
UNIT 8 ABSORPTION AND MARGINAL COSTING

Objectives

The aims of this unit are:

- to familiarise you with the techniques of Absorption Costing and Marginal Costing
- to explain the basic features and in that process bring out explicitly the differences between the two techniques
- to develop an appreciation that Marginal Costing has an edge over Absorption Costing as far as managerial decision making is concerned

Structure

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8.1 INTRODUCTION

In the preceding unit, we familiarised you with the different elements of cost i.e. materials, labour and expenses. These elements of cost can broadly be put into two categories: Fixed and variable costs. Fixed costs are those which do not vary but remain constant within a given period of time in spite of fluctuations in production. The examples of fixed costs are: rent, insurance charges, management salaries, etc. On the other hand, variable costs are those which vary in direct proportion to any change in the volume of output. The costs of direct material, direct wages etc, can be put into this category. The cost of a product or process can be ascertained (using the different elements of cost) by any of the following two techniques:

- Absorption Costing
- Marginal Costing



8.2 ABSORPTION COSTING

Absorption Costing technique is also termed as Traditional or Full Cost Method. According to this method, the cost of a product is determined after considering both fixed and variable costs. The variable costs, such as those of direct materials, direct labour, etc. are directly charged to the products, while the fixed costs are apportioned on a suitable basis over different products manufactured during a period. Thus, in case of Absorption Costing all costs are identified with the manufactured products. This will be clear with the help of the following illustration.

Illustration 8.1

Tripura Ltd. is manufacturing three products : A, B and C. The costs of manufacture are as follows:

	A	B	C
	Rs.	Rs.	Rs.
Direct Labour	2	3	4
Selling Price	10	15	20
Output	1,000 units	1,000 units	1,000 units

The total overheads are Rs. 12,000 out of which Rs. 9,000 are fixed and the rest are variable. It is decided to apportion these costs over different products in the ratio of output. We would prepare a statement showing the cost and profit of each product according to Absorption Costing.

Statement Showing Costs and Profit (According to Absorption Costing Technique)

	A		B		C	
	<i>Per Unit</i>	<i>Total</i>	<i>Per Unit</i>	<i>Total</i>	<i>per Unit</i>	<i>Total</i>
	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
Direct Materials	3	3,000	4	4,000	5	5,000
Direct Labour	2	2,000	3	3,000	4	4,000
Overheads:						
Fixed	3	3,000	3	3,000	3	3,000
Variable	1	1000	1	1,000	1	1,000
Total Cost	9	9,000	11	11,000	13	13,000
Profit	1	1,000	4	4,000	7	7,000
Selling Price	10	10,000	15	15,000	20	20,000
Total profit		Rs. 1,000+ Rs. 4,000 + Rs. 7,000= Rs. 12,000				

This system of costing has a number of disadvantages:

- It assumes prices are simply a function of costs.
- It does not take account of demand.
- It includes past costs which may not be relevant to the pricing decision at hand.
- It does not provide information which aids decision-making in a rapidly changing market environment

As a result of these disadvantages, fallacious conclusions may be derived as shown



by the following illustration.

Illustration 8.2

With the data given in Illustration 8.1, we would calculate the amount of profit or loss made by Tripura Ltd. in the first two years of its existence, presuming that:

- i) In the first year, it manufactures 1,000 units of each of the products A, B and C but fails to effect any sales.
- ii) In the second year, it does not produce anything but sells the entire stock carried forward from the first year.

The profit or loss for the first two years can be ascertained by preparing the Profit and Loss Account for each of these years

Tripura Ltd.

Profit & Loss Account for the 1st year

	Rs.	Rs.	Rs.
Direct Material		Sales	-
A	3,000	Closing Stock	33,000
B	4,000		
C	5,000		
	12,000		
Direct Labour			
A	2,000		
B	3,000		
C	4,000		
	9,000		
Overheads:			
Variable			
A 1,000			
B 1,000			
C 1,000	3,000		
Fixed	9,000	12,000	
	33,000		33,000

Tripura Ltd.

