

4. DECISION MAKING

The information provided by the total cost method is not sufficient in solving the management decision-making, especially in dealing with the problems requiring short-term decisions where fixed costs are excluded. The following are important areas where managerial problems are simplified by use of the marginal costing:

- (i) Fixation of selling price.
- (ii) Make or buy decisions.
- (iii) Assessment of capital investment plans.
- (iv) Key or limiting factor.
- (v) Effect of change in sales price.
- (vi) Maintaining a desired level of profits.
- (vii) Selection of a suitable product mix.
- (viii) Alternative methods of production.
- (ix) Diversification of products.
- (x) Closing down or suspending activities.
- (xi) Alternative course of action.
- (xii) Level of activity planning.
- (xiii) Purchasing or Leasing.

(i) Fixation of Selling Prices

Although prices are more controlled by market conditions and other economic factors than by decisions of the management, yet fixation of selling price is one of the most important functions of management. This function is to be performed:

- (a) Under normal circumstances.
- (b) In times of competition.
- (c) In times of trade depression.
- (d) In accepting additional orders for utilising idle capacity.
- (e) In exporting and exploring new markets.
- (f) Quotation in a jobbing undertaking.

In *normal circumstances*, the price fixed must cover total cost as otherwise profit cannot be earned. It can also be fixed on the basis of marginal cost by adding a high margin to marginal cost which may be sufficient to contribute towards fixed expenses and profits. But under other circumstances, product may have to be sold at a price below total cost, if such a step is necessary to meet the situation arising due to competition, trade depression, additional orders for utilising spare capacity, exploring new markets etc. Thus, in special circumstances, price may be below the total cost and it should be equal to marginal cost plus a certain amount (if possible).

Pricing in Depression. Prices fall during depression and the product may be sold below the total cost. In case there is a serious but temporary fall in the demand on account of depression leading to the need for a drastic reduction in prices temporarily, the minimum selling price should be equal to the marginal cost. If the selling price at which the goods can be sold is equal to marginal cost or more than marginal cost, the product should be continued. Fixed expenses will be incurred even if the product is discontinued during depression for a short period. If the product can be sold at a price which is a little more than marginal cost, loss on account of fixed expenses will be reduced because price will recover fixed expenses to some extent. This can be made clear by giving the following example :

Suppose, marginal cost per unit is Rs. 10 and fixed expenses amount to Rs. 1,50,000. Selling

price per unit is Rs. 11 and 40,000 units can be sold at this price.

Marginal cost : 40,000 units @ Rs. 10

Fixed Expenses

Rs.	4,00,000
<u>1,50,000</u>	
<u>5,50,000</u>	

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Analysis

	Rs.
3,200	3,200
400	400
1,000	1,000
200	200
200	200
100	100
200	200
1,000	1,000
6,300	6,300
600	600
<u>6,900</u>	<u>6,900</u>

to buy 200 such motors at Rs. 5,000 each
ould you advise acceptance of the offer?
ole for a motor to be purchased by a company
be at cost?

	Rs.
3,200	3,200
400	400
1,000	1,000
100	100
200	200

10 × Rs. 100)
be worthwhile to accept the offer since the accepta
profit will increase if BEP has already been achieve
will recover fixed cost and loss to that extent will
cause it is an export order. Further, Government in
freight etc. associated with export order (if any)

) be purchased by a company under the same manu

	Rs.
100	100
1,000	1,000
<u>1,900</u>	<u>1,900</u>

so be added.

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e of repetition of orders for similar products w
ixing policy in a unit of this type should be
ill capacity working is to be achieved. Quoted
tion which would be earned in each case. If there is
g to the availability of capacity. If there is
y to accept a low contribution in order to provide
ce charged should be such which provides high
e price fixer will not have the vital informati

$$\text{Cost per unit} = \frac{\text{Rs. } 5,50,000}{40,000} = \text{Rs. } 13.75$$

Even though the selling price of Rs. 11 is below the total cost, yet it is advantageous to sell the product at the selling price of Rs. 11 which is more than the marginal cost of Rs. 10. Thus will reduce the loss on account of fixed expenses (if the product is discontinued) by Rs. 40,000 as shown below :

Selling price of 40,000 units @ Rs. 11	Rs. 4,40,000
Less : Total cost (Calculated earlier)	= 5,50,000
Loss	= 1,10,000
Loss if the product is discontinued (Fixed Expenses)	1,50,000
Loss reduced if the product is continued (Rs. 1,50,000 - Rs. 1,10,000)	40,000

If the selling price is below the marginal cost, loss will be more than the fixed costs because variable expenses will not be recovered fully. Hence, efforts should be made to sell the product at a price which is equal to the marginal cost or more than the marginal cost. Production should be discontinued if the price obtained is below the marginal cost so that loss may not be more than the fixed costs. But, in the following circumstances, production may be continued even if the selling price is below the marginal cost.

Selling Price Below the Marginal Cost

1. When a new product is introduced in the market. The new product is sold at a very low price to make it popular. This is done with the hope that sales will increase with the passage of time and cost of production will come down as a result of increase in sales. Ultimately cost of production will be in line with the selling price and the concern will start earning profit from the new line of production.

2. When foreign market is to be explored to earn foreign exchange. Government sometimes allows import quotas against foreign exchange earned and profits from import quotas may be much more than the loss on exporting the product at a price below the marginal cost.

3. When the concern has already purchased large quantities of materials. It is better to convert the material into finished goods and sell these at a price below the marginal cost if the sale of materials will give rise to loss which is more than the loss incurred if the production is done.

4. When closure of business may mean breaking of business connections and connections may be re-established by a heavy expenditure on advertisement and sales promotion. In such a case, it is better to continue the production and sell the product at a price below the marginal cost.

5. When the sales of one product at a price below the marginal cost will push up the sales of other profitable products. The loss in one product will be made up by profits in other products.

6. When employees cannot be retrenched. In such a case, it is better to maintain the production even if the price is below the marginal cost.

7. When competitors are to be eliminated from the market.

8. When the goods are of perishable nature. It is better to sell the perishable goods at a price which they can realise; otherwise these goods will perish and nothing will be realised.

Accepting Additional Orders, Exploring Additional Markets and Exporting

When additional orders are accepted or additional markets explored at a price below normal price to increase the capacity, it should be very carefully seen that they will not affect the normal market and goodwill of the company. The order from a local merchant should not be accepted at a price below normal price because it will affect relationship of the concern with the other customers purchasing the goods at normal price. In case of foreign markets, goods may be sold at a price below normal price keeping in view the direct and indirect benefits of exporting such as import quota, subsidies of Government, prestige of exporting etc.

ILLUSTRATION A company manufacturing electric motors at a price of Rs. 6,900 each, made up as under :

	Rs.
Direct materials	3,200
Direct labour	400
Variable overheads	1,000
Fixed overheads	200
Appropriation	200
Variable selling overheads	100
F finally paid on production	200
Total	1,000
	6,900
Central excise duty	600
Total	6,900

QUESTION

(i) Who offered to buy a foreign buyer
 (ii) Variable costs :
 Direct materials
 Direct labour
 Variable overheads
 Variable selling overheads
 Royalty (assumed to be based on production, so taken as variable)

Contribution per motor

Contribution on 200 motors ($200 \times \text{Rs. } 100$)

From the above it appears that it would be worthwhile to accept the offer since the acceptance of the total contribution of Rs. 20,000 by which profit will increase if EEP has already been achieved, contribution of Rs. 20,000 will recover fixed cost and loss to that extent will be no incidence of central excise duty because it is an export order. Further, Governmental export order and expenses of packing, freight etc. associated with export order (if an order is confirmed before the acceptance of the offer).

(ii) The price to be quoted for a motor to be purchased by a company under the same market will be

Total price
 Selling overheads (not to be incurred)
 Profit (not to be charged)

Rs. 1,000

Price to be quoted
 Central excise duty if payable should also be added.

It is unlikely that any significant degree of repetition of orders for similar products in a jobbing undertaking. The price fixing policy in a unit of this type should be based on the principle of maintaining the plant at full capacity working to be achieved. Quotations for fixed keeping in view the contribution which would be earned in each case (unit). Contribution may be varied according to the availability of capacity. If there is well filled, the selling price charged should be such which provides him with a profit within which he can operate.

ILLUSTRATION 21. In a purely competitive market, 10,000 pocket transistors can be manufactured and sold and a certain profit is generated. It is estimated that 2,000 pocket transistors need be manufactured and sold in a monopoly market to earn the same profit. Profit under both the conditions is targeted at Rs. 2,00,000. The variable cost per transistor is Rs. 100 and the total fixed cost is Rs. 37,000.

You are required to find out the unit selling prices both under monopoly and competitive conditions.

SOLUTION

Suppose X—be the selling price per transistor under purely monopolistic conditions, and

Y—be the selling price under competitive conditions.

Under marginal costing, the profit equation would be :

Profit = No. of units (Selling price per unit — variable cost per unit)—Fixed Cost.

Under Monopolistic Conditions :

$$\begin{aligned} \text{Rs. } 2,00,000 &= 2,000 (X - \text{Rs. } 100) - \text{Rs. } 37,000 \\ &= 2,000 X - \text{Rs. } 2,00,000 - \text{Rs. } 37,000 \end{aligned}$$

$$\text{or } 2,000 X = \text{Rs. } 2,37,000 + \text{Rs. } 2,00,000 = \text{Rs. } 4,37,000$$

$$\begin{aligned} X &= \frac{\text{Rs. } 4,37,000}{2,000} = \text{Rs. } 218.50 \text{ per unit} \\ &= \text{Rs. } 2,000 \end{aligned}$$

Under Competitive Conditions :

$$\begin{aligned} \text{Rs. } 2,00,000 &= 10,000 (Y - \text{Rs. } 100) - \text{Rs. } 37,000 \\ &= 10,000 Y - \text{Rs. } 10,00,000 - \text{Rs. } 37,000 \end{aligned}$$

$$\text{or } 10,000 Y = \text{Rs. } 10,37,000 + \text{Rs. } 2,00,000 = \text{Rs. } 12,37,000$$

$$Y = \text{Rs. } 123.70$$

(i) Make or Buy Decision

Management sometimes may be confronted with the problem of making a choice between manufacturing the component parts of a product or buying them from outside. Such a problem will arise when the firm has the idle capacity and the technical capacity of manufacturing the component parts. In arriving at such a make or buy decision, quantitative factors to be considered relating to the problem will be taken into consideration. The quantitative factors of the alternative are the differential costs of the make and buy alternatives and the consequences of the alternative uses of the idle capacity which exists in the firm. The relevant costs of buying the component part will include the purchase price and other costs related to purchasing the component part. Similarly, costs relevant for make decision will include the variable cost of making the component part. Fixed costs which are not made. Fixed costs which are avoidable if the component is not made. Management and fixed costs which are avoidable if the component part is bought. Management expected to change would be ignored being irrelevant in the make or buy decision. But on the basis of total cost method, it appears that it is cheaper to buy the component. But on the basis of differential cost method, it appears that the acceptance will mean that the total cost of the component part from the outside supplier will come to Rs. 9 i.e., Rs. 7 (廟加) a total cost of the purchased part from the outside supplier is purchased from outside price) plus Rs. 2 (fixed cost which cannot be saved even if the component is purchased by the supplier).

