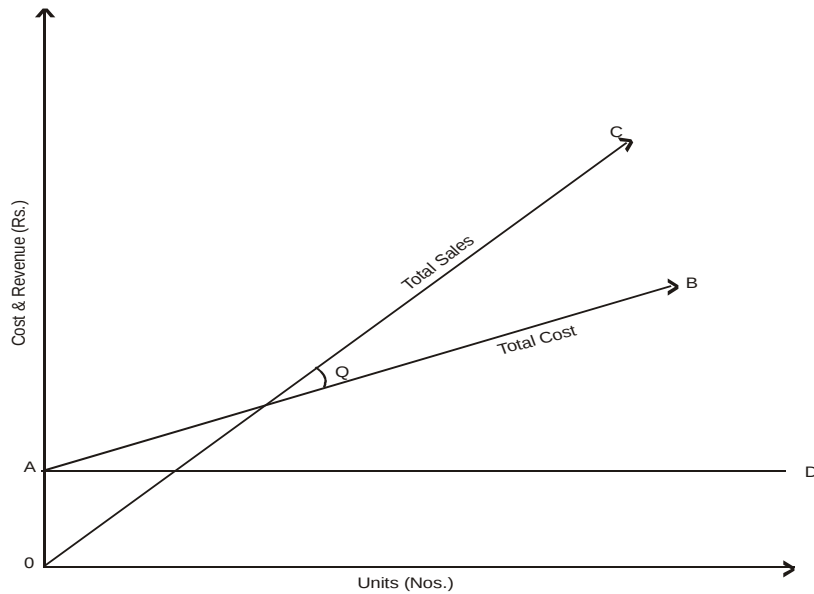
Year 2007	Variable Overhead	300
	Fixed Overhead	<u>600</u>
		900

Question 12

Draw and explain the angle of incidence in a break-even chart. What is its significance to the management?

Answer

(c)



Angle of incidence (Q) is the angle between the total cost line and the total sales line.

If the angle is large, the firm is said to make profits at a high rate and vice-versa.

A high angle of incidence and a high margin of safety indicate sound business conditions.

Question 13

A single product manufacturing company has an installed capacity of 3,00,000 units per annum. The normal capacity utilization of the company is 90%. The company has prepared the following budget for a year:

Variable costs:

Factory costs	₹ 33 per unit
---------------	---------------

Selling and Administration costs	₹ 9 per unit
----------------------------------	--------------

Fixed costs:

Factory costs	₹ 21,60,000
---------------	-------------

Selling and Administration costs	₹ 7,56,000
----------------------------------	------------

Selling Price

Selling price per unit	₹ 60
------------------------	------

The actual production, sales, price and cost data relating to the year under review are as given below:

Production	2,40,000 units
Sales	2,25,000 units
Finished goods stock in the beginning of the year:	15,000 units
Actual factory variable costs exceeded the budget by	₹ 1,20,000

Required:

- Calculate the budgeted profit and break-even point in units.
- What increase in selling price was necessary during the year under review to maintain the budgeted profit?
- Prepare statements showing the actual profit during the year under review by using (1) absorption costing method and (2) marginal costing method.

Answer

- Contribution per unit:**

	₹	₹
Selling price per unit		60
Variable costs per unit:		
Factory	33	
Selling & Administration	<u>9</u>	<u>42</u>
Contribution per unit (Selling price – Variable cost)		<u>18</u>

Budgeted Profit:

	Units	₹	₹
Installed capacity	3,00,000		
Normal capacity utilization (3,00,000 × 90%)	2,70,000		
Total contribution (A) (Contribution per unit × Normal capacity utilization) (2,70,000 × 18)			48,60,000
Fixed Costs (B)			
Factory Costs		21,60,000	
Selling and Administration costs		<u>7,56,000</u>	<u>29,16,000</u>
Profit (A – B)			<u>19,44,000</u>

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$$\text{Break - even point (in units)} = \frac{\text{Fixed costs}}{\text{Contribution per unit}} = \frac{29,16,000}{18} = 1,62,000.$$

(ii) 1.	Actual variable costs per unit	₹	₹
	Budgeted factory costs	33	
	Increase in Factory costs per unit		
	$\frac{₹ 1,20,000}{2,40,000}$	<u>0.50</u>	33.50
	Selling and Administration costs		<u>9.00</u>
			<u>42.50</u>

2. Selling price required to maintain the budgeted profit:

A. Total contribution required (₹)	48,60,000
B. Actual production (units)	2,40,000
C. Contribution desired per unit (A ÷ B) (₹)	20.25
D. Variable cost per unit (₹)	42.50
E. Selling price required to maintain budgeted profit (C + D) (₹)	62.75
F. Increase in selling price necessary ₹ (62.75 – 60)	2.75

(iii) **Fixed overhead recovery rate:**

Fixed factory overheads	₹ 21,60,000
Normal Production	2,70,000 units
Absorption Rate per unit : 21,60,000 / 2,70,000 = ₹ 8	

Stock analysis:

	Units
Opening stocks	15,000
Add: Production	2,40,000
Total	2,55,000
Less: Sales	2,25,000
Closing stocks	30,000

1. Profitability based on Absorption Costing Method:

		₹	₹
A.	Sales (2,25,000 units @ ₹ 60)		<u>1,35,00,000</u>
B.	Production costs:		
	Variable factory cost:(2,40,000 units ´ ₹ 33)	79,20,000	
	Increase in cost	1,20,000	
	Fixed factory costs (2,40,000 units ´ ₹ 8)	<u>19,20,000</u>	
	Total production costs	99,60,000	
	Less: Closing stock		
	(30,000 units ´ 99,60,000) / 2,40,000	<u>12,45,000</u>	
		87,15,000	
	Add: Opening stock 15,000 units ´ ₹ 41*	<u>6,15,000</u>	
	Production cost of goods sold		93,30,000
C.	Selling and Administration Costs:		
	Variable costs: 2,25,000 units ´ ₹ 9	20,25,000	
	Fixed Costs	<u>7,56,000</u>	<u>27,81,000</u>
D.	Less: Total cost of goods sold (B + C)		<u>1,21,11,000</u>
			13,89,000
	Less: Under absorption of factory fixed overheads		
	(2,40,000 – 2,70,000 units) ´ ₹ 8		<u>2,40,000</u>
	Profit		<u>11,49,000</u>

Cost of opening stock (per unit) = Variable Factory cost + Fixed overhead recovery rate

= ₹ 33 per unit + ₹ 8 per unit = ₹ 41 per unit.