Profit & Loss Account for the 2nd year

	Rs.		Rs.
Opening Stock	33,000	Sales	
Fixed Overheads	9,000		
Profit	3,000	A	10,000
		B	15,000
		C	20,000
	45,000		45,000

The above Profit and Loss Accounts show that in the first year in spite of the fact that the company does not make any sales, there is no loss what so ever; while in the second year, it makes a profit of Rs.3,000. As a matter of fact, the company losses Rs. 9,000 on account of non-recovery of fixed cost in the first year. The Profit and Loss Account does not show any loss because these fixed costs have been included in the closing inventory values and thus carried forward to the next year. As a result, the Profit and Loss Account for the second year has to bear Rs.18,000 on account of fixed costs (i.e. Rs. 9,000 for the first year + Rs. 9,000 for the second year). The real



profit in the second year should have been Rs.12,000 and not Rs. 3,000. This will be elaborated a little later.

Thus, the technique of Absorption Costing may lead to rather odd results particularly for seasonal businesses in which the stock levels fluctuate widely from one period to another. Their profits for the two periods will be influenced by the transfer of overheads in and out of stock, showing falling profits when the sales are high and increasing profits when the sales are low.

The technique of Absorption Costing may also lead to the rejection of profitable business. The total unit cost will tend to be regarded as the lowest possible selling price. An order at a price which is less than the total unit cost may be refused, though this order may actually be profitable, as shown in Illustration 8.3.

Illustration 8.3

You are the Managing Director of Usha Automobiles Ltd. and have received a special offer for the supply of 200 components at Rs. 60 a piece from a motorbike manufacturer. Your company has a capacity to produce 1,000 components. You are at present, working at 80 per cent capacity. The present selling price per component is Rs.100. The cost details, as supplied by your Cost Accountant, are as follows:

Variable cost per unit	Rs. 40
Fixed overheads cost per unit	
(Total Fixed overheads Rs. 24,000)	Rs. 30
Total Cost per unit	<u>Rs. 70</u>

Your Cost Accountant advises you to reject the order since you will be getting less than the total cost of the component. How would you react?

The advice given by the Cost Accountant is not correct. Since he has based his decision on Absorption Costing, he is advising against accepting the special offer. As a matter of fact, the acceptance of the special order may result in extra profit to the company, as shown below:

Statement of Profit

	<u>Sales</u>		<u>Total</u>
Sales in Units	800	200	1000
Sales in Rs.	80,000	12,000	92,000
	(800 x 100)	(200 x 60)	
Total Cost:			
Fixed (Rs)	24,000	-	24,000
	56,000	8,000	64,000
Profit (Rs)	24,000	4,000	28,000

Thus, if the offer is accepted, the profit will increase from Rs. 24,000 to Rs. 28,000. It is, therefore, advisable to accept the offer rather than reject it.

8.3 MARGINAL COSTING

The technique of Marginal Costing is a definite improvement over the technique of Absorption Costing. According to this technique, only the variable costs are considered in calculating the cost of the product, while fixed costs are charged against the



revenue of the period. The revenue arising from the excess of sales over variable costs is technically known as Contribution under Marginal Costing.

The following illustration will help you in understanding the technique.

Illustration 8.4

From the data given in Illustration 8.1, Let us prepare a statement of cost and profit according to Marginal Costing Technique.