The qualitative factors which are taken into consideration to influence the make or buy decision are as follows:

- Quality of goods supplied by the supplier.
- Uninterrupted supply by the supplier meeting the delivery dates.
- Ifactory is to be maintained and manufacturing know-how is not to be passed on to the supplier of the component part, the decision will be to manufacture the component part even though the manufacturing cost may be more than the price to be charged by the supplier.

ILLUSTRATION 22. A factory in producing four types of articles and in condition of capacity working, a decision has to be made as to which article shall be bought out and which article shall be manufactured in the factory.

The cost of manufacture and bought out prices of the four articles are as follows :

	A Rs.	B Rs.	C Rs.	D Rs.
Cost per article				
Marginal cost	50	58	72	75
Fixed cost	10	20	25	70
Total cost	60	78	97	145
Bought out price	46	84	115	128

ILLUSTRATION 23. To take a decision on whether to make or buy an article, fixed cost should not be added because it is incurred even if the article is not produced. Only marginal cost should be taken into consideration to arrive at correct decision of make or buy.

ILLUSTRATION

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	A Rs.	B Rs.	C Rs.	D Rs.
Bought out price	46	84	115	128
Marginal cost	60	68	72	75
Article				
Buyout cost over marginal cost	—4	—26	—43	—53

Article A should be bought from outside because its bought out price is less than its marginal cost. Article B and C are more than their marginal costs, so these articles should be manufactured in the factory if production facilities are available. The greatest contribution is in case of D. So it should be given preference as compared to B and C. C has more contribution as compared to B.

Make or Buy Decision when there is Increase in Fixed Costs

In some cases in spite of lower variable cost of production, there may be an increase in fixed cost incurred in the factory to justify the making instead of buying. This volume can be calculated by the following formula :

Increase in Fixed Costs

Contribution per unit (i.e., Purchase Price — Variable Cost of Production)

ILLUSTRATION 24. A firm can purchase a separable part from an outside source @ Rs. 100. There is a proposal that the spare part be produced in the factory itself. For this proposal, a machine costing Rs. 1,00,000 with annual capacity of 20,000 units and a life of 10 years is required. A foreman with a monthly salary of Rs. 500 will have to be engaged. Materials required will be Rs. 4.00 per unit and wages Rs. 2.00 per unit. Variable overheads are 150% of direct labour. This firm can easily raise funds @ 10% p.a. Advise the firm whether the proposal should be accepted.

ILLUSTRATION 25. Increase in Fixed Costs

	Rs.
Depreciation of Machine	10,000
Salary of Foreman	6,000
Interest on Capital	10,000
Total	26,000

Contribution per unit

	Purchase Price	Variable Cost	Contribution per unit
Item			
Materials			
Wages			
Total	Rs. 11	4.00	7.00

Variable Overheads	3.00		9
Contribution per unit		—	2
Minimum Volume = $\frac{\text{Rs. } 26,000}{\text{Rs. } 2}$ = 13,000 units.			

In order to accept the proposal it is essential that the volume should be at least 13,000 units.

Make or Buy Decision when there is No Idle Capacity

If there is no idle capacity and making of the spare part in the factory involves the loss of other work, the loss of contribution arising from displacement of work should be considered alongwith variable cost of production. The loss of contribution is found with reference to key or limiting factor. If the purchase price is higher than the total of variable cost of production plus traceable fixed costs plus the loss of contribution of production, it will be more profitable to manufacture.

ILLUSTRATION 24. Product 'A' takes five hours to produce on a particular machine and it has a selling price of Rs. 50 and a marginal cost of Rs. 35.

On the same machine, another product 'B' can be made at two hours at marginal cost of Rs. 5 per unit. Supplier's price of product 'B' is Rs. 10 per unit.

Assuming that machine hour is the key factor, advise whether product 'B' could be bought out (C.A. Final) or manufactured.

SOLUTION

Selling price per unit of product 'A'	50		
Less: Marginal cost per unit of product 'A'	35		
Contribution per unit of product 'A'		15	
Machine hours required for 1 unit of product 'A' = 5 hours			
Contribution per machine hour of product 'A' = $\frac{15}{5} = \text{Rs. } 3$			

One unit of product 'B' requires 2 machine hours and the availability of machine hours is the limiting factor. Therefore, if a unit of 'B' is produced then the contribution lost by not producing 'A' is Rs. 6 (i.e. 2 hours \times Rs. 3).

Rs.	5		6
		—	11
Total cost of producing one unit of product 'B'			

Since the supplier's price per unit of product 'A' is Rs. 10 and that of producing in the factory is Rs. 11, it is, therefore, recommended that it is better to buy product 'B' from outside.

ILLUSTRATION 25. A factory operates at full machine capacity to produce an assembly type product with 3 component parts. Data concerning one unit of the product are as follows :

Items	Component parts	Machine Hours	Variable Costs	Fixed Costs	Total
A		5	24	8	32
B		8	30	10	40
C		10	30	30	60
Assembly Total		—	50	20	70
Sales price			134	68	202

There is a big demand of the product in the market but the factory is unable to expand due to machine capacity limitation. If any one component is purchased from outside and that capacity is diverted to other components (same machine can produce any component) the factory will be able to sell more assembled products.

If component parts A, B and C can be purchased at Rs. 50, Rs. 60 and Rs. 80 respectively, state which one is to be purchased.

ELIMINATION

At present 23 machine hours are required for producing one component. If a part is purchased, machine hours to that extent will be available, resulting in more production of other components. We get four

Purchase	Machine hours	%
Part A	23 - 5	18
Part B	23 - 8	15
Part C	23 - 10	13

Purchase		Present	A	B	C
	Rs.	Rs.	Rs.	Rs.	Rs.
Variable Cost (per unit)					
Component A	24	50	24	24	24
Component B	30	30	60	30	30
Component C	30	30	30	30	80
Assembly	50	50	50	50	50
Selling price	134	160	164	184	Conclusion :
Profit Margin	250	250	250	250	Component B should be purchased as this alternative gives highest contribution.
*Contribution per unit	116	90	86	66	
% Utilization Contribution	100	128	153	177	
	116	115	132	117	
		$(90 \times \frac{128}{100})$	$(86 \times \frac{153}{100})$	$(66 \times \frac{177}{100})$	

ILLUSTRATION 26. A company proposes to install a machine for the manufacture of a component which at present is being purchased at Rs. 24 each. There are two alternatives, namely (a) installation of an automatic machine and (b) installation of a semi-automatic machine. The details of the two machines are as under :

Initial cost of the machine (Rs.)	Automatic Machine	Semi-Automatic Machine
Life	9,00,000	6,00,000
Plant overheads other than depreciation on machines (per annum) (Rs.)	10 years	10 years
Variable expenses of the component (Rs.)	1,62,000	84,000
This company charges depreciation on straight line method. Scrap value of the machine at the end of life is nil.	12	15

The demand for the components at present is 20,000 units per annum. This demand is expected to increase to 40,000 units.

Required

(a) For each of the two volumes of output namely 20,000 and 40,000 units, state with supporting calculations whether the components should be purchased or manufactured by installation of machine. If your decision is in favour of installation of machine, which model will you advise?

(b) At what volume of output should the company change over from purchase of components to manufacture by installation of (i) semi-automatic machine and (ii) automatic machine?

(c) At what volume of manufacture of the components will the company switch over from installation of one type of machine to the other?

SOLUTION (for SOLUTION of (a) see next page)

It will take place
be elastic if the
ed prices should
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STATEMENT SHOWING COST PER UNIT UNDER VARIOUS ALTERNATIVES	
Demand for the Components is 40,000 units	Demand for the Components is 20,000 units
Automatic Machine	Semi-Automatic Machine
Rs. 12.00	Rs. 15.00
8.10	12.00
4.50	4.05
(1,62,000 + 20,000)	(84,000 + 20,000)
24.50	22.20
24.00	18.30
18.60	18.60
24.00	24.00
0.60	(1.80)
(5.70)	(5.40)

SOLUTION (a)

SOLUTION (b)

From the above it is evident that component should be manufactured because it is cheaper than to purchase it. If the demand for the component is 20,000 units, manufacturer is less by semi-automatic machine. Therefore, for demand of 20,000 units automatic machine should be installed. If the demand for component is expected to be 40,000 units of manufacture is less by automatic machine. Hence installation of automatic machine recommended for requirement of 40,000 components.

(b) STATEMENT SHOWING CHARGES OVER PURCHASE TO MANUFACTURE

	Automatic Machine	Semi-Automatic Machine	Diff.
Purchasing price of component	Rs. 24	Rs. 12	12
Less : Variable cost of manufacture			
Saving			
Fixed expenses other than depreciation	1,62,000	84,000	78,000
Add : Depreciation	90,000	60,000	30,000
	(9,00,000 ÷ 10)	(6,00,000 ÷ 10)	
	2,52,000	144,00	108,00
Total fixed expenses			
No. of units at which changeover from purchase to manufacture is to be effec-			
tuted			

Key (or Limiting) Factor

A key factor is that factor which puts a limit on production and profit of a business. Usually limiting factor is sales. A concern may not be able to sell as much as it can sometimes a concern can sell all it produces but production is limited due to the shortage of materials, labour, plant capacity or capital. In such a case, a decision has to be taken regarding the choice of the product whose production is to be increased, reduced or stopped. Ordinarily there is no limiting factor, the choice of the product will be on the basis of the highest per unit contribution. Selection of the product will be on the basis of the highest per unit contribution per unit of scarce factor of production. In short, scarce resources should be utilized those directions where contribution per unit of limited resources is the maximum. For example materials are limited in supply and product X and Y use the same materials. Three materials are used for producing product X and five for Y. Suppose further contribution per material is Rs. 12 in case of product X and Rs. 15 in case of product Y. In this case, contribution per material is Rs. 4 (*i.e.* $\frac{3}{5}$) in case of product X and Rs. 3 ($\frac{12}{20}$) in case of product Y.