Profitability based on Marginal Costing Method:

		₹	₹
A	Sales (2,25,000 units @ ₹ 60)		<u>1,35,00,000</u>
	Production variable costs:		
	Variable cost (2,40,000 units ´ ₹ 33)	79,20,000	
	Increase in cost	<u>1,20,000</u>	
	Total	80,40,000	

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Less: Closing stock:		
(30,000 ´ 80,40,000) / 2,40,000	<u>10,05,000</u>	
	70,35,000	
Add: Opening Stock (15,000 units ´ ₹ 33)	<u>4,95,000</u>	
B Production variable cost of goods sold	75,30,000	
C Variable Selling & Administrative Expenses (2,25,000 ´ ₹ 9)	20,25,000	
D Total variable costs (B + C)		<u>95,55,000</u>
E Contribution (A - D)		39,45,000
F Less: Fixed overheads: Factory	21,60,000	
Selling & Administration	<u>7,56,000</u>	<u>29,16,000</u>
G Profit (E - F)		<u>10,29,000</u>

Question 14

Paints Ltd. manufactures 2,00,000 tins of paint at normal capacity. It incurs the following manufacturing costs per unit:

	₹
Direct material	7.80
Direct labour	2.10
Variable overhead	2.50
Fixed overhead	<u>4.00</u>
Production cost / unit	<u>16.40</u>

Each unit is sold for ₹ 21, with an additional variable selling overhead incurred at ₹ 0.60 per unit.

During the next quarter, only 10,000 units can be produced and sold. Management plans to shut down the plant estimating that the fixed manufacturing cost can be reduced to ₹ 74,000 for the quarter.

When the plant is operating, the fixed overheads are incurred at a uniform rate throughout the year. Additional costs of plant shut down for the quarter are estimated at ₹ 14,000.

You are required:

- To advise whether it is more economical to shut down the plant during the quarter rather than operate the plant.

(ii) Calculate the shut down point for the quarter in terms of numbering units.

Answer

Contribution per tin = Selling Price – Variable cost

$$= 21 - (7.8 + 2.1 + 2.5 + 0.6) = ₹ 8 \text{ per tin.}$$

Loss on operation:

Fixed cost per annum = 2,00,000 units ÷ 4 per unit = 8 lakhs.

$$\therefore \text{Fixed cost for 1 quarter} = \frac{8}{4} = 2 \text{ lakhs}$$

	₹
Fixed cost for the quarter	2,00,000
Less: Contribution on operation (8 ÷ 10,000)	<u>80,000</u>
Expected loss on operation	<u>(1,20,000)</u>

Loss on shut down:

	₹
Unavoidable Fixed Cost	74,000
Additional shut down cost	<u>14,000</u>
Loss on shut-down	<u>(88,000)</u>

Conclusion: Better to shut down and save ₹ 32,000.

$$\begin{aligned} \text{Shut-down point (number of units)} &= \frac{\text{Avoidable Fixed Cost}}{\text{Contribution per unit}} = \frac{2,00,000 - 88,000}{8} \\ &= \frac{1,12,000}{8} = 14,000 \text{ units.} \end{aligned}$$

Question 15

TQM Limited makes engines for motor cars for its parent company and for two other motor car manufacturers.

On 31st December, the company has sufficient work order for January and one further order for 21,000 engines. Due to recession in the economy, no further order are expected until May when it is hoped economic prospect for the motor car industry will have improved. Recently factory has been working at only 75% of full capacity and the order for 21,000 engines represents about one month production at this level of activity.

The board of directors are currently considering following two options:

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- (i) Complete the order in February and close the factory in March and April.

OR

- (ii) Operate at 25 per cent of full capacity for each of three months of February, March and April.

The costs per month at different levels of activities are as follows:

	At 75% (₹)	At 25% (₹)	Idle (₹)
Direct Material	5,25,000	1,75,000	--
Direct Labour	5,23,600	1,73,250	--
Factory overhead:			
Indirect material	8,400	4,900	4,900
Indirect labour	1,01,500	59,500	--
Indirect expenses:			
Repairs and maintenance	28,000	28,000	--
Others expenses	52,500	34,300	26,600
Office overheads:			
Staff salaries	1,48,400	98,000	67,550
Other overheads	28,000	19,950	11,200

Other information is as follows:

- Material cost and labour cost will not be incurred where there is no production.
- On the reopening of the factory, one time cost of training and engagement of new personnel would be ₹65,800 and overhauling cost of plant would be ₹14,000.
- Parent company can purchase engines from open market at reasonable price.

Required:

- (i) To express your opinion, along with calculations, as to whether the plant should be shut down during the month of March and April or operate 25% of full capacity for three months.
- (ii) To list and comment on cost and non-costs factors which might be relevant to the discussion.

Answer

- (i)

	Option I At 75% in Feb and close in March and April (₹)	Option II At 25% each from Feb – April (₹)
Direct Material	5,25,000	5,25,000

Direct Labour	5,23,600	5,19,750
	10,48,600	10,44,750
Factory Overhead :		
Indirect Material	8,400	14,700
Two months idle	9,800	
Indirect Labour	1,01,500	1,78,500
Training cost	65,800	
Indirect Exp. :		
Repairs & Maintenance	28,000	84,000
Over hauling cost	14,000	
Others Expenses	52,500	1,02,900
Idle × 2	53,200	
Office overhead:		
Staff Salaries	1,48,400	2,94,000
Idle 67,550 × 2	1,35,100	
Other overheads	28,000	59,850
Idle	22,400	
Total overhead cost	6,67,100	7,33,950
Total cost	17,15,700	17,78,700

The more economic course of action is to operate at 75% capacity for a month only, and close the plant for March and April. This option will save (₹17,78,700 – ₹17,15,700) = ₹63,000.

(ii) Cost Factors and Non Cost Factors

In regard to the decision on close down of operations or continuing with operations, the factors to be considered are:

(a) Cost factors:

- (1) The proposal which involves the lower total costs will be selected.
- (2) If the company has contracted the purchases from high quality and high price suppliers, a change in the procurement policy to 'shop around' may be considered to obtain economics in purchases.
- (3) The services of unskilled labour, if any, who do not require re-training may be dispensed with. They may be recruited and put on work without incurring training cost on re-opening of the factory. This will save training

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and idle time cost.

- (4) The possibility of wage freeze may reluctantly be considered as an extreme measure.