Statement of Cost and Profit (According to Marginal Costing Technique)

	Product A		Product B		Product C	
	<i>Per Unit</i>	<i>Total</i>	<i>Per Unit</i>	<i>Total</i>	<i>Per Unit</i>	<i>Total</i>
	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
Direct Material	3	3,000	4	4,000	5	5,000
Direct Labour	2	2,000	3	3,000	4	4,000
Variable overheads	1	1,000	1	1,000	1	1,000
Total Marginal Cost	6	6,000	8	8,000	10	10,000
Contribution	4	4,000	7	7,000	10	10,000
Selling Price	10	10,000	15	15,000	20	20,000

Thus, the total contribution from the three products, A, B and C is Rs. 21,000. The profit will now be computed as follows:
profit will now be computed as follows:

Total Contribution			Rs. 21,000
Fixed Costs			9,000
Profit			12,000

Marginal Costing helps us in managerial decision-making as can be seen from the following illustrations:

Illustration 8.5

With the data given in Illustration 8.2, let us calculate the amount of profit or loss by preparing a Profit and Loss Account according to Marginal Costing technique.

Profit and Loss Account for the 1st year

	Rs.		Rs.
Direct Material	3,000	Sales	-----
A	4,000	Closing Stock	24,000
B	5,000	Loss	9,000
C	12,000		
Direct Labour			
A			
B	2,000		
C	3,000		
Variable overheads	4,000		
Fixed overheads	9,000		
	3,000		
	9,000		
	33,000		33,000

Profit and Loss Account for the 2nd year

	Rs.		Rs.
Opening Stock	24,000	Sales	
Fixed overheads	9,000	A	10,000



Profit	12,000	B	15,000	
	<u> </u>	C	<u>20,000</u>	<u>45,000</u>
	45,000			45,000

The above statement shows that the company suffers a loss of Rs. 9,000 in the first year because of non-recovery of fixed overheads, while in the second year it makes a profit of Rs. 12,000. It may be seen from the two years' Profit and Loss Accounts that the fixed cost of one year has not been carried forward to the next year. Thus, the profit and Loss Account gives a correct picture.

8.4 ABSORPTION COSTING AND MARGINAL COSTING : DIFFERENCES

The difference between Absorption Costing and Marginal Costing is based on the recovery of fixed overheads. The difference in valuation of inventory under the two techniques is a consequence of such treatment. However, for the sake of clarity, we are analysing the difference from both angles, viz. recovery of overheads and valuation of stock.

Recovery of overheads

In case of Absorption Costing, both fixed and variable overheads are charged to production. On the other hand, in Marginal Costing only variable overheads are charged to production while fixed overheads are transferred in full to the profit and loss account. Thus, in case of marginal Costing, there is under-recovery of overheads since only variable overheads are charged to production.

Valuation of Stocks

In Absorption Costing stocks of work-in-progress and finished goods are valued at works cost and total cost of production respectively. The works cost or cost of production is so defined as to include the amount of fixed overheads also. In marginal Costing, only variable costs are considered while computing the value of work-in-progress or finished goods. Thus, the closing stock in Marginal Costing is under-valued as compared to Absorption Costing. But this does not result in carrying over of fixed overheads of one period to another, as it happens in Absorption Costing.

The above points of difference will become clear with the help of the following illustration.

Illustration 8.6

Taking the figures given in Illustration 8.1, let us compute the amount of profit under Marginal and Traditional Costing systems, in case units sold of products A, B and C are 900 each.

Statement of Profit (Absorption Costing Systems)

	A	B	C
	Rs.	Rs.	Rs.
Direct Material	3,000	4,000	5,000
Direct Labour	2,000	3,000	4,000
Overheads : Variable	<u>1,000</u>	<u>1,000</u>	<u>1,000</u>
Total Marginal Cost	6,000	8,000	10,000
Add: Fixed overheads	<u>3,000</u>	<u>3,000</u>	<u>3,000</u>
Total Cost of Production	9,000	11,000	13,000
Less: Closing Stock	<u>900</u>	<u>1,100</u>	<u>1,300</u>



Cost of goods sold	8,100	9,900	11,700
Profit	<u>900</u>	<u>3,600</u>	<u>6,300</u>
Sales	9,000	13,500	18,000

Thus, total profit under Absorption Costing is:

	Rs.
Product A	900
Product B	3,600
Product C	<u>6,300</u>
	<u>10,800</u>

**Statement of Profit
(Marginal Costing)**

	A	B	C
	Rs.	Rs.	Rs.
Total Marginal Cost	6,000	8,000	10,000
Less: Closing Stock	<u>600</u>	<u>800</u>	<u>1,000</u>
Cost of goods sold	5,400	7,200	9,000
Contribution	3,600	6,300	9,000
(Sales - Marginal Cost of Production)			
Sales	<u>9,000</u>	<u>13,500</u>	<u>18,000</u>

Thus, total profit under Marginal Costing will be:

	Rs
Product A	3,600
Product B	6,300
Product C	<u>9,000</u>
Total Contribution	18,900
Less: Fixed cost	<u>9,000</u>
Profit	<u>Rs. 9,900</u>

The profit under Traditional Costing system is Rs. 10,800 while it is Rs. 9,900 under Marginal Costing system. This is on account of the difference in valuation of closing stock. The closing stock under Traditional Costing system includes fixed cost of Rs. 900.

That is why the profit under Traditional Costing System is higher by Rs. 900 compared to Marginal Costing system.

Illustration 8.7

From the following cost, production and sales data of Competent Motors Ltd., prepare comparative income statement for three years under (i) absorption costing method, and (ii) marginal costing method. Indicate the unit cost for each year under each method. Also evaluate the closing stocks. The company produces a single article for sale.

Particulars	Year		
	2001	2002	2003
Selling price per unit	20	20	20
Variable manufacturing cost per unit	10	10	10
Total fixed manufacturing cost	5,000	5,000	5,000
Opening stock			500



Units produced	1,000	1,500	2,000
Units sold	1,000	1,000	1,500
Closing stock		500	1,000

**Comparative Income Statement
(Absorption Costing System)**

	2001		2002		2003	
	<i>Per Unit Rs.</i>	<i>Total Rs.</i>	<i>Per Unit Rs.</i>	<i>Total Rs.</i>	<i>Per Unit Rs.</i>	<i>Total Rs.</i>
Variable cost	10	10,000	10	15,000	10.00	20,000
Fixed cost	5	5,000	3.33	5,000	2.50	5,000
Total cost of production	15	15,000	13.33	20,000	12.50	25,000
Add: Opening stock	-			-		6,665
	15	15,000	13.33	20,000	12.50	31,665
Less : Closing Stock	-			6,665		12,500
Cost of production of goods sold	15	15,000	13.33	13,335	12.50	19,165
Profit	5	5,000	6.67	6,665	7.50	10,835
Sales	20	20,000	20.00	20,000	20.00	30,000

**Comparative Income Statement
(Marginal Costing System)**

	2001		2002		2003	
	<i>Per Unit Rs.</i>	<i>Total Rs.</i>	<i>Per Unit Rs.</i>	<i>Total Rs.</i>	<i>Per Unit Rs.</i>	<i>Total Rs.</i>
Variable cost	10	10,000	10	15,000	10	20,000
Add: Opening stock	---	---	---	---	---	5,000
Less: Closing stock	10	10,000	10	15,000	10	25,000
	---	---	---	5,000	---	10,000
Cost of production of goods sold	10	10,000	10	10,000	10	15,000
Sales	20	20,000	20	20,000	---	30,000
Contribution	10	10,000	10	10,000		15,000
Less: Fixed cost		5,000		5,000		5,000
Profit		5,000		5,000		10,000

From the above illustrations the following general rules can be made out:

- The profit under Traditional Costing System and the Marginal Costing System will be the same in case there are no opening and closing stocks.
- In case, there is closing stock (and no opening stock), the profit under Traditional Costing system will be more as compared to Marginal Costing System.
- In case, there is opening stock (and no closing stock), the profit under Marginal Costing system will be more than the profit under Traditional Costing System.
- If the quantity of closing stock is more than the quantity of the opening stock (presuming that both opening and closing stocks are valued at uniform prices), profit under Traditional Costing System will be more as compared to profit under Marginal Costing System and *vice versa*.