The available material should first be used for manufacturing product X upto limit of demand and then the balance of materials (if any) for Y because product X yields more contribution per unit of scarce resource *i.e.*, materials.

As mentioned earlier, usually limiting factor is sales. Therefore, in addition to limitation from the production side, limiting factor may also be difficulty in selling the items produced such a case ranking of items produced will be based on relative contribution per unit of

factor of production but the number of units of a product to be produced getting rank one will be restricted to the number of units as per demand for that product and then the production of the other product getting second rank will be done but restricted to sales demand if balance of limiting factors is available and so on.

If the number of limiting productive factors is more than one and the ranking given by contribution per unit of limiting factor conflicts with that given by the contribution per unit of another limiting factor, the problem of taking decision becomes complicated. In such a case, solution will not be simple as discussed in case of one limiting factor. Mathematical techniques like linear programming are to be applied for handling such types of problems.

ILLUSTRATION 27. A small firm has two production sections, namely, manufacturing and packaging. The total available daily production time in these sections is 400 minutes and 320 minutes respectively. A choice among three products A, B and C in any possible combination is open for production planning. Raw materials, labour and other facilities required are available in sufficient quantities to meet any programme that can be formulated within the plant capacity. The Sales Department is also geared to sell all that is produced. Product A needs 12 minutes of manufacturing time per unit of output and 4 minutes of packaging time, Product B requires 4 minutes each of manufacturing and packaging per unit, and C needs 8 minutes of manufacturing but 24 minutes of packaging per unit. The contribution per unit of A, B and C is respectively Rs. 12, Rs. 8 and Rs. 24, and the total fixed charges per day come to Rs. 500. Advise about the best possible production programme under the circumstances.

SOLUTION

	Product A	Product B	Product C	
Manufacturing time (in minutes)	12	4	8	
Packaging time (in minutes)	4	4	24	
Total time (in minutes)	16	8	32	
Contribution per unit	Rs. 12	Rs. 8	Rs. 24	
Contribution per minute	$\frac{12}{16} = \text{Re. } 0.75$	$\frac{8}{8} = \text{Re. } 1$	$\frac{24}{32} = \text{Re. } 0.75$	

Since time is the limiting factor, product B appears to be most profitable because its contribution per minute is the maximum. So if only product B is produced the position will be as follows:

Manufacturing	Packaging
400	320
Time required to produce 80 units of product B (Maximum production possible is 80 units @ 4 minutes)	320
Idle time (in minutes)	80

Total contribution from 80 units of product B @ Rs. 8 = Rs. 640.

To utilise idle time of 80 minutes in the manufacturing process, either product A or product C should be introduced. Since packaging time is the limiting factor (its total available time being less than manufacturing time). Product A which takes less packaging time than product C should be introduced. Therefore to utilise idle time of 80 minutes of manufacturing time, 10 units of product A instead of product B should be produced. It is worked out as follows :

Less : Manufacturing time required per unit of product A

Additional manufacturing time required if product A is produced instead of product B

Idle manufacturing time

Therefore, output of product A (80/8)

The optimum production arrangement will be as follows :

Production	Manufacturing (minutes)	Packaging (minutes)	Contribution (Rs.)
Product A	10	120 (@ 4 minutes)	120 (@ Rs. 12) 120
Product B	70	280 (@ 4 minutes)	560 (@ Rs. 8) 560
	(50 - 10)	320 (@ 4 minutes)	640

ILLUSTRATION 28. A company manufactures three components. These components pass through two of the company's departments P and Q. The machine hour capacity of each department is limited to 6,000 hours in a month. The monthly demand for components and cost details are as under :

Components	Demand (units)	A	B	C	Total
		900	900	1,350	
		Rs.	Rs.	Rs.	
Direct Materials/unit		45	56	14	
Direct Labour/unit		36	38	24	
Variable Overheads/unit		18	20	12	
Fixed Overheads P @ Rs. 8 per hour		16	16	12	
Q @ Rs. 10 per hour		30	30	10	
		145	160	72	

Components A and C can be purchased from market at Rs. 129 each, and Rs. 70 each respectively. You are required to prepare a statement to show which of the components in what quantities should be purchased to minimise the cost.

SOLUTION

Components	Components			Total hours required
	A	B	C	
	900	900	1,350	
Hours required in Department P	2	2	1	
Hours required in Department Q	3	3	1	
Hours in Departments P & Q calculated on the basis of fixed overheads per unit as given)	5,625	5,625		
Total hours required in Department P to produce maximum quantity demanded	1,800	1,800		
Total hours required in Department Q to produce maximum quantity demanded	2,700	2,700		
Total hours required in the two departments P and Q are 0,900 hours and 6,750 hours respectively. Since the hours available in departments P and Q are 6,000 each, department Q is short of 750 hours (i.e., 6,750 hours required - 6,000 hours available) to produce the components as per demand. Therefore, component A or C will have to be purchased from market. Which of the components in what quantity to be purchased to minimise the cost will be computed as given below :				
Statement showing the Units of the Component A or C to be Purchased to Minimise the Cost				
Component	A	B	C	
	Rs.	Rs.	Rs.	
Variable cost to purchase per unit	129	70	50	
Extra cost to make per unit	99	20		
Netta cost to buy per unit	30	1		
Hours required in department Q (i.e. department which is short of 750 hours)	10	20		
Hours required per unit	3	1		
Watta cost per hour on buying	(Rs. 30)	(Rs. 20)	(Rs. 1)	

Component A is minimum, component A should be purchased to the extent of units requiring 750 hours to make these units. Therefore, 250 units of

Component A (i.e., $\frac{750}{3}$ hours required per unit) should be purchased from the market to minimise cost.

ILLUSTRATION 29. Comment on the relative profitability of the following two products if Production cost per unit

	<i>Product A</i>	<i>Product B</i>
Rs.	Rs.	Rs.
Materials	100	100
Wages	350	200
Fixed Overhead	150	360
Variable Overhead	200	1,000
Profit	1,000	100

SOLUTION

COMPARATIVE STATEMENT OF PROFITABILITY

	<i>Product A</i>	<i>Product B</i>
Rs.	Rs.	Rs.
Sale price per unit	1,000	1,000
<i>Less :</i>		
Marginal cost per unit	200	150
Materials	100	200
Wages	350	460
Variable Overheads	150	450
Contribution per unit		
<i>Less :</i>		
Fixed cost per unit		
Profit per unit		
Output per week		
Profit per week		
P/V Ratio ($\frac{\text{Contribution}}{\text{Sale}}$ × 100)	55% ($\frac{550}{1,000} \times 100$)	45% ($\frac{450}{1,000} \times 100$)

Contribution per unit, total profit and P/V ratio are higher in case of product A though profit per unit of product B is higher. If output is the key factor, product B will give more profit, so it is preferable. But if there is no limit on the output, then product A will give more profit.

ILLUSTRATION 30. X Ltd. has two factories, one at Lucknow and another at Pune producing 7,200 tonnes and 10,800 tonnes of a product against the maximum production capacity of 9,000 and 11,880 tonnes respectively at Lucknow and Pune.

The maximum quantity of 10% of the raw material introduced is lost in the production process. The maximum quantity available locally are 6,000 and 13,000 tonnes at Rs. 720 and Rs. 729 per tonne at Lucknow and Pune respectively. For the additional needs a supplier of Bhopal is ready to supply raw material at our factory site at Rs. 792 per tonne.

Other variable costs of the production process are Rs. 22.32 lacs and Rs. 32.94 lacs and fixed costs are Rs. 18 lacs and Rs. 24.84 lacs respectively for Lucknow and Pune factory.

The output is sold at a selling price of Rs. 1,450 and Rs. 1,460 per tonne by Lucknow and Pune factory respectively.

You are required to compute the cost per tonne and net profit earned in respect of each factory. Can you suggest any other alternative production plan for both the factories without any change in present total output of 18,000 tonnes whereby the company may earn optimum profit.

SOLUTION

	STATEMENT SHOWING COST PER TONNE AND NET PROFIT EARNED	
(A)	Factory at Lucknow	Factory at Pune
(1)	Rs. 7,200	Rs. 10,800

Raw Material

Marginal Costing and Cost Volume Profit Analysis

Other Variable Costs
Fixed Costs
Total Cost

(B)	22.32,000	32.8
(C)	18,00,000	24.4
(D)	99,36,000	1,45

(D - C)	1,380	
(D - C)	1,450	
(D - C)	70	12.

Total Profit of X Ltd. = Rs. 5,04,000 + Rs. 12,42,000 = Rs. 17,46,000.