Question 16

Fairbilt Furniture Ltd. manufactures three products: Tables, Chairs and Cabinets. The company is in the process of finalizing the plans for the coming year; hence the executives thought it would be prudent to have a look at the product-wise performance during the current year. The following information is furnished:

	Tables	Chairs	Cabinets
Unit selling price	80	60	36
Direct material	28	24	16
Direct labour	20	12	12
Factory overheads:			
Variable	8	6	4
Fixed	8	6	1.28
Cost of production	64	48	33.28
Selling, distribution and general administration expenses :			
Variable	4	2	2
Fixed	4	6	1.52
Unit cost (I)	72	56	36.80
Unit profit (loss) (II)	8	4	(0.80)
Sales volume (units)	10,000	15,000	15,000
Profit (loss)	80,000	60,000	(12,000)

For the coming period, the selling prices and the cost of three products are expected to remain unchanged. There will be an increase in the sales of tables by 1,000 units and the increase in sales of cabinets is expected to be 8,000 units. The sales of chairs will remain to be unchanged. Sufficient additional capacity exists to enable the increased demands to be met without incurring additional fixed costs. Some among the executives contend that it will be unwise to go for additional production and sale of cabinets, since it is already making losses at ₹0.80 per unit. The suggestion is that cabinets should be eliminated altogether.

Do you agree? Substantiate with necessary analysis and determine the product wise and overall profits for the coming year.

Answer

Note: Reconciliation of the figures given for 'cabinets' reveals the fact that the selling price is 36(36.80 – .80)

Fairbilt Furniture Ltd.**Statement showing Product-wise Contribution and Total Profit**

	Tables		Chairs		Cabinets		Total
	Per Unit	Total	Per unit	Total	Per unit	Total	
Sales volume (units)		10,000		15,000		15,000	
Selling price (₹)	80	800,000	60	900,000	36	540,000	22,40,000
Direct Material	28	280,000	24	360,000	16	240,000	880,000
Direct Labour	20	200,000	12	180,000	12	180,000	560,000
Variable factory overheads	8	80,000	6	90,000	4	60,000	230,000
Variable selling, distribution and administration overhead	4	40,000	2	30,000	2	30,000	100,000
Total variable cost	60	600,000	44	660,000	34	510,000	1,770,000
Contribution	20	200,000	16	240,000	2	30,000	470,000
Fixed factory overheads		80,000		90,000		19,200	189,200
Fixed selling, distribution and administration overheads		40,000		90,000		22,800	152,800
Total fixed overheads							342,000
Total Profit							128,000

The above analysis shows the cabinets make a contribution of ₹2 per unit. The loss sustained in the previous year is because of the falling sales volume below breakeven level.

Fairbilt Furniture Ltd.**Budgeted Performance for the Coming Year**

	Tables	Chairs	Cabinets
Unit Contribution (₹)	20	16	2
Sales Volume (Units)	11,000	15,000	23,000
Total Contribution (₹)	220,000	240,000	40,000
Less: Fixed Cost (₹)	120,000	180,000	42,000
Profit (₹)	100,000	60,000	4,000

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The company makes a total profit of ₹164,000 if all the products are continued. However, if the production of cabinets is discontinued, there will be an adverse effect on the overall profit of the company. This is because cabinets also contribute toward meeting the fixed costs of the company.

Question 17

An agro-products producer company is planning its production for next year. The following information is relating to the current year:

Products/Corps	A1	A2	B1	B2
Area occupied (acres)	250	200	300	250
Yield per acre (ton)	50	40	45	60
Selling price per ton (₹)	200	250	300	270
Variable cost per acre (₹)				
Seeds	300	250	450	400
Pesticides	150	200	300	250
Fertilizers	125	75	100	125
Cultivations	125	75	100	125
Direct wages	4,000	4,500	5,000	5,700

Fixed overhead per annum (₹) 53,76,000.

The land that is being used for the production of B1 and B2 can be used for either crop, but not for A1 and A2. The land that is being used for A1 and A2 can be used for either crop, but not for B1 and B2. In order to provide adequate market service, the company must produce each year at least 2,000 tons each of A1 and A2 and 1,800 tons each of B1 and B2.

You are required to:

- Prepare a statement of the profit for the current year.
- Profit for the production mix by fulfilling market commitment.
- Assuming that the land could be cultivated to produce any of the four products and there was no market commitment, calculate: Profit amount of most profitable crop and break-even point of most profitable crop in terms of acres and sales value.

Answer

- (i) Calculation of selling price and contribution per acre:

Products	A1	A2	B1	B2	Total
Yield per acre in (tones)	50	40	45	60	

Selling price per tones (₹)	200	250	300	270	
Sales revenue per acre (₹)	10,000	10,000	13,500	16,200	
Variable cost per acre (₹)	4,700	5,100	5,950	6,600	
Contribution per acre (₹)	5,300	4,900	7,550	9,600	
Area (acres)	2,50	200	300	250	
Total contribution (₹)	13,25,000	9,80,000	22,65,000	24,00,000	69,70,000
Less: Fixed Cost					53,76,000
Profit (₹)					15,94,000

(ii) Profit Statement for recommended mix

Products	A1	A2	B1	B2	Total
Contribution per acre	5300	4900	7550	9600	
Rank	1	2	2	1	
Minimum Sales Requirement in acres		2000/40 = 50	1800/45 = 40		
Recommended Mix (in Acres)	400	50	40	510	
Total Contribution (₹)	21,20,000	2,45,000	3,02,000	48,96,000	75,63,000
Less: Fixed Cost					53,76,000
Profit					21,87,000

(iii) Most profitable crop: Production should be concentrated on B2 which gives highest contribution per acres ₹9,600.

Overall contribution if complete land is used for B2 (1,000 × 9,600) = ₹96,00,000

Less: Fixed Cost = ₹53,76,000

Profit: = ₹42,24,000

Break even point in acres for B2 = 5376000 ÷ 9600 = 560 acres

Break even point in sales value = 560 × (270 × 60) = ₹90, 72,000

Question 18

LMV Limited manufactures product Z in departments A and B which also manufacture other products using same plant and machinery. The information of product Z is as follows:

Items	Department A (₹)	Department B (₹)
Direct material per unit	30	25
Direct labour per unit (₹10 per hour)	30	40
Overhead rates:		
Fixed	8 per hour	4 per hour

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Variable	6 per hour	3 per hour
Value of Plant and Machinery	25 lakhs	15 lakhs

Overheads are recovered on the basis of direct labour hours. Variable selling and distribution overheads relating to product Z are amounting to ₹30, 000 per month. The product requires a working capital of ₹4, 00,000 at the target volume of 1,500 units per month occupying 30 per cent of practical capacity.

You are required:

- To calculate the price of product Z to yield a contribution to cover 21 percent rate of return on investment.
- Set the minimum selling price of the product if (1) the product is well established in the market; (2) the product is first time launched in the market.