Activity 8.1

Prepare a Comparative Inventory and Income Measurement Statement for a firm for years II and III under Absorption and Marginal costing. The statement for the 1st



years is given. You may assume the following for your calculations :

- Sales annually remain constant at 36,000 units at Rs. 10 per unit.
- Variable overhead is Re. 1 Per unit, and fixed overheads is Rs. 20,000 per annum.
- Production in Year I is 40,000 units, Year II is 50,000 units and Year III is 25,000 units.
- Direct materials and labour costs amount to Rs. 6 per unit.

You can further assume that overheads absorption rate and actual overhead costs are the same. From (b) and (c) you will see that the fixed overheads absorption rate is Re. .50, .40, .80, per unit in the three successive years.

Comparative Inventory and Income Measurement

(In thousand rupees)

Year I	Units (‘000)	Per Unit Rs.	Absorption		Marginal			
Sales	36	10		360		360		
Cost of Goods Produced								
Direct Material and Labour	40	6	240			240		
Variable Overhead	40	1	40			40		
Fixed Overheads	40	.5	<u>20</u>	300		<u>---</u>	280	
Closing Stock								
Direct Materials and Labour	4	6	24			24		
Variable Overhead	4	1	4			4		
Fixed Overheads	4	.5	<u>2</u>	<u>30</u>	<u>270</u>	<u>---</u>	<u>28</u>	<u>252</u>
Fixed Overheads								108
Profit				90				20
								88
Year II	Units (‘000)	Per Unit Rs.	Absorption		Marginal			
Sales								
Opening Stock								
Cost of Goods Produced								
Direct Material and Labour								
Variable Overhead								
Fixed Overheads								
Closing Stock								
Direct Materials and Labour								
Variable Overhead								
Fixed Overheads								
Fixed Overheads								
Profit								
Year III	Units (‘000)	Per Unit Rs.	Absorption		Marginal			
Sales								
Opening Stock								
Cost of Goods Produced								
Direct Material and Labour								
Variable Overhead								
Fixed Overheads								



Closing Stock
Direct Materials and
Labour
Variable Overhead
Fixed Overheads
Fixed Overheads
Profit

8.5 MARGINAL COST

The technique of marginal costing is concerned with marginal cost. It is, therefore, necessary for you to understand correctly the term 'Marginal Cost'. The Institute of Cost and Management Accountants, London, has defined Marginal Cost as "the amount at any given volume of output by which aggregate costs are changed if the volume of output is increased by one unit". On analysing this definition we can conclude that the term "Marginal Cost" refers to increase or decrease in the amount of cost on account of increase or decrease of production by a single unit. The unit may be a single article or a batch of similar articles. This will be clear from the following example.

A factory produces 500 tricycles per annum. The variable cost per tricycle is Rs. 100. The fixed expenses are Rs. 10,000 per annum.

Thus, the cost sheet of tricycles will appear as follows:

	Rs.
Variable Cost (500 x Rs. 100)	50,000
Fixed cost	10,000
	<hr/> 60,000 <hr/>

If production is increased by one unit, i.e. it becomes 501 tricycles per annum, the cost sheet will then appear as follows:

	Rs.
Variable Cost (501 x Rs. 100)	50,100
Fixed cost	10,000
	<hr/> 60,100 <hr/>

Marginal cost per unit is, therefore, Rs 100

Marginal cost ordinarily is equal to the increase in total variable cost because within the existing production capacity an increase of one unit in production will cause an increase in variable cost only. The variable cost consists of direct materials, direct labour, variable direct expenses and variable overheads. The term 'all variable overheads' includes variable overheads plus the variable portion contained in semi-variable overheads. This portion has to be segregated from the total semi-variable overheads according to the methods to be discussed later.