ALTERNATIVE PRODUCTION PLAN TO EARN OPTIMUM PROFIT

	Tonnes	Rs.
Cost per Tonne (B) + (A)		
Selling Price per Tonne		
Net Profit per Tonne		
Total Net Profit (Output × Profit)		
(7,200 × Rs. 70)	(10,800 × Rs. 1)	

	Rs.
Cost per Tonne (B) + (A)	(7,200 × 100)
Selling Price per Tonne	(792 × 90)
Net Profit per Tonne	(792 × 100)
Total Net Profit (Output × Profit)	(7,200 Tonnes)
(D)	1,450

	Rs.
Maximum Production Capacity	800
Present Production	(792 × 90)
Cost of Materials of Output from Bhopal after Allowing 10% Wastage	680
Cost of Material from Material Purchased from Bhopal after Allowing 10% Wastage	(792 × 100)
(C)	310
(D)	(Rs. 22,32,000) (7,200 Tonnes)
(D)	(Rs. 32,04, 10,800 Tonnes)

The priority to be given to produce 18,000 tonnes of total output, on the basis of above calculation follows:

Priority I
II
III
IV

Pune Factory (if material is purchased locally)
Lucknow Factory (if local purchase of material is made)
Pune Factory (if raw material is purchased from Bhopal)
Lucknow Factory (if material is purchased from Bhopal)

BUCCO-FERRED ALTERNATIVE PRODUCTION PLAN TO EARN OPTIMUM PROFIT

	Raw Material	Input (Tonnes)	Output (Tonnes)	Rs.
I	13,000	Lucknow	11,700	(13,000 - 10% Wastage)
II	6,000	(Local material available at Pune)	11,700	(6,000 - 10% Wastage)

Raw Material

Marginal Costing and Cost Volume Profit Analysis

Marginal Costing and Cost Volume Profit Analysis

SOLUTION

CALCULATION OF CONTRIBUTION PER MACHINE HOUR

				Products
				A B X
III	200 (i.e. $180 \times \frac{100}{90}$) (Material from Bhopal)	—	180 (11,880 Capacity of Pune - 1,700)	180
IV	$800 \left(i.e. 720 \times \frac{100}{90} \right)$	720	—	720
			(Balance output needed to have total output of 18,000 tonnes)	
	20,000	6,120	11,880	18,000

Working Note:

(I) Cost of Raw Material

Present Production (Tonnes)
Total Material Required
(After allowing 10% wastage)

Lucknow
7,200

Pune

10,800

Rs. 729

—

12,000

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MACHINING HOURS UTILISATION

If machines are converted into a variable centre

Product	Product X	Product Y
A	9,000	3,000
B	4,800	1,600
(of M ₁)	1,800	600
(of M ₂)	1,200	400
Total	3,000	1,600

Only change after conversion is that 900 free hours of M₂ can be used to produce the more profitable product A instead of product Y. By doing so additional contribution generated in 900 free hours is 900 hours contribution per hour of A—contribution per hour of Y = 900 (Rs. 10/Rs. 10) = Rs. 1,800. Additional fixed cost on conversion is Rs. 40,000. Since additional cost on conversion is much more than additional contribution on conversion, it is recommended that conversion of machine into a variable centre should not be undertaken.

ILLUSTRATION 32. S.R. Ltd. manufactures 3 products A, B and C. The details are as under:

Product	A	B	C
Per Unit	Rs. 10	Rs. 19	Rs. 25
Direct Materials	15	19	11
Direct Labour	7	5	6
Variable Overhead	3	6	4
Selling Price	30	38	50
Output per day (Units)	100	60	50

If solo of product A exceeds 50 units a day, the selling price is expected to fall to Rs. 29 a unit for each additional unit ; if solo of C exceeds 20 units a day, the selling price is expected to fall to Rs. 49 a unit for each additional unit and if solo of B exceeds 15 units a day, the price is expected to fall to Rs. 37 a unit for each additional unit.

The company works an eight-hour day and on an average 40 minutes daily are taken by machine setting up time. The constraint is the machine capacity. Work out the optimum level of production that would give maximum profits for the company.

SOLUTION

- At initial demand prices :

Product	A	B	C
Output (units)	50	60	50
Rs.	500	600	500
Contribution per unit	15	19	25
Total Contribution	750	1140	1250

Product	Output \times Sales Units	CONTRIBUTION OF OPTIMUM CONTRIBUTION	
		Contribution per unit at Initial demand prices	Total Contribution
Product A	50 units	Rs. 192.50	Rs. 192.50
Product B	18 units	Rs. 120.00	Rs. 120.00
Product C	20 units	Rs. 200.00	Rs. 200.00
		512.50	512.50

ILLUSTRATION 33. The following is the quarterly budget of a company engaged in manufacture of a range of products.

Product	A	B	C
Rs.	5,600	5,600	5,200
Contribution per unit	3,600	3,600	3,200
(A)	1,000	1,200	2,300
Total contribution	3,600	4,320	7,500
(60 × Rs. 6)	(60 × Rs. 8)	(20 × Rs. 10)	
II.			
At further demand prices :			
Possible Output (units)	60	45	60
Contribution per unit	(110 - 60)	(60 - 15)	(60 - 90)
Rs.	5,100	4,500	2,400
Selling price per unit	37	49	40
(A)	29	30	40
Marginal cost	25	25	25
Contribution per unit	4	4	15
(B)	315	315	240
Total contribution (a) + (b)	(60 × Rs. 4)	(45 × Rs. 7)	490
Total Contribution	4,000	6,200	5,700

If withdrawal of 6 units of A from the market will not reduce the sale of A, then company should produce only A because it gives maximum contribution of Rs. 3,600. Rs. 3,600 contribution of Rs. 400 can be fully recovered in Rs. 600 if no new product is introduced. At units of B and an extra of 60 additional units of C at selling price of Rs. 10/Rs. 10 minutes.

180 minutes (60 × 10)

10 minutes

140 minutes

Time used for production

100 minutes

286 min

Time left for producing product A

154 min

Time left for producing product B

38.5 min

Time left for producing product C

154 min

Time used for producing 60 units of B $\Rightarrow \frac{1}{4}$ minutes per unit

110 minutes

Time used for producing 45 units of A $\Rightarrow \frac{1}{4}$ minutes per unit

110 minutes

Time used for producing 60 units of C $\Rightarrow \frac{1}{4}$ minutes per unit

110 minutes

Time used for producing 49 units of B $\Rightarrow \frac{1}{4}$ minutes per unit

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Time used for producing 60 units of C $\Rightarrow \frac{1}{4}$ minutes per unit

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Time used for producing 49 units of A $\Rightarrow \frac{1}{4}$ minutes per unit

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Time used for producing 60 units of B $\Rightarrow \frac{1}{4}$ minutes per unit

The production capacity is limited to 7,53,000 hours in the quarter. Products A and C can be bought and sold. The purchase prices of the products A and C respectively are Rs. 890 and Rs. 2,200.

- Determine whether the investment in advertisement campaign should be made or not;
- Compute the profit or loss arising from the implementation of the advertisement programme. (U.C.W.A. Final, June 2003)

SOLUTION

Computation of Contribution per Hour and Ranking of Products

	Products				Total
	A	B	C	D	
Contribution per unit (a)	Rs. 1,000	Rs. 1,200	Rs. 2,300	Rs. 2,000	
Less : Variable Cost per unit :					
Direct Material	425	555	1,275	1,045	
Direct Labour	180	180	280	265	
Variable Overheads	240	240	480	400	
Variable Cost per unit (b)	845	975	2,035	1,710	
Contribution per unit (a) - (b)	155	225	265	290	
Contribution per hour (a) - (b) (hours per unit) $\left(\frac{\text{Variable Overheads}}{\text{Rs. 8}}$)	30	30	60	50	
Ranking of the Products according to Contribution per hour	III	I	IV	II	

Computation of the Profit or Loss from the Implementation of the Advertisement Programme

	Products				Total
	A	B	C	D	
No. of units expected to be sold after advertisement	4,000	6,200	5,700	3,300	
Hours required	$(4,000 \times 30)$	$(6,200 \times 30)$	$3,42,000$	$1,65,000$	
Hours available	$(4,000 \times 30)$	$(6,200 \times 30)$	$(5,700 \times 60)$	$(3,300 \times 60)$	
Necessitating purchase of either A or C	1,20,000	1,85,000	890	890	
Purchase Price	$(4,000 \times 30)$	$(6,200 \times 30)$	Rs. 845	Rs. 845	
Extra Price to be paid	-	-	45	45	
Hours required per unit	30	30	30	30	
Extra Cost per hour	Rs. 150	Rs. 150	Rs. 150	Rs. 150	
Ranking (cheapest cost first)	I	II	III	IV	
A should be bought					
Units of A to be bought					
Share of Hours					
Hours used					
Total	4,000	6,200	5,700	3,300	
Less : Variable cost	3,600	5,600	5,200	3,000	
Contribution per unit	400	600	500	300	

Contribution margin per unit	Rs. 155	Rs. 225	Rs. 265	Rs. 290	Rs. 290
Total contribution on Additional Units	62,000	1,35,000	1,32,500	87,000	87,000
Less : Variable cost of buying 200 units of A @ Rs. 45 per unit					4,16,500
Additional cost					2,90,000
Additional Profit					1,26,500

Conclusion : Advertisement programme should be implemented because it gives additional profit of Rs. 1,26,500.

Effect of Change in Selling Price

Management is confronted with the problem of cut in prices of products from time to time on account of competition, expansion programme or government regulations. It is, therefore, necessary to know the effect of a cut in prices of the products.

ILLUSTRATION 34. A company budgets a production of 5,00,000 units at a variable cost of Rs. 20 each. The fixed costs are Rs. 20,00,000. The selling price is fixed to yield 25% on cost. You are required to calculate :

(1) P/V ratio,
(2) Break even point.
If the selling price is reduced by 20%, find (a) the effect of the price reduction on the break-even point and P/V ratio, (b) the number of units required to be sold at the reduced selling price to obtain an increase of 20% over the budgeted profit.