Answer

- Statement showing price of Product Z

Direct Material	Deptt. A	30	
	Deptt. B	<u>25</u>	55
Direct Labour	Deptt. A	30	
	Deptt. B	<u>40</u>	70
Variable overhead	Deptt. A 3×6	18	
	Deptt B 4×3	<u>12</u>	30
Variable selling and distribution overhead 30,000/1,500			20
Total Variable Cost per unit		<u>175</u>	
Total hours required for a target of 1,500 units of product Z			
Deptt. A 1500 × 3			4500 hours
Deptt. B 1500 × 4			<u>6000 hours</u>
			<u>10500 hours</u>

10500 hours represent 30% capacity

So total capacity per month $10500 / 0.30 = 35000$ hours.

Yearly capacity is $35000 \times 12 = 420000$ hours.

Fixed capital employed in both department = 40.00 Lakhs

(25 lakhs + 15 Lakhs)

Expected return	= $0.21 \times 40,00,000$	= 840000
Contribution per hour	= $840000 / 4200000$	= 2.00 per hour
Working Capital	= 0.21×400000	= 84000
Contribution per unit	$84000 / 18000$ unit	= 4.67 per unit
Total contribution required		₹
To cover fixed cost 3 hours of A and 4 of B = 7×2		= 14.00
To working capital		= <u>4.67</u>
		<u>18.67</u>

Fixed charges recovery is based on usage. Full capacity is not being used by product Z and departments are also producing other products using same plant and machinery. Price of Product = Variable cost + contribution required = $175 + 18.67 = 193.67$ per unit.

(ii) Price of product when product is well established in market:

Variable Cost	175
Fixed Cost (24 + 16)	<u>40</u>
Total price	<u>215</u>

The product is first time launched in the market, and then variable cost ₹175 should form the basis for price fixation.

and earn an additional contribution.

Question 19

6000 pen drives of 2 GB to be sold in a perfectly competitive market to earn ₹1,06,000 profit, whereas in a monopoly market only 1200 units are required to be sold to earn the same profit. The fixed costs for the period are ₹74,000. the contribution per unit in the monopoly market is as high as three fourths its variable cost. Determine the targets selling price per unit under each market condition.

Answer

	Perfect Competition	Monopoly
Units	6,000	1,200
Contribution (1,06,000 + 74,000)	1,80,000	1,80,000
Contribution per unit	30	150

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Variable Cost per unit 150 , $\frac{3}{4}$		200
Variable Cost per unit	200	
Selling Price per unit	230	350

Question 20

Vikram Ltd. produces 4 products using 3 different machines. Machine capacity is limited to 3,000 hours for each machine. The following information is available for February, 2009

Products	A	B	C	D
Contribution (Sales-direct material) ₹	1,500	1,200	1,000	600
Machine Hours Required/Unit :				
Machine 1	10	6	2	1
Machine 2	10	9	3	1.5
Machine 3	10	3	1	0.5
Estimated Demand (units)	200	200	200	200

From the above information you are required to identify the bottleneck activity and allocate the machine time.

Answer

Machine	Time required for products				Total Time	Time Available	Machine utilization
	A	B	C	D			
1	2000	1200	400	200	3800	3000	126.67%
2	2000	1800	600	300	4700	3000	156.67%
3	2000	600	200	100	2900	3000	96.67%

Since Machine 2 has the highest machine Utilization it represents the bottleneck activity hence product, ranking & resource allocation should be based on contribution/machine hour of Machine 2.

Allocation of Resources						
	A	B	C	D	Machine Utilization	Spare Capacity
Contribution per unit (₹)	1500	1200	1000	600		
Time required in Machine 2	10	9	3	1.5		
Contribution per Machine – hour (₹)	150	133.33	333.33	400		
Rank as per contribution /	3 rd	4 th	2 nd	1 st		

mach. Hour						
Allocation of Machine 2 time	200×10 = 2000	100 (balancing figure)	200×3 = 600	200×1.5 = 300	3000	
Production Quantity	200	100/9=11.11	200	200		
Allocation Machine 1 time	2000	11.11×6 = 66.66	400	200	2666.66	333.34
Allocation of Machine 3 time	2000	11.11×3 = 33.33	200	100	2333.33	666.67

Question 21

G Ltd. produces and sells 95,000 units of 'X' in a year at its 80% production capacity. The selling price of product is ₹ 8 per unit. The variable cost is 75% of sales price per unit. The fixed cost is ₹ 3,50,000. The company is continuously incurring losses and management plans to shut-down the plant. The fixed cost is expected to be reduced to ₹1,30,000. Additional costs of plant shut-down are expected at ₹15,000.

Should the plant be shut-down? What is the capacity level of production of shut-down point?

Answer

	If plant is continued	If plant is shutdown
Sales	7,60,000	-
Less: Variable Cost	<u>5,70,000</u>	-
Contribution	1,90,000	
Less: Fixed Cost	3,50,000	1,30,000
Additional Cost		<u>15,000</u>
Operating Loss	<u>1,60,000</u>	<u>1,45,000</u>

A comparison of loss figures indicated as above points out that loss is reduced by (16,000-14,500) ₹ 15,000 if plant is shut down.

$$\text{Shut down point} = \frac{3,50,000 - 14,5000}{8 - 6} = \frac{20,500}{2} = 1,02,500 \text{ units}$$

Capacity level of shut down point:

$$\text{At 100\% level production is } \frac{95,000}{0.80} = 1,18,750$$

$$\text{Capacity level at shut down} = \frac{1,02,500}{1,18,750} = 86.31\%$$

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Alternative Solution

	₹
If the plant is shut down, the sunk cost or fixed expenses	1,45,000
If it is working at 80% capacity, the fixed cost	3,50,000
Additional fixed expenses	2,05,000
Contribution (95000*2)	1,90,000
Incremental Loss on Continuing	15,000

Decision - better to shut down

Production at shut-down point

$$2x - 350000 = 1,45,000$$

$$2x = 2,05,000$$

$$x = 1,02,500 \text{ Units}$$

$$\text{Capacity \%} = 1,02,500 / (95,000 / 0.8) = 86.31\%$$

Question 22

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

Products	Mix% to total sales	PV Ratio (5)	Raw material as % on sales value
A	30	20	35
B	10	30	40
C	20	40	50
D	40	10	60

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

You are required to :

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

Answer

Revised P/V ratio and ranking of products:

Product	Existing P/V ratio %	Increase in Raw material cost as % of sales value	Revised P/V Ratio	Revised raw material as % of sale value	Contribution per ₹ 100 of raw material %	Rank
A	20	3.5	16.5	38.50	42.86%	III
B	30	4	26	44.00	59.09%	II
C	40	5	35	55.00	63.64%	I
D	10	6	4	66.00	6.06%	IV

Maximum Sales potential

A	30 % ₹ 3000	900
B	30 % ₹ 3000	900
C	30 % ₹ 3000	900
D	40 % of 3000	1200

Allocation of raw material whose supply is restricted to ₹ 1535 lacs in order of raw material profitability.