The accountant's concept of marginal cost is different from the economist's concept of marginal cost. According to economists, the cost of producing one additional unit of output is the marginal cost of production. This shall include an element of fixed cost also. Thus, fixed cost is taken into consideration according to the economist's concepts of marginal cost, but not according to the accountant's concept. Moreover, with additional production the economist's marginal cost per unit may not be uniform since the law of diminishing (or increasing) returns may be applicable, while the accountant's marginal cost is taken as constant per unit of output with additional



production.

Illustration 8.8

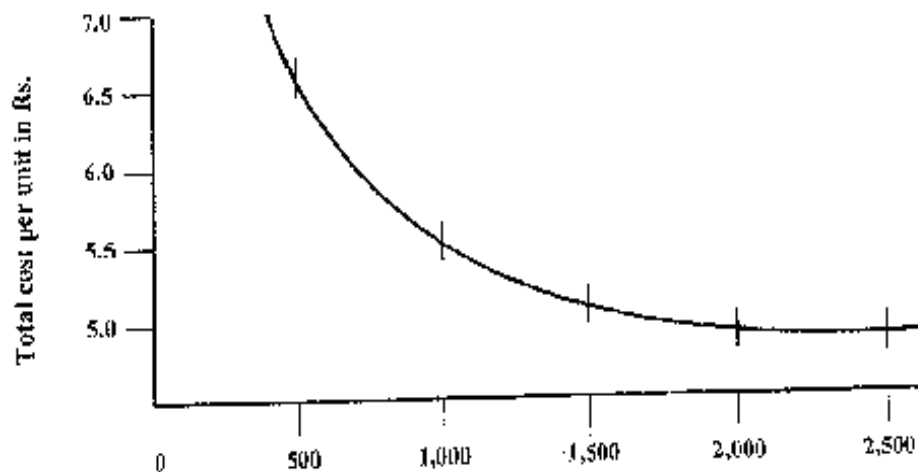
Following information related to a factory which manufactures fans:

Production in units	Direct Material Rs.	Direct Labour Rs.	Other Variable Costs Rs.	Fixed Costs Rs.	Total Cost Rs.
500	1,000	750	500	1,000	3,250
1,000	2,000	1,500	1,000	1,000	5,500
1,500	3,000	2,250	1,500	1,000	7,750
2,000	4,000	3,000	2,000	1,000	10,000
2,500	5,000	3,750	2,500	1,000	12,250

Let us see the effect of increase in output on per unit cost of production through a graph and calculate the marginal cost of production.

Production units	Total Variable Cost per unit Rs.	Fixed Cost per unit Rs.	Total Cost per unit Rs.
500	4.50	2.00	6.50
1,000	4.50	1.00	5.50
1,500	4.50	0.67	5.17
2,000	4.50	0.50	5.00
2,500	4.50	0.40	4.90

Graph Depicting Total Cost per Unit at Varying Levels of Output



The above graph shows that with an increase in production the total cost per unit is decreasing. This happens because the fixed overheads which are constant at all levels of output are spread over successively larger outputs. Hence cost of output per unit goes on decreasing with every increase in volume of output. It will be seen that while the marginal cost of production per unit remains constant (at Rs. 4.50), the fixed cost per unit decreases from Rs. 2 to 0.40. This phenomenon will have considerable effect in motivating the firm in its decision to increase production, as in the present illustration.

Marginal cost under the present illustration can be calculate with the help of the following formula:

$$\text{Marginal Cost} = \text{Direct Material Cost} + \text{Direct Labour Cost} + \text{Other Variable Costs}$$

or



When the production is 500 units, the marginal cost of production shall be equal to Rs. 1,000 + Rs. 750 + Rs. 500, i.e, Rs. 2,250 (or Rs. 3,250 - Rs. 1,000). Marginal cost at other levels of output can be figured out in a similar fashion.

8.6 SEGREGATION OF SEMI-VARIABLE COSTS

As explained earlier, Marginal Costing Method requires segregation of all costs into two parts-fixed and variable. This means that the semi-variable costs will have to be segregated into fixed and variable elements.