SOLUTION

Calculation of Selling Price

Variation per unit
Fixed cost for 5,00,000 units is Rs. 20,00,000, so fixed cost per unit

$$\text{Selling Price} = \frac{\text{Fixed Cost} + \text{Profit}}{\text{P.V.Ratio}} = \frac{20,00,000 + 5,00,000}{\frac{1}{3}} = \text{Rs. } 30$$

Effect of Change in Selling Price

Total Cont. $= 24 \times \frac{25}{100}$ = Rs. 6

Add. Profit on cost (i.e., $24 \times \frac{25}{100}$) $= \frac{24 \times 25}{100} \times 30 = \text{Rs. } 30$

Selling Price $= \text{Fixed cost per unit} + \text{Profit per unit}$

Contribution per unit $= \text{Rs. } 4 + \text{Rs. } 6 = \text{Rs. } 10$

P.V Ratio $= \frac{\text{Contribution}}{\text{Sales}} = \frac{10}{30} = 33\frac{1}{3}\%$

Break even Point $= \frac{\text{Fixed Expenses (Total)}}{\text{P.V Ratio}} = \frac{20,00,000}{33\frac{1}{3}\%} = \text{Rs. } 60,00,000$

If the selling price is reduced by 20%:

Present selling price	Rs. 30
With reduction	Rs. 6
New selling price	Rs. 24
Less : Variable cost	20
Contribution per unit	4

$$\begin{aligned} \text{P/V ratio after 20% reduction} &= \frac{\text{New Contribution}}{\text{New Sales}} \times 100 \\ &= \frac{\text{Rs. } 4}{\text{Rs. } 24} \times 100 = 16\frac{2}{3}\% \\ \text{Break-even point after 20% reduction} &= \frac{\text{New P/V Ratio}}{\text{Fixed Expenses}} \\ &= \frac{\text{Rs. } 20,00,000}{\text{Rs. } 16\frac{2}{3}\%} = \text{Rs. } 1,20,00,000 \end{aligned}$$

Calculation of number of units required to be sold to obtain an increase of 20% over the budgeted profit

$$\begin{aligned} \text{Budgeted profit on } 5,00,000 \text{ units} @ \text{Rs. } 6 &= \text{Rs. } 30,00,000 \\ \text{Add: } 20\% \text{ increase} &= \text{Rs. } 6,00,000 \\ \text{Desired profit} &= \text{Rs. } 36,00,000 \\ \text{Sales (in units)} &= \frac{\text{Fixed Expenses + Profit}}{\text{Selling Price (per unit) - Marginal (cost per unit)}} \\ &= \frac{\text{Rs. } 20,00,000 + \text{Rs. } 36,00,000}{\text{Rs. } 24 - \text{Rs. } 20} \\ &= \frac{\text{Rs. } 56,00,000}{\text{Rs. } 4} = 14,00,000 \text{ units.} \end{aligned}$$

Maintaining a Desired Level of Profits

Management may be interested in maintaining a desired level of profits. The volume of sales needed to have a desired level of profits can be ascertained by the marginal costing techniques.

ILLUSTRATION 35. A and B are two similar plants under the same management who want them to be merged for better expansion. The details are as follows :

Plant	Capacity operated	A	B
	(in lakhs)	100%	70%
	Rs.	Rs.	Rs.
Turnover	200	210	140
Variable Cost	150	140	60
Fixed Cost	40	40	60

Find out : (i) the capacity of the merged plant at break even ; (ii) turnover from the merged plant to give a profit of Rs. 20 lakhs.

SOLUTION

Plant	Capacity	A	B	A + B
	Turnover (Rs. in lakhs)	100%	100%	100%
	(^a)	200	300	500
	Variable cost	150	200	350
	Contribution (^c)	50	100	150
	Fixed cost	40	60	100

$$\text{P/V Ratio} = \frac{150}{500} \times 100 = 30\%$$

$$\begin{aligned} \text{(i) Break even for the merged plant} \\ \frac{\text{Fixed Cost}}{\text{P/V Ratio}} &= 100 \times \frac{100}{30} = \frac{1000}{3} \text{ lakhs} \end{aligned}$$

$$\begin{aligned} \text{(ii) Capacity of the merged plant at B.E.P.} \\ &= \frac{100 \times 1000 \text{ lakhs}}{500 \text{ lakhs} \times \frac{1}{3}} = 60\frac{2}{3}\% \end{aligned}$$

(ii) Required Turnover = $\frac{\text{Fixed Cost + Required Profit}}{\text{P/V Ratio}}$

$$\begin{aligned} &= \frac{\text{Rs. } 100 \text{ lakhs} + \text{Rs. } 20 \text{ lakhs}}{30\%} = \frac{120 \text{ lakhs} \times 100}{30} \\ &= \text{Rs. } 400 \text{ lakhs.} \end{aligned}$$

Selection of a Suitable Product Mix

When a factory manufactures more than one product, a problem is faced by the management as to which product mix will give the maximum profits. The best product mix is that which yields the maximum contribution. The products which give the maximum contribution are to be retained and their production should be increased to the extent of their demand in the market and their contribution should be increased to the extent of their contribution should be reduced or closed down altogether. The products which give comparatively less contribution should be reduced or closed down altogether. The effect of sales mix can also be seen by comparing the P/V ratio and reduces the break even point. The new sales mix will be favourable if it increases the P/V ratio and reduces the break even point. However, management should keep in view the effect of new sales mix on physical and financial resources of the organisation and arrange them accordingly.

ILLUSTRATION 16. The following set of information is presented to you by your client AB Ltd. producing two products X and Y.

	X	Y
20	6	18
40	6	30
100	150	150
200	150	150

(i) Direct Material per unit (Rs.)
(ii) Direct Wages per unit (Rs.)
(iii) Fixed Prices per unit (Rs.)

Proposed Future Mixes

(i) (units)
(ii) (i)
(iii) (i)

(iv) Fixed expenses during the period are expected to be Rs. 1,600.

(v) Variable expenses are allocated to products at the rate of 100% of Direct Wages.
(vi) Variable expenses are required to present to the management of AB Ltd. the following
(a) As a final Accountant
(b) The unit marginal cost and unit contribution.
(c) The total contribution and resultant profit from each of the above sales mixes.
(d) The proposed sales mixes to earn a profit of Rs. 300 and Rs. 600 with the total sales of X and Y being 100 units.

ILLUSTRATION 17.

AB Ltd. STATEMENT OF UNIT MARGINAL COST AND UNIT CONTRIBUTION

	X	Y	Total	Per unit	Per unit	Per unit	Per unit
Rs.	40	40	80	Rs.	Rs.	Rs.	Rs.
20	6	32	48	18	4	4	36
6	6	8	8				
NIL	NIL	NIL	NIL				

STATEMENT OF PROFITABILITY OF DIFFERENT SALES MIXES

(i) (a) Contribution (X) - (B)
(b) Contribution (Y) - (B)

(c) Contribution (X) - (A)

(d) Contribution (Y) - (A)

(e) Contribution (X) - (C)

(f) Contribution (Y) - (C)

(g) Contribution (X) - (D)

(h) Contribution (Y) - (D)

(i) Contribution (X) - (E)

(j) Contribution (Y) - (E)

(k) Contribution (X) - (F)

(l) Contribution (Y) - (F)

(m) Contribution (X) - (G)

(n) Contribution (Y) - (G)

(o) Contribution (X) - (H)

(p) Contribution (Y) - (H)

(q) Contribution (X) - (I)

(r) Contribution (Y) - (I)

(s) Contribution (X) - (J)

(t) Contribution (Y) - (J)

(u) Contribution (X) - (K)

(v) Contribution (Y) - (K)

(w) Contribution (X) - (L)

(x) Contribution (Y) - (L)

(y) Contribution (X) - (M)

(z) Contribution (Y) - (M)

(aa) Contribution (X) - (N)

(bb) Contribution (Y) - (N)

(cc) Contribution (X) - (O)

(dd) Contribution (Y) - (O)

(ee) Contribution (X) - (P)

(ff) Contribution (Y) - (P)

(gg) Contribution (X) - (Q)

(hh) Contribution (Y) - (Q)

(ii) Break even for the merged plant

$= \frac{\text{Fixed Cost}}{\text{P/V Ratio}} = 100 \times \frac{100}{30} = \frac{1000}{3} \text{ lakhs}$

(jj) Profitability of the merged plant at B.E.P.

$= \frac{100 \times 1000 \text{ lakhs}}{500 \text{ lakhs} \times \frac{1}{3}} = 60\frac{2}{3}\%$

Marginal Costing and Cost Volume Profit Analysis

Marginal Costing and Cost Volume Profit Analysis

(c)	PROPOSED MIXES		
	Case I	Case II	
Required Profit (Rs.)	300	600	
Fixed Cost (Rs.)	1,600	1,600	
Contribution (Rs.)	1,900	2,200	

Case I :

Let p nos. of X to be sold
then $(300 - p)$ nos. of Y are to be sold.

$$\text{Equating } 8p + 4(300 - p) = 1900$$

$$\text{or } 8p + 1,200 - 4p = 1,900$$

$$\text{or } 4p = 700$$

$$\therefore \quad p = 175 \text{ units}$$

$$\text{Proposed mix} \quad X = 175 \text{ units}$$

$$Y = 125 \text{ units (i.e., 300 units} - 175 \text{ units of X)}$$

Case II :

Say 'd' nos. of X to be sold
then $(300 - d)$ nos. of Y are to be sold.

$$\text{Equating } 8d + 4(300 - d) = 2,200$$

$$\text{or } 8d + 1,200 - 4d = 2,200$$

$$\text{or } 4d = 1,000$$

$$\therefore \quad d = 250$$

$$\text{Proposed Mix} \quad X = 250 \text{ units}$$

$$Y = 50 \text{ units (i.e., 300 units} - 250 \text{ units of X)}$$

ILLUSTRATION 37. Calculate the effect of sales mix from the following data by comparing the P/V ratio and break even point :

EXISTING SALES MIX					
	P	Q	R	S	Total
Sales	Rs. 40,000	Rs. 50,000	Rs. 20,000	Rs. 10,000	
Variable Costs	24,000	34,000	16,000	4,000	
New Sales Mix	30,000	44,000	40,000	6,000	
Fixed Cost	Rs. 29,400				

SOLUTION

	P	Q	R	S	Total
Sales	Rs. 40,000	Rs. 50,000	Rs. 20,000	Rs. 10,000	Rs. 1,20,000
Variable Costs	24,000	34,000	16,000	4,000	78,000
Contribution	16,000	16,000	4,000	6,000	42,000
P/V Ratio	$\left[\frac{\text{Contribution}}{\text{Sales}} \times 100 \right]$	40%	32%	20%	35%
Break Even Point	Rs. 29,400 (i.e., Fixed Cost)				
Contribution	35%				
					84,000

NEW SALES MIX					
	P	Q	R	S	Total
Sales	Rs. 30,000	Rs. 44,000	Rs. 40,000	Rs. 6,000	Rs. 1,20,000
Variable Costs	18,000	29,920	32,000	2,400	82,320
Contribution	(60%)	(68%)	(80%)	(40%)	
					37,680

From the above it is clear that new sales mix is not favourable as it reduces the P/V Ratio and pushes up the break even point.

II. ILLUSTRATION 38. A company has furnished the following product mix for a period :

Product	Sales Rs.	P/V Ratio
A	3,00,000	50%
B	4,00,000	40%
C	8,00,000	25%

Required :

(i) Prepare a statement showing the loss.