Product	Rank	Sales ₹. In lacs	Raw Material per ₹ 100 Lacs Sales	Raw Material Equired	Balance Raw Material
C	I	900	55	495	1040
B	II	900	44	396	644
A	III	900	38.5	346.5	297.5
D	IV	451**	66	297.5*	0

* Balancing figure, hence sales will be restricted to 451** lakhs (297.5/66%)

Profitability Statement Lakhs							₹	In
Product	Existing (2009)			Proposed(2010)				
	Sales	P/V Ratio	Contribution	Sales	P/V Ratio	Contribution		
A	900	20	180	900	16.5	148.5		
B	300	30	90	900	26	234		
C	600	40	240	900	35	315		

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D	1200	10	120	451	4	18.04
Total	3000		¹ 630	3151		³ 715.54
Less : Fixed Costs*			² 330			330
Profit before Dep and Int.			300			385.54
Less :Depreciation			225			225.00
Less :Interest			115.5			115.50
Profit before tax			(40.5)			45.04

* Balancing figure(Contribution - Profit before Depreciation & Interest)

The increase of contribution of ₹85.54 in 2010 will set off loss of ₹40.50 lakhs and result in profit of ₹45.04 lakhs.

Question 23

The following information is given by Z Ltd.:

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

Required:

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

Answer

Margin of Safety(%)	= MoS Units/Actual Sales Units
	= 7500/(7500+2500) = 75%
Total Sales	= 187500/0.75 = ₹ 2,50,000/-
Profit	= Total sales – Total Cost
	= 250000 – 193750 = ₹ 56250
P/V Ratio	= Profit/MoS (₹) ´ 100
	= 56250/187500 ´ 100 = 30%
BEP Sales	= Total Sales / (100 – MS)
	= 2,50,000 ´ 0.25 = ₹ 62,500
Fixed Cost	= Sales x P/V Ratio
	= 250000 ´ 0.30-56250 = 18750

Alternate Answer 1

Margin of Safety = Selling Price per unit $\times$ (7500 units)

₹ 187500 = Selling Price per unit $\times$ (7500 units)

Therefore ,

Selling Price per unit = $187500/7500$ = ₹ 25

Profit ₹

Sales 10000×25 2,50,000

Less: Total Cost 1,93,750

Profit 56,250

P/V Ratio Profit/Margin of Safety

$56250/187500=$ 30%

BEP Sales 2500×25 ₹ 62,500

Fixed Cost $62500 \times 30\%=$ ₹ 18,750

Alternative Answer 2

Selling price = ₹ $187500/7500$ = ₹ 25

Total Cost at Break Even point = ₹ 25×2500 = 62500 = Break Even Sales

$(\text{Total Cost} - \text{Total Cost of BE})/(\text{Total Units} - \text{Break Even Units}) = \text{Variable Cost per Unit}$

$(93,750 - 62,500)/(10,000 - 2,500) = 1,31,250/7,500 = ₹ 17.50$ per unit

Selling Price = 25.00

Variable Cost = 17.50

Contribution = 7.50

P/V Ratio = $7.50/25$

= 30%

Fixed Cost = 7.50×2500 units

= ₹ 18750.

Profit = 7.50×7500 = ₹ 56,250

Question 24

Calculate the selling price per unit to earn a return of 12% net on capital employed (net of tax @40%). The cost of production and sales of 80,000 units are:

Variable cost including material cost ₹ 9,60,000

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Fixed overheads

₹5,00,000

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

Answer

Let 'x' be the selling price per unit, Therefore, Turnover = 80000 x

Capital Employed = 1200000+40000 x

Return on capital employed after tax = 12%

Therefore,

Return on capital employed before tax = 12/0.6

= 20%

Therefore,

Return on capital employed before tax = 20% of (1200000+40000x) = 240000+8000x

Sales	80000 x
Variable Cost	960000
Fixed Cost	500000
Profit	80000x – 1460000
Therefore	

$$80000x - 1460000 = 240000 + 8000x$$

$$72000x = 1700000$$

$$X = ₹ 23.61$$

Alternative Answer

Selling price per unit should cover Variable cost unit, Fixed Cost per unit and ROCE per unit

Fixed Capital Employed = ₹ 12 lacs

Required Return (net of tax) = 12% = ₹ 1,44,000

Pre tax return = 1,44,000 / 0.6 = ₹ 2,40,000

Let Selling Price per unit = X

$$X = (14,60,000+2,40,000)/20,000 + (12\% \text{ of } 50\% \text{ of } X)/0.6$$

$$= 17,00,000/20,000 + 6/100 \times 1/0.6 X$$

$$X(1-0.1) = 21.25$$

$$X = 21.25/0.9 = ₹ 23.61 \text{ per unit}$$

Required Selling price = ₹ 23.61

If a student has arrived at ₹ 23.61, full 4 marks may be given even if the intermediary steps are not adequately shown.

Question 25

Entertain U Ltd. hires an air-conditioned theatre to stage plays on weekend evenings. One play is staged per evening. The following are the seating arrangements:

VIP rows-the first 3 rows of 30 seats per row, priced at ₹ 320 per seat.

Middle level-the next 18 rows of 20 seats per row priced at ₹ 250 per seat.

Last level -6 rows of 30 seats per row priced at ₹ 120 per seat.

For each evening a drama troupe has to be hired at ₹ 71,000, rent has to be paid for the theatre at ₹ 14,000 per evening and air conditioning and other state arrangements charges work out to ₹ 7,400 per evening. Every time a play is staged, the drama troupe's friends and guests occupy the first row of the VIP class, free or charged, by virtue of passes granted to these guests. The troupe ensures that 50% of the remaining seats of the VIP class and 50% of the seats of the other two classes are sold to outsiders in advance and the money is passed on to Entertain U. The troupe also finds for every evening, a sponsor who puts up his advertisements banner near the stage and pays Entertain U a sum of ₹ 9,000 per evening. Entertain U supplies snacks during the interval free of charge to all the guests in the hall, including the VIP free guests. The snacks cost Entertain U ₹ 20 per person. Entertain U sells the remaining tickets and observes that for every one seat demanded from the last level, there are 3 seats demanded from the middle level and 1 seat demanded from the VIP level. You may assume that in case any level is filled, the visitor books the next higher or lower level, subject to availability.

- (i) *You are required to calculate the number of seats that Entertain U has to sell in order to break-even and give the categorywise total seat occupancy at BEP.*
- (ii) *Instead of the given pattern of demand, if Entertain U finds that the demand for VIP, Middle and Last level is in the ratio 2:2:5, how many seats each category will Entertain U have to sell in order to break-even?*

Answer

(i) Fixed Costs

	₹	₹
Troupe hire	71,000	
Rent	14,000	

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A/C		7,400	
VIP Snacks		<u>600</u>	93,000
Fixed Revenues:			
Seats Sold by the troupe		54,000	
Sponsor's advertisement		<u>9,000</u>	<u>63,000</u>
Net fixed costs recovered by Entertain U to Break even			<u>30,000</u>
Seats Sold by the troupe	54,000		
Sponsor's advertisement	9,000		
		63,000	
	VIP	Med	Lost
Total seats available	90	360	180
Less: Free	30		
Less: Sold by troupe	30	180	90
Can be sold by Entertain U	30	180	90
Row Price	320	220	120
Variable cost	<u>20</u>	<u>20</u>	<u>20</u>
			(Snacks)
Contribution per seat	300	200	100
Demand	1	3	1

$$= \frac{300 \times 1 + 200 \times 3 + 100 \times 1}{1 + 3 + 1} = \frac{300 + 600 + 100}{5} = \frac{1000}{5} = 200$$

\ Break Even Point for Entertain U = ₹ $\frac{30,000}{200}$ = 150 No. of seats

	VIP Rows	Middle Level	Last Level	
BF Seats Total 150	30	90	30	
Contribution per unit	300	200	100	
Contribution (₹)	<u>9,000</u>	<u>18,000</u>	<u>3,000</u>	₹ 30,000

Category wise occupancy at Break Even Point

VIP 30+30+30 = 90

Middle = 90+180 = 270

Last = 120

(ii) If demand is in the ratio 2 : 2 : 5

$$\text{Weighted contribution per seats} = \frac{2 \times 300 + 2 \times 200 + 5 \times 100}{9}$$

$$= \frac{600 + 400 + 500}{9} = \frac{1500}{9} = \frac{30,000}{1,500} \times 9 = 180 \text{ seats}$$

Ratio	40	40	100
Quantity available	30	180	90
Break Even quantity	30	10	90
		10	10
	30	60	90
Contribution per unit	300	200	100
No. of seats	30	60	90
Contribution ₹	<u>9,000</u>	<u>12,000</u>	<u>9,000</u>

Total = 30,000

EXERCISE

Question 1

AB Ltd. Manufacture foam, carpets and upholstery in its three divisions. Its operating statement for 1995-96 showing the performance of these divisions drawn for the use of management is reproduced below:

(₹ in '000)

	Manufacturing Divisions			Total
	Foam	Carpets	Upholstery	
Sales revenue	1,600 (A)	1,200	1,200	4,000
Manufacturing Costs Variable	1,200	700	680	2,580
Fixed (Traceable)	-	100	20	120
	1,200	800	700	2,700
Gross Profit	400	400	500	1,300
Expenses: Administration	134	116	172	422
Selling	202	210	232	644
	336	326	404	(B) 1,066
Net Income	64	74	96	234
Division's Ranking	3 rd	2 nd	1 st	-

(A) Sales include foam transferred to the Upholstery division at its manufacturing cost ₹2,00,000.

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- (B) Common expenses of ₹1,30,000 and ₹1,00,000 on account of administration and selling respectively stand apportioned to these divisions at 10% of Gross Profit in case of administration and 2.5 % of Sales in case of selling expense. Rest of ₹8,36,000 of the expense are traceable to respective divisions.

The manager of the foam division is not satisfied with the above approach of presenting operating performance. In his opinion his division is best among all the divisions. He requests the management for preparation of revised operating statement using contribution approach and showing internal transfer at market price.

You are required to:

- Draw the revised operating Statement using contribution approach and pricing the internal transfer at market price.
- Compute relevant ratios to show comparative profitability of these division and rank them in the light of your answer at (a) above. Further, other your comments on the contention of the manager of foam division.
- State why the contribution approach and pricing of internal transfer at market price are more appropriate in realistic assessment of the performance of various divisions.

Answer

(₹'000)

Divisions	Foam	Carpets	Upholstery	Total
(a) Contribution:	480	500	440	1,420
(b) Fixed Cost	256	356	344	956
(c) Net Income of the company				234

Question 2

K. Ltd. Manufactures and sells a range of sport goods. Management is considering a proposal for an advertising campaign, which would cost the company ₹3,00,000. The marketing department has put forward the following two alternative sales budgets for the following year.

	Product ('000)			
	A	B	C	D
Budget 1 – Without Advertising	216	336	312	180
Budget – 2 With Advertising	240	372	342	198

Selling prices and variable production costs are budgeted as follow:

	Product (₹ Per unit)			
	A	B	C	D
Selling prices	11.94	14.34	27.54	23.94
Variable Production Costs:				

Direct Material	5.04	6.60	15.24	12.48
Direct Labour	2.04	2.04	3.36	3.18
Variable overheads	0.72	0.72	1.20	1.08

Other Data:

- (1) The variable overheads are absorbed on a machine hour basis at a rate of ₹1.20 per machine hour.
- (2) Fixed overheads total ₹30,84,000 per annum.
- (3) Production capacity during the budget period 8,15,000 machine hours.
- (4) Products A and C could be bought in at ₹10.68 per unit and ₹24 per unit respectively.

Required:

- (i) Determine whether investment in the advertising campaign would be worthwhile and how production facilities would be best utilised.
- (ii) Explain the assumptions and reasoning behind your advise.

Answer

Statement of production facilities utilisation

Product	Machine hours utilised
A	1,44,000
B	2,23,200
C	2,69,600
D	1,78,000
Total	8,15,000

Question 3

You have been approached by a friend who is seeking your advice as to whether he should give up his job as an engineer, with a current salary of ₹14,800 per month and go into business on his own, assembling and selling a component which he has invented. He can procure the parts required to manufacture the component from a supplier.

It is very difficult to forecast the sales potential of the component, but after some research, your friend has estimated the sales as follows:

- (i) Between 600 to 900 components per month at a selling price of ₹250 per component.
- (ii) Between 901 to 1,250 components per month at a selling price of ₹220 component for the entire lot.

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The cost of the parts required would be ₹140 for each completed component. However if more than 1,000 components are produced in each month, a discount of 5% would be received from the supplier of parts on all purchases.

Assembly costs would be ₹60,000 per month upto 750 components. Beyond this level of activity assembly costs would increase to ₹70,000 per month.

Your friend has already spent ₹30,000 on development, which he would write-off over the first five years of the venture.