(ii) Suggest a change in the product mix such that the total sales value is not changed and that the total value of sales of product A cannot exceed Rs. 4 lacs to eliminate the loss. (J.C.W.A. Final)

SOLUTION

Product	Sales Rs.	P/V Ratio	Contribution
A	3,00,000	50%	1,50,000
B	4,00,000	40%	1,60,000
C	8,00,000	25%	2,00,000

(ii) Change in the product mix desired to eliminate the loss of Rs. 40,000

Further contribution desired to eliminate loss
Maximum possible sale of A giving the highest P/V ratio of 50%

Increase in sale of A as compared to the present sale
(Rs. 4,00,000 - Rs. 3,00,000)

Built of sale from C (giving lowest P/V Ratio) to A

A's P/V ratio

C's P/V ratio

Difference in P/V ratio (50% - 25%)

Additional contribution on shifting Rs. 1,00,000
Sale from C to A (Rs. 1,00,000 × 25%)

further contribution desired (Rs. 40,000 - Rs. 25,000)

B's P/V ratio

C's P/V ratio

Total sale value remaining same

Additional contribution on sale of B to be shifted from C
Additional sale of B = Rs. 15,000 × $\frac{100}{15}$ = Rs. 1,00,000
Hence, revised sales mix to eliminate loss of Rs. 40,000 is :

Product A = Rs. 3,00,000 + Rs. 1,00,000	= Rs. 4,00,000
Product B = Rs. 4,00,000 + Rs. 1,00,000	= Rs. 5,00,000
Product C = Rs. 8,00,000 - Rs. 2,00,000	= Rs. 6,00,000
Total sale value remaining same	= Rs. 15,00,000

True work

If the high contribution.
ation of the price

ILLUSTRATION 39. A company engaged in plantation activities has 200 hectares of virgin land which can be used for growing jointly or individually tea, coffee and cardamom. The yield per hectare of the different crops and their selling prices per kg. are as under :

	Yield kgs.	Selling Price per kg. Rs.
Tea	2,000	50
Coffee	500	40
Cardamom	100	30

The relevant cost data are given below :

(A) Variable Cost per kg.
Tea
Rs. 10
Labour Charges
2
Packing Materials
10
Other Costs
4
Total Cost
14

(B) Fixed Cost per annum
Cultivation and Growing Cost
Administration Cost
Land Revenue
Repairs and Maintenance
Other Costs
Total Costs
18,00,000

	Tea	Coffee	Cardamom
Rs.	Rs.	Rs.	Rs.
Labour	10	10	120
10	10	10	10
2	2	2	20
4	4	1	20
Total	14	13	150

The policy of the company is to produce and sell all the three kinds of products and the maximum and minimum area to be cultivated per product is as follows :

	Maximum	Minimum
Tea	100	120
Coffee	50	30
Cardamom	30	10

Calculate the most profitable product mix and the maximum profit which can be achieved.

SOLUTION

	Tea	Coffee	Cardamom
Rs.	Rs.	Rs.	Rs.
10	40	50	120
10	10	10	10
2	2	2	20
4	4	1	20
Total	14	13	150

Thus, order of priority will be coffee, tea and cardamom.

ILLUSTRATION 40. From the following particulars find the most profitable product mix and prepare a statement of profitability of the product mix.

	Product A	Product B	Product C
Production per hour	4 hrs.	3 hrs.	2.5 hrs.
Unit Profit	Rs. 6,75,000	1,00,000	1,00,000
Fixed Overheads	Rs. 1,00,000	Rs. 1,00,000	Rs. 1,00,000
Profit	Rs. 575,000	Rs. 100,000	Rs. 100,000

ILLUSTRATION 40. From the following particulars find the most profitable product mix and prepare a statement of profitability of the product mix.

	Product A	Product B	Product C
Production per hour	4 hrs.	3 hrs.	2.5 hrs.
Unit Profit	Rs. 6,75,000	1,00,000	1,00,000
Fixed Overheads	Rs. 1,00,000	Rs. 1,00,000	Rs. 1,00,000
Profit	Rs. 575,000	Rs. 100,000	Rs. 100,000

	Product A	Product B	Product C
Production per hour	4 hrs.	3 hrs.	2.5 hrs.
Unit Profit	Rs. 6,75,000	1,00,000	1,00,000
Fixed Overheads	Rs. 1,00,000	Rs. 1,00,000	Rs. 1,00,000
Profit	Rs. 575,000	Rs. 100,000	Rs. 100,000

All the three products are produced from the same direct material using the same type of machines and labour. Direct labour, which is the key factor, is limited to 10 hours.

SOLUTION

STATEMENT SHOWING THE MOST PROFITABLE PRODUCT MIX

	Product A	Product B	Product C
Production per hour	4 hrs.	3 hrs.	2.5 hrs.
Unit Profit	Rs. 6,75,000	1,00,000	1,00,000
Fixed Overheads	Rs. 1,00,000	Rs. 1,00,000	Rs. 1,00,000
Profit	Rs. 575,000	Rs. 100,000	Rs. 100,000

Ranking of Most Profitable Product Mix

(i) Contribution per hour \div (ii)

(iii) Contribution per hour \div (iv)

(v) Contribution per hour \div (vi)

(vii) Contribution per hour \div (viii)

Direct labour hour is the key factor and only 18,600 labour hours are available to produce the three products which are not sufficient to produce maximum possible units of sales of all three products. Therefore, available 18,600 hours are utilised in the order of ranking assigned as follows:

	Hours Utilised
Product C : 1,500 units (to the extent of maximum possible units of sales) @ 2 hours	3,000
Product B : 5,000 units (to the extent of maximum possible units of sales) @ 3 hours	15,000
Product A : 150 units (to the extent of balance of 600 hours available) @ 4 hours	600 (Remaining hrs.)

STATEMENT OF PROFITABILITY OF THE MOST PROFITABLE PRODUCT MIX

	Rs.
Contribution from 150 units of Product A @ Rs. 25 per unit	3,750
Contribution from 5,000 units of Product B @ Rs. 24 per unit	33,000
Contribution from 1,500 units of Product C @ Rs. 22 per unit	33,000
Total Contribution	18,600
<i>Less</i> : Fixed Overheads	60,000
Maximum Possible Profit	96,750

Working Note (1) :

Calculation of Fixed Overheads

	Product A	Product B	Product C	Total
Units budgeted to be produced	1,800	3,000	1,200	
Fixed Overheads per unit (Rs.)	10	10	10	
Total Fixed Overheads (Rs.)	18,000	30,000	12,000	60,000

ILLUSTRATION 41. The directors of ABC Ltd., manufacturers of three products A, B and C, have asked for advice on the product mix of the Company.

The following information is given :

	Products		
	A	B	C
	Rs.	Rs.	Rs.
Standard cost per unit:			
Direct Material			
Variable Overhead			
Direct Labour :			
Rate/Hr.			
Department 1			
Rate 1			
Hrs. 20			
Hrs. 6			
Hrs. 16			
Hrs. 4			
Hrs. 30			
Rate 2			
Hrs. 5			
Hrs. 10			
Rate 1			
Hrs. 16			
Hrs. 8			
Hrs. 30			
Current production per annum			
Selling price per unit			
Forecast of sales for the next year			
Fixed overhead per annum			
Rs. 4,00,000			

Further, the type of labour required by Department 2 is in short supply and it is not possible to increase the manpower of this department beyond its present level.

(a) You are required to prepare a statement showing the most profitable mix of the products to be made and sold. The statement which should be presented in two parts should show :

- (i) the profit expected on the current budgeted production, and
- (ii) the profit which could be expected if the most profitable mix was produced.

(i) You are also required to bring out any problems which are likely to arise if the product in (a) (ii) above were to be adopted.

SOLUTION

(a) Statement showing the profit expected on the current budgeted production.

	A	B	C	Total
Units	1,600	7,000	9,000	Rs.
Margin of Contribution	1,60,000	9,52,000	16,20,000	27,32,000
Fixed Cost	1,28,000	7,00,000	11,70,000	19,98,000
Net Profit	32,000	2,52,000	4,50,000	7,34,000
				4,00,000
				3,34,000

(b) The following problems may arise if the product mix in (a) (ii) above were to be adopted :

- (i) If the demand of A is complementary to the demand of B and C, then the sale of A are likely to fall as the sale of A falls.
- (ii) It may affect the customer preference adversely due to lower production of A.

Diversification of Products

Sometimes it becomes necessary for a concern to introduce a new product to the market or to produce or products in order to utilise the idle capacity or to capture a new market or for other purposes. The new product must be profitable. In order to decide about the profitability of the new product it is assumed that the manufacture of new product will not increase fixed costs concerned and if the price realised from the sale of such product is more than its variable

In production, it is worth trying. If this data is presented under absorption costing method, the decision will be wrong. This will be clear from the illustration given below:

ILLUSTRATION 42. The following data are available in respect of product X produced by Delhi Co. Ltd.

Sales Rs. 70,000; Direct Materials Rs. 30,000, Direct Labour Rs. 15,000; Variable Overhead Rs. 7,000; Fixed Overhead Rs. 10,000.
The company now proposes to introduce a new product Z so that sales may be increased by Rs. 30,000. There will be no increase in fixed costs and the estimated variable costs of product Z are: Materials Rs. 15,000; Labour Rs. 7,000; Overhead Rs. 5,000. Advise whether product Z will be profitable or not.

SOLUTION

PRESSENT POSITION UNDER ABSORPTION COSTING

	Product X	Product Z	Total
Sales (A)	Rs. 70,000	Rs. 70,000	Rs. 140,000
Less : Marginal Cost:			
Direct Materials	Rs. 30,000	Rs. 30,000	Rs. 60,000
Direct Labour	Rs. 15,000	Rs. 15,000	Rs. 30,000
Variable Overheads	Rs. 7,000	Rs. 7,000	Rs. 14,000
Fixed Overhead (apportioned on the basis of sales)			
Total cost	Rs. 54,000	Rs. 54,000	Rs. 108,000
Sales	Rs. 70,000	Rs. 70,000	Rs. 140,000
Profit (A - C) Loss	Rs. 16,000	Rs. 16,000	Rs. 16,000

From the above it is observed that the whole profit is contributed by product X while product Z incurs a loss of Rs. 5,000. But if the data is presented under *Marginal Costing*, the position will be different.