Required:

- (i) Calculate for each of the possible sales levels at which your friend could expect to benefit by going into the venture on his own.
- (ii) Calculate the break-even point of the venture for each of the selling price.
- (iii) Advise your friend as to the viability of the venture.

Answer

It is not worthwhile to sell between 900 and 1,000 units when no discount is available. Also, it is worthwhile selling at ₹220 if sales units are in excess of 1,000 units and a discount of 5% is available on the purchase of all components – parts.

Profit on the sale of 1,250 units = 1,250 units × ₹87 – ₹84,800 = ₹23,950

Question 4

SWEET DREAMS LTD. Manufactures and markets three products A, Band C in the State of Haryana and Rajasthan. At the end of first half of 1996-97 the following absorption based profit statement has been drawn by the accountant:

(₹ in '000)

	Haryana	Rajasthan	Total
Sales	3,000	900	3,900
Manufacturing Costs of Sales	<u>2,331</u>	<u>699</u>	<u>3,030</u>
Gross Profit	<u>699</u>	<u>201</u>	<u>870</u>
Administration Expenses (A)	120	36	156
Selling Expenses (B)	184	169	353
Total Expenses	<u>304</u>	<u>205</u>	<u>509</u>
Net Profit	<u>365</u>	<u>(-) 4</u>	<u>361</u>

- (A) The expenses are constant and common to both the States. They stand allocated on the basis of Sales.
- (B) The expenses are semi-fixed but specifically relate to the respective State.

The management is worried to note that the decision taken to market the products in Rajasthan to utilise idle capacity has proved wrong and wish to cover only Haryana State. The incharge marketing division is not satisfied with the above way of profit presentation. He is of the firm opinion that sales effected in the State of Rajasthan is contributing profits. For the next half year he expects no increase in demand in Haryana while for Rajasthan he anticipates to sell B or C more by 50% of existing sales. This will utilise the idle capacity in full.

The product-wise relevant details for the first half of 1996-97 are:

	A	B	C
Sales (in ₹000):			
Haryana	1,200	900	900
Rajasthan	300	300	300
Variable Costs (as a % on sales) :			
Manufacturing	40	35	30
Selling	3	2	2
Specific fixed manufacturing expenses (in ₹000)	570	470	610

You are required to:

- Prepare a State-wise profit statement for the first half of 1996-97 using contribution approach. Also offer your views on the contention of the management and opinion expressed by incharge marketing division.
- Prepare a product wise profit statement for the same period using contribution approach.
- Submit your well thought out recommendation as to which product should be produced to utilise idle capacity.

Answer

	A	B	C	Total
P/V ratio (Contribution/Sales) × 100	57%	63%	68%	62.23%

Recommendation for utilising idle capacity:

A review of the above P/V ratio's shows that the increase of output of product C in Rajasthan is the best. The increase of production after utilising the idle capacity in Rajasthan to the extent of ₹1,50,000 (i.e. 50% of ₹3,00,000) would increase the contribution of the company in the state of Rajasthan by ₹1,02,000 (68% × ₹1,50,000).

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Question 5

The relevant data of X Ltd. For its three products A, B and C are as under:

	A	B	C
Direct Material (₹/Unit)	260	300	250
Direct Labour (₹/Unit)	130	270	260
Variable Overheads (₹/Unit)	110	230	180
Selling Price (₹/Unit)	860	1040	930
Machine Hours Required (per Unit)	12	6	3

The estimated fixed overheads at four different levels of 3,600; 6,000; 8,400 and 10,800 machine hours are ₹1,00,000; ₹1,50,000; ₹2,20,000 and ₹3,00,000 respectively. The maximum demand of A, B and C in a cost period are 500; 300 and 1,800 units respectively.

You are required to find out (i) the most profitable product-mix at each level and (ii) the level of activity where the profit would be maximum.

Answer

Product	A	B	C
Maximum demand in units	500	300	1,800

Recommendation:

At 8,400 machine hour level of capacity the company would earn maximum profit i.e. ₹3,20,000.

* Refer to working note.

Question 6

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

A transporter used to provide the required number of buses at a flat rate of ₹700 per bus for the aforesaid purpose. In addition, a special permit fee of ₹50 per bus is required to be deposited with city Municipal Corporation. Each bus is 52 seater. Two seats are reserved for teachers who accompany in each bus. Each teacher is paid daily allowance of ₹100 for the day. No other costs in respect of teachers are relevant to the trip.

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

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

No. of students in a Group	Block Entrance Fee
Upto 100	200
101-200	300
201 & above	450

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

No. of students in a Trip ₹	Cost of Prizes
Upto 50	900
51-125	1,050
126-150	1,200
151-200	1,300
201-250	1,400
251 & above	1,500

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

You are required to:

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

Answer

(a)

No. of students	60	120	180	240	300
Total costs	5,850	9,600	13,500	17,400	21,150

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(b)

No. of students:	60	120	180	240	300
Average cost (₹)	97.50	80	75	72.50	70.50

(c)

No. of students in the trip	51-100	101-125	126-150	151-200	201-250	251-300
No. of students to break even:	105	140	145	180	220	255

Question 7

A Company produces three products from an imported material. The Cost Structure per unit of the products are as under:

	Product		
	A ₹	B ₹	C ₹
Sales Value	<u>200</u>	<u>300</u>	<u>250</u>
Direct Material	50	80	60
Direct Wages ₹6 per hour	60	120	108
Variable Overheads	30	60	54

Out of Direct Material 80% is of the imported material @ ₹10 per kg.

Prepare a statement showing comparative Profitability of the three products under the following scenarios.

- Imported Material is in restricted supply.
- Production Capacity is limiting factor.
- When maximum sales potential of products A and B are 1,000 units each and that of product 'C' is 500 units for specific requirement, availability of imported material is restricted 10,000 kgs per month, how the profit could be maximised?