	Product X	Product Z	Total
Sales (A)	Rs. 70,000	Rs. 70,000	Rs. 140,000
Less : Marginal Cost:			
Direct Materials	Rs. 30,000	Rs. 30,000	Rs. 60,000
Direct Labour	Rs. 15,000	Rs. 15,000	Rs. 30,000
Variable Overheads	Rs. 7,000	Rs. 7,000	Rs. 14,000
Total Marginal Cost (B)	Rs. 52,000	Rs. 52,000	Rs. 104,000
Contribution [(A) - (B)]	Rs. 18,000	Rs. 18,000	Rs. 18,000
Less : Fixed Cost			
Profit	Rs. 10,500	Rs. 10,500	Rs. 10,500

From the above it is clear that product Z is contributing Rs. 2,500 towards fixed costs and profits. Hence Product Z may be introduced provided the capacity utilized by Z may not be utilized more profitably otherwise. But if with the introduction of new product there is an increase in fixed costs, then such specific increase in fixed costs must be deducted from the contribution for making any decision. General fixed costs will, however, be charged to the old product produced.

Closing Down or Suspending Activities

Sometimes it becomes necessary for a firm to temporarily suspend or close the activities of a particular product, department or factory as a whole due to trade recession. The decision to close down or suspend its activities will depend on whether products are making a contribution towards fixed costs or not. If the products are making a contribution towards fixed costs, it is preferable not to close business or suspend its activities to minimize the losses. If the business is closed down to certain fixed costs which could be avoided but there will be certain expenses which will have to be incurred at the time of closing the operation like redundancy payments, necessary maintenance of plant or overhauling of plant on reopening, training of personnel etc. Such costs are associated with closing down of the business and must be taken into consideration before taking any decision. Fixed costs may be general or specific. General fixed costs may or may not remain constant while specific costs will be directly affected by the closing down of the operation. To conclude, if general fixed costs are likely to come down in the event of closure or suspension of activities, the excess of contribution over specific fixed costs will have to be compared with reduction in general fixed cost. If the former exceeds the latter it is profitable to continue the activities and close down or suspend activities if the latter exceeds the former.

- In addition to cost consideration, there may be some non-cost considerations which may bring the decision to close down or suspend its activities or not. The following non-cost considerations are relevant in this respect:
- Once the business is closed down, competitors may establish their products and heavy business may be lost. It may be difficult to recapture the lost market again; heavy advertisement charges may have to be incurred to recapture the business again.
 - Fear of retrenchment of workers. If workers are discharged it may be difficult to get experienced and skilled workers again at the restart of the business.
 - Plant may become obsolete with the closure of the business. Expenditure may have to be incurred on restart of the business.
 - Reputation of the firm may suffer if some activities are closed down or suspended respectively and considerable saving in Fixed Cost for 2003, it expects to incur even if the company prefers to shut down its operations for 2003, it expects to incur minimum fixed cost of Rs. 60,000. You are required to :
 - Present the comparative statement for the years 2002 and 2003 showing under marginal costing.
 - What will be minimum sales required, if it decides to shut down its unit in 2003? (C.A. Final, Nov. 5, 2003)

SOLUTION

ILLUSTRATION 43. Supreme Ltd. which manufactures the component EXCEL, has achieved turnover of Rs. 6,00,000 for the calendar year 2002. The Manager of the company has informed the company has worked at a profit volume ratio of 25% and margin of safety of 20%. But due to severe competition, the selling price is to be reduced to maintain the same volume sales for the year 2003. He does not expect any change in variable costs. He expects that due to sales for the year 2003, the profit volume ratio and margin of safety will be 20% and 10% respectively and considerable saving in Fixed Cost for 2003.

Even if the company prefers to shut down its operations for 2003, it expects to incur minimum fixed cost of Rs. 60,000. You are required to :

- Present the comparative statement for the years 2002 and 2003 showing under marginal costing.
- What will be minimum sales required, if it decides to shut down its unit in 2003? (C.A. Final, Nov. 5, 2003)

SOLUTION

ILLUSTRATION Computation of Sales, Break-even Sales, Profit and Fixed Cost for the Year 2002

Given Data: Computation of Variable Costs, Break-even Sales, Profit and Fixed Cost for the Year 2002

Turnover for the year 2002

Profit Volume Ratio (given)

Contribution on Rs. 6,00,000 turnover @ 25%

Variable Costs : Sales—Contribution

Margin of Safety

Margin of Safety in Rs. Sales (Rs. 6,00,000 × 20%)

Break Even Sales : Turnover—Margin of Safety

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

Rs. 1,20,000 = $\frac{\text{Fixed Expenses}}{25\%}$

Fixed Expenses = Rs. 4,80,000 × $\frac{25}{100} = \text{Rs. } 1,20,000$

Computation of Sales, Break-even Sales and Fixed Cost for the year 2003

Let the sales revenue for the year 2003 be x , variable cost for the year will be Rs. 4,50,000, same last year.

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

$$= x - \text{Rs. } 4,50,000$$

$$\text{P/V Ratio for the year } = 20\% \text{ (given)}$$

$$\text{Contribution} = \frac{x - 4,50,000}{20\%}$$

$$\text{Sales} = \frac{x - 4,50,000}{20\%}$$

$$\text{or}$$

$$x = \frac{x - \text{Rs. } 4,50,000}{20\%}$$

$$\text{or}$$

$$x = \frac{200}{100}$$

$$\text{or } \frac{20}{100}x = x - \text{Rs. } 4,50,000$$

$$x = \text{Rs. } 5,62,500$$

Margin of Safety = 30% (given)

Therefore, break-even sales occurs at 70% of turnover for the year 2003

$$\text{Break-even Sales} = \frac{70}{100} \times \text{Rs. } 5,62,500 = \text{Rs. } 3,93,750$$

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

$$\text{or } \text{Rs. } 3,93,750 = \frac{\text{Fixed Expenses}}{20\%}$$

$$\text{or Fixed Expenses} = \text{Rs. } 3,93,750 \times \frac{20}{100} = \text{Rs. } 78,750$$

- (i) COMPARATIVE STATEMENT OF SALES AND PROFIT UNDER MARGINAL COSTING
for the years 2002 and 2003

	2002	2003
Sales	Rs. 6,00,000	Rs. 5,62,500
Less : Variable Costs	Rs. 4,50,000	Rs. 4,50,000
Contribution	Rs. 1,50,000	Rs. 1,12,500
Less : Fixed Expenses	Rs. 1,20,000	Rs. 78,750
Profit	Rs. 30,000	Rs. 33,750

(ii) Minimum Sales Required (if the firm decides to shut down its unit in 2003)

$$\text{Minimum Sales Required} = \frac{\text{Avoidable Fixed Cost}}{\text{P/V Ratio}}$$

$$= \frac{\text{Rs. } 78,750 - \text{Rs. } 50,000}{20\%} = \text{Rs. } 93,750$$

ILLUSTRATION 44. The annual flexible budget of a company is as follows :

Production Capacity	40%	60%	80%	100%
Cost:				
Direct Material	Rs. 12,000	Rs. 18,000	Rs. 24,000	Rs. 30,000
Direct Labour	16,000	24,000	32,000	40,000
Production Overhead	11,400	12,600	13,800	15,000
Administration Overhead	5,800	6,600	7,000	8,000
Selling and Distribution Overhead	6,200	6,800	7,400	8,000
	<u>51,400</u>	<u>67,600</u>	<u>83,800</u>	<u>100,000</u>

Owing to trade difficulties the company is operating at 50% capacity. Selling prices have had to be lowered to what the directors maintain is an uneconomic level and they are considering whether or not their single factory should be closed down until the trade recession has passed.

A market research consultant has advised that in about twelve months' time there is every indication that sales will increase to about 75% of normal capacity and that the revenue to be produced from sales in the second year will amount to Rs. 90,000. The present revenue from sales at 50% capacity would amount to only Rs. 49,500 for a complete year.

If the directors decide to close down the factory for the year, it is estimated that :

- (a) The present fixed costs would be reduced to Rs. 11,000 a year.
 - (b) Closing down costs (redundancy payments etc.) would amount to Rs. 7,500.
 - (c) Necessary maintenance of plant would cost Rs. 1,000 p.a.
 - (d) On reopening the factory the cost of overhauling plant, training and engagement of new personnel would amount to Rs. 4,000.
- Prepare a statement for the directors presenting in such a way as to indicate whether or not it is desirable to close the factory.

SOLUTION

STATEMENT OF PROFIT AND LOSS

	Production Capacity		
	Zero %	50%	75%
	Rs. —	Rs. 49,500 (1)	Rs. 90,000 (2)
Sales	—	9,000 (1)	29,250
Less : Marginal Costs	—	19,000 (1)	19,000 (1)
Difference	20%	Rs. 16,200 (Variable)	
		On 40% Variable Costs = Rs. 16,200 $\times 2 = \text{Rs. } 32,400$	
		On 60% Variable Costs = (Rs. 51,400 — Rs. 32,400) = Rs. 19,000	
		Variable Costs at 50% = Variable Costs at 40% + Variable Costs at 10%	
		= 10. 32,400 + Rs. 8,100 = Rs. 40,500	
(2) Calculation of Variable Cost at 75%			
	On 80% Total Cost	Rs. 83,800	
	On 60%	Rs. 67,600	
	Difference	20%	
	For	Rs. 16,200	
	Variation	15%	
	Variable Cost at 75% = Variable Cost at 60% + Variable Cost at 15%		
	= Rs. 16,200 $\times 3 + \text{Rs. } 12,150$		
	= Rs. 48,600 + Rs. 12,150 = Rs. 60,750		

Alternative Course of Action

When deciding between alternative courses of action, it shall be kept in mind that whatever course of action is adopted, certain fixed expenses will remain unaffected. The criterion, therefore, which weighs is the effect of alternative courses of action upon the marginal (i.e., variable) costs in relation to the revenue obtained. The course of action which yields the greatest contribution is the most profitable to be followed by the management.

ILLUSTRATION 45. X Co., Ltd. manufactures and sells only two types of products A and B under a unit basis and vice-versa. An increase in the sale of one depresses sales of the other on a unit basis.