Answer

Products	A	B	C
Contribution per kg (₹)	15	6.25	5.83
	4,000	3,600	2,400
No. of units	1,000	562	500

Question 8

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

The following information is available:

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

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

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

You are required to find out:

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

Answer

Rent per day of single room (in ₹)	756 (approx.)
Rent per day of double room (in ₹)	907 (approx.)
(b) Profitability of restaurant:	₹ 99,50,000
Profitability of sports centre:	
	₹
Contribution of sports centre per day:	4,12,500
Profitability of shopping arcade:	Nil

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Question 9

ACE Office Supplies Corporation retails two products – a standard and a deluxe version of a designer ball point pen. The budgeted income statement is as under :

Sales (in units)	Standard 1,50,000 ₹	Deluxe 50,000 ₹	Total 2,00,000 ₹
Sales:			
@ ₹20 per unit	30,00,000	-	-
At ₹30 per unit	-	15,00,000	45,00,000
Variable Costs:			
At ₹14 per unit	21,00,000	-	-
At ₹18 per unit	-	9,00,000	30,00,000
Contribution	9,00,000	6,00,000	15,00,000
Fixed Costs			12,00,000
Profit			3,00,000

Required:

- Calculate the breakeven point in units assuming that the planned sales mix is maintained.
- Calculate the breakeven point in units:
 - if only standard version is sold, and
 - if only deluxe version is sold.
- Suppose 2,00,000 units are sold, but only 20,000 units are of deluxe quality. Calculate the profit. Calculate the breakeven points if these relationships persist in the next accounting period. Compare your answer with the original plan and the answer in requirement (b). what is your major finding?

Answer

- Break even point in units (if only Standard version is sold)
= 2,00,000 units
- Break even point in units (if only Deluxe version is sold)
= 1,00,000 units

Major findings on comparing budgeted sales plan and original sales plan

Sales mix ratio of Standard and Deluxe	Unites to be sold at breakdown		Total units sold	Profit on the sale of 2,00,000 unit
	Standard	Deluxe		
3 : 1	1,20,000	40,000	1,60,000	3,00,000

Question 10

The details of the output presently available from a manufacturing department of Hitech Industries Ltd. Are as follows:

Average output per week 48,000 units from 160 employees

Saleable value of output ₹6,00,000

Contribution made by the output towards fixed

Expenses and profit ₹2,40,000

The Board of Directors plans to introduce more automation in the department at a capital cost of ₹1,60,000. The effect of this will be to reduce the number of employees to 120, but to increase the output per individual employee by 60%. To provide the necessary incentive to achieve the increased output the Board intends to offer a 1% increase in the piecework rate of one rupee per article for every 2% increase in average individual output achieved. To sell the increased output, it will be necessary to decrease the selling price by 4%.

Required:

Calculate the extra weekly contribution resulting from the proposed change and evaluate, for the Board's information, the worth of the project.

Answer

- | | | |
|-----|---|-----------------|
| (a) | Proposed piece work rate | = ₹130 per unit |
| (b) | Proposed sale price per unit | = ₹12 |
| (c) | Present marginal cost (excluding wages) per unit. | = ₹6.50 p.u. |

Question 11

Satish Enterprises are leading exporters of Kid's Toys. J Ltd. of U.S.A. have approached Satish Enterprises for Exporting a special toy named "Jumping Monkey". The order will be valid for next three years at 3,000 toys per month. The export price of the toy will be 84.

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Cost data per toy is as follows:

	₹
Materials	60
Labour	25
Variable overheads	20
Primary packing of the toy	15

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

Satish Enterprises will also have to import a special machine for making the toys. The cost of the machine is ₹24,00,000 and duty thereon will be at 12%. The machine will have an effective life of 3 years and depreciation is to be charged on straight-line method. Apart from depreciation, annual fixed overheads is estimated at ₹4,00,000 for the first year with 6% increase in the second year. Fixed overheads are incurred uniformly over the year.

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

- Prepare a monthly and yearly profitability statements for the first year and second year assuming the production at 3,000 today per month.
- Compute a monthly and yearly break even units in respect of the first year.
- In what contingency can there be a second break-even point for the month and for the year as a whole?
- Have you any comments to offer on the above?

Answer

- (b) (i) Profit Statement of M/s Satish Enterprises for first and second year on monthly and yearly basis.

	First year		Second Year	
	Monthly ₹	Yearly ₹	Monthly ₹	Yearly ₹
Profit	108	1,296	106	1,272

Question 12

“Cost is not the only criterion for deciding in favour of shut down” – Briefly explain.

Answer

Refer to Chapter 3: Paragraph 3.5

Question 13

M Company's Central Services Department is evaluating new coping machines to replace the firm's current copier, which is worn out. The analysis of alternative machines has been narrowed to three and the estimated costs of operating them are shown below:

	Cost per 100 copies		
	Machine A	Machine B	Machine C
	₹	₹	₹
Materials Cost	60	40	20
Labour Cost	80	30	20
Annual Lease Cost	30,000	58,000	1,00,000

Required:

- Compute the cost indifference points for the three alternatives.
- What do the cost indifference points suggest as a course of action in this regard?
- If the management expects to need 87,000 copies next year which copier would be most economical?

Answer

Cost indifference point for two machines viz.,

- A & B = 400 Nos. (Multiple of 100 copies)
- B & C = 1,400 Nos. (Multiple of 100 copies)
- C & A = 700 Nos. (Multiple of 100 copies)
- Hence from the above we conclude as follows:
 From 0 to 400 Nos. (Multiple of 100 copies) use Machine A
 From 400 to 1,400 Nos. (Multiple of 100 copies) use Machine B
 Above 1,400 Nos. (Multiple of 100 copies) use Machine C.
- machine B would be most economical.

Question 14

Somesh of Agra presently operates its plant at 80% of the normal capacity to manufacture a product only to meet the demand of Government of Tamil Nadu under a rate contract.

He supplies the product for ₹4,00,000 and earns a profit margin of 20% on sales realisations. Direct cost per unit is constant.

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The indirect costs as per his budget projections are:

Indirect costs	20,000 units (80% capacity) ₹	22,500 units (90% capacity) ₹	25,000 units (100% capacity) ₹
Variable	80,000	90,000	1,00,000
Semi-variable	40,000	42,500	45,000
Fixed	80,000	80,000	80,000

He has received an export order for the product equal to 20% of its present operations. Additional packing charges on this order will be ₹1,000.

Arrive at the price to be quoted for the export order to give him a profit margin of 10% on the export price.

Answer

Price to be quoted	₹ 50,000
Export price per unit	₹ 12.50

Question 15

ACE Ltd. has an inventory of 5,000 units of a product left over from last years' production. This model is no longer in demand. It is possible to sell these at reduced prices through the normal distribution channels. The other alternative is to ask someone to take them on "as is where is" basis. The latter alternative will cost the company ₹5,000.

The company produced 2,40,000 units of the product, last year, when the unit costs were as under:

Manufacturing Costs:

Variable	6.00	
Fixed	1.00	7.00

Selling & Distribution Cost:

Variable	3.00	
Fixed	1.50	4.50

Total Cost 11.50

Selling Price per Unit 14.00

Required:

Should the company scrap the items or sell them at a reduced price? If you suggest the latter, what minimum price would you recommend?

Answer

If the company can get anything more than ₹ 2/- per unit, then it is worthwhile to sell the stock of 5,000 units