An increase in the sale of one depresses sales of the other on a unit basis and vice-versa. An increase in the sale of one depresses sales of the other on a unit basis.

following data in respect of a period are presented to you :

Per unit

	A	B
Sales Price	Rs. 45	Rs. 55
Fixed Overhead (Rs. 4,80,000 allocated on 1 : 2 basis)	4	8
Variable Cost of Sales	24	30
Sales Commission (20% of Sales)	9	11
Net Profit	8	6

Required : (a) Work out the number of units of A and B used in the above cost data; (b) Show clearly the actual operating results; (c) State, with arguments whether the management should

From the above it is clear that the amount of loss can be reduced by Rs. 13,500 (Rs. 23,500 — Rs. 10,000) if the factory is continued to operate. There will be a profit of Rs. 10,250 in the second year, so closing down of the factory is undesirable.

Working Notes :

(1) Calculation of Variable Costs at 50%

On 40% Total Cost is Rs. 67,600

On 60% " " " Rs. 51,400

Difference 20%

Rs. 16,200 (Variable)

On 40% Variable Costs = Rs. 16,200 $\times 2 = \text{Rs. } 32,400$

On 60% Variable Costs = (Rs. 51,400 — Rs. 32,400) = Rs. 19,000

Variable Costs at 50% = Variable Costs at 40% + Variable Costs at 10%

= 10. 32,400 + Rs. 8,100 = Rs. 40,500

(2) Calculation of Variable Cost at 75%

On 80% Total Cost

Rs. 83,800

On 60%

Rs. 67,600

Difference 20%

Rs. 16,200 Variable

On 75% Total Cost

Rs. 12,150

Difference 15%

Rs. 16,200

Variable Cost at 75% = Variable Cost at 60% + Variable Cost at 15%

= Rs. 16,200 $\times 3 + \text{Rs. } 12,150$

= Rs. 48,600 + Rs. 12,150 = Rs. 60,750

increase the sales of A or B; (d) If the units of A actually sold are increased by 20% or decreased by 10% how would this increase or decrease affect the quantum of profit or loss?

Note. Assume any other data necessary.

SOLUTION

(a) Fixed Overhead (allocated on 1 : 2 basis)

Fixed Overhead per unit

No. of units used

	A Rs. 1,60,000	B Rs. 3,20,000
Fixed Overhead per unit	4	8
No. of units used	40,000	40,000

(b) and (c)

STATEMENT OF OPERATING RESULTS

	Units 40,000 A		Units 40,000 B		Total Sales (Rs. in lakhs)
	Per Unit Rs.	Total (Rs. in lakhs)	Per Unit Rs.	Total (Rs. in lakhs)	
Sales	45	18.00	55	22.00	40.00
Less : Commission	9	3.60	11	4.40	4.00
Net Sales Revenue	36	14.40	44	17.60	14.00
Less : Variable Cost of Sales	24	9.60	30	12.00	9.60
Contribution	12	4.80	14	5.60	4.40
Less : Fixed Cost		1.60		3.20	4.00
Profit		3.20		2.40	0.00

From the above it is clear that the contribution of B is higher, so management should increase the sales of B.

B.

Case I

	Product A 48,000	Product B 32,000	Product A 36,000	Product B 44,000
Sales (Units)	12	14	12	14
Contribution Per Unit (Rs.)	5,76,000	4,48,000	4,32,000	6,16,000

Total Contribution of A and B in each case	Rs.
Sales : Fixed Costs	10,24,000
Profit	5,44,000

Profit is more in Case II, therefore decrease of sale of product A by 10% and increasing the sale of product B correspondingly by 4,000 units would be recommended.

ILLUSTRATION 46. The management of a concern, manufacturing two products, X and Y, have the following independent possibilities before them :

(a) To produce and sell 16,000 additional units of Y but only if the production of X is reduced by 20,000 units.

(b) To reduce the price of X by Re. 0.20 per unit. This will result in a 25% increase in the sales of X without any change in activity of Y.

(c) To produce and sell 55,000 units of X and 1,05,000 units of Y.

Product X

50,000

Sales (in Units)

Rs. 2,50,000

Sales (Values)

Rs. 1,50,000

Cost of Sales

Rs. 1,00,000

Gross Margin

Rs. 60,000

Selling and Distribution Expenses

Rs. 40,000

Net Margin

Rs. 1,40,000 for product X and Rs. 1,40,000 for product Y.

Product Y

1,00,000

Sales (in Units)

Rs. 8,50,000

Sales (Values)

Rs. 6,00,000

Cost of Sales

Rs. 2,50,000

Gross Margin

Rs. 1,50,000

Selling and Distribution Expenses

Rs. 1,00,000

Net Margin

Rs. 1,40,000 for product X and Rs. 1,40,000 for product Y.

From the above it is clear that that Proposal (c) gives more increase in contribution. Therefore, it should be accepted.

Note (1). For contribution per unit, please see the next page.

The amount is considerable. If the work, if the high contribution

STATEMENT SHOWING THE DIRECT COST PER UNIT AND TOTAL FIXED COSTS

Units	Product X	Product Y	Total
	50,000	1,00,000	1,50,000
	Total Per unit	Total Per unit	
Sales	Rs. 2,50,000	Rs. 8,50,000	Rs. 11,00,000
Less : Direct Costs	2,40,000	2,40	4,60,000
Contribution	1,30,000	2,60	5,10,000
Fixed Costs (Cost of Sales—Direct Cost + S. and D. Costs)	90,000	4,10,000	6,40,000
Net Profit	40,000	1,00,000	1,40,000

Level of Activity Planning

Marginal costing may be of great help to the management in planning the level of activity will show the position of maximum profitability. This will be clear from the following illustration.

ILLUSTRATION 47. Mikado Engineering Company has received an export order for its sole product that would require the use of half of the factory's total capacity which is estimated at 4,00,000 units per annum. The factory is currently operating at 60% level to meet the demand of its domestic customers only. As against the current price of Rs. 6.00 per unit the export offer is for Rs. 4.50 per unit which is less than the total cost of production, the breakdown of which is given below:

Variable Cost	Rs. 4.00 per unit
Fixed Overhead	Rs. 1.00 per unit
Total Cost	Rs. 5.00 per unit

The condition of the export order is that it has either to be accepted in full or totally rejected.

(A) Accept the order and keep domestic sales unfulfilled to the extent of excess demand for the same.

(B) Increase factory capacity by installing a few balancing machines and equipments and also by working overtime to meet the balance of the required capacity. This will increase fixed overhead by Rs. 15,000 annually and the additional cost for overtime work will be Rs. 40,000 per annum.

(C) Reject the order and remain with the domestic market only.

Prepare statements indicating the alternatives and suggesting the proposal which would be most convenient to the company.

SOLUTION**ALTERNATIVES**

Units (in Lakhs)	A			B			C		
	Domestic	Export	Domestic	Export	Domestic	Export	Domestic	Export	Domestic
Sales (A)	2.00	2.00	2.40	2.00	2.40				
Less : Variable Cost	(Lakhs)	(Lakhs)	(Lakhs)	(Lakhs)	(Lakhs)				
Overtime	12.00	9.00	14.40	9.00	14.40				
Total Variable Cost (B)									
Contribution	8.00	8.00	10.00	8.00	9.60				
	4.00	1.00	4.40	1.00	4.80				
Total Contribution for each Alternative	A	B	C						
Less : Fixed Costs	5.00	5.40	4.80						
Net Profit	2.40	2.55	2.40						

DIFFERENTIAL COST ANALYSIS**Meaning**

Differential cost is the change in the costs which may take place because of the adoption of alternative course of action necessitated by change in sales volume, product mix or change of method of production or make or buy decision. For example, difference in costs may arise because replacement of labour by machinery and difference in costs of two alternative courses of action will be the differential cost. It may be of interest to note that differential cost may be increased

From the above, it is clear that alternative B is the best as it yields the highest net profit. profit in B alternative is more by Rs. 25,000 as compared to alternative A. As alternative B requires purchase of machinery and equipment and increases the fixed cost also so it is worth while or gainfully be utilised in some other work also.

LIMITATIONS OR DISADVANTAGES OF MARGINAL COSTING

Marginal costing technique has certain limitations which must be kept in mind while making of this technique.

(1) The separation of expenses into fixed and variable presents certain technical difficulties. whereas marginal costing technique assumes that all expenses can be divided into fixed variable. In fact, no variable cost is completely variable and no fixed cost is completely fixed. Actually, most of the expenses are semi-variable and it is difficult to segregate them into fixed variable.

(2) Time taken for the completion of job is not given due attention because marginal excludes fixed expenses which are connected with time. Fixed expenses should be considered if suitable comparison of two jobs is to be made.

(3) With the development of technology, fixed expenses have increased and their impact on production is much more than that of variable expenses. So, a system of costing which ignores fixed expenses is less effective because a significant portion of the cost representing fixed expenses is taken care of.

(4) It is possible that a concern using marginal costing technique may value work-in-progress and finished stocks at marginal cost. The arguments against valuing these items at marginal cost are as follows :

(a) Balance Sheet will not exhibit a true and fair view because work-in-progress and finished stock will be shown at marginal costs which do not include fixed expenses. Thus, finished stock work-in-progress will be understated in the Balance Sheet.

(b) In case of loss by fire, full loss on account of stock destroyed by fire cannot be recovered from the insurance company because marginal costing technique of valuation of stock will not take fixed expenses into consideration.

(5) Marginal costing technique does away with the difficulties involved in the apportionment of overheads because fixed expenses are deducted from total contribution. But the problem of apportionment of variable costs still arises.

(6) Marginal costing technique is difficult to apply in contract or ship-building industry where the valuation of work-in-progress is high in relation to turnover. If fixed expenses are not included on the completion of the contract there may be huge profits.

(7) Cost control can be better achieved with the help of other techniques such as budgetary control and standard costing as marginal costing technique does not provide any standard for evaluation of performance which is provided by standard costing and budgetary control.

(8) Marginal costing technique cannot be successfully applied in cost plus contracts unless high percentage over the marginal cost is charged from the contractor to cover the fixed costs.

(9) Sometimes an order from a new customer is accepted at a very low price on the argument that if marginal cost is little less than the price of the order it will give some contribution. This sometimes lead to general reduction in selling price and thus to losses.