This may be done by any of the following methods:

- Levels of output compared to levels of expenses method,
- High-low method,
- Degree of variability Method,
- Scattergraph method,
- Least squares method.

Each of the above methods has been discussed in detail with the help of the following illustration:

Illustration 8.9

	Production Units	Semi-variable expenses
July 2002	100	300
August 2002	60	264
September 2002	160	400
October 2002	120	340
November 2002	200	460
December 2002	140	380

During the month of January, 2003 the production is 80 units only. Let us calculate the amount of fixed, variable and total semi-variable expenses for the month.

Levels of Output to Levels of Expenses Method

According to this method, the difference in output at two different points of time is compared with the corresponding difference in expenses. Since the fixed portion of expenses remains constant, any increase or decrease in total semi-variable expenses must be attributed to the variable portion. The variable cost per unit can be derived by dividing the difference in (total) semi-variable expenses with the difference in the level of output at two points of time.

Taking the figures for the month of September and November of the illustration given above, we can calculate fixed and variable components of semi-variable costs:

Month	Production units	Semi-variable expenses (Rs.)	Fixed (Rs.)	Variable (Rs.)
September	160	400	160*	240
November	200	460	160**	300



Difference	40	Rs.60
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The variable element included in semi-variable expenses is:

$$= \frac{\text{Change in amount of expenses}}{\text{Change in activity or quantity}}$$

$$= \frac{60}{40} = \text{Rs. 1.50 per unit}$$

* Variable overheads for September = $160 \times \text{Rs. 1.50} = \text{Rs. 240}$
 Fixed overheads for September = $\text{Rs. 400} - \text{Rs. 240} = \text{Rs. 160}$

** Overheads (into fixed and variable components) for November have been computed in a similar manner.

Semi-variable Overheads for January:	Rs.
Variable overheads for January $80 \times \text{Rs. 1.50} =$	120
Fixed overheads	160
	<u>280</u>

High-Low Method

This method is similar to previous method except that only the highest and the lowest levels of output rate are considered out of various levels. This method is also known as the Range Method.

The highest production in the illustration is in the month of November while the lowest is in the month of August. The figures for these two months, therefore, have been considered.

Month	Production units	Semi-variable expenses (Rs.)	Fixed (Rs.)	Variable (Rs.)
August	60	264	180**	84*
November	200	460	180**	280
Difference	140	196		

Variable element: $196/140$ i.e., Re 1.40 per unit.,

* Variable overheads for August = $60 \times \text{Rs. 1.4} = \text{Rs. 84}$
 Fixed overheads for August = $\text{Rs. 264} - 84 = \text{Rs. 180}$

** Similarly, the fixed and variable overheads for November have been ascertained.

Semi Variable overheads for January:	Rs.
Variable overheads for January: $80 \times \text{Rs. 1.40}$	112
Fixed overheads	180
	<u>292</u>

The High - Low Method takes into consideration two sets of data instead of all the data. The two sets of data are the high cost point and the low cost point relating to a specific measure of output such as number of units produced (as in our Illustration), labour hours, machine hours etc.

As the results in High-Low method are based on observation of extreme data, the results may not be very accurate. Because of relying only on the extreme points, the basis computed for segregation of fixed and variable costs may not be representative of normal situation. As such the High-Low method is generally not recommended. Though a crude alternative to more elaborate Least Squares, this method can give



fairly acceptable results if the high and low points are chosen with careful consideration of the data.

Degree of Variability Method

In this method, degree of variability is estimated for each item of semi-variable expenses. Some semi-variable items may have 40% variability while others may have 60% variability. The method is simple to understand. However, determining the degree of variability may be quite difficult.

Assuming the degree of variability is 60% in semi-variable expenses and taking the month of October as a basis, the analysis can be done as under:

Variable element = (60% of Rs. 340) i.e. Rs. 204

Fixed element = Rs. 340-204 = 136

On the above basis, the variable expenses for 80 units (the production of January 2003) will be as follows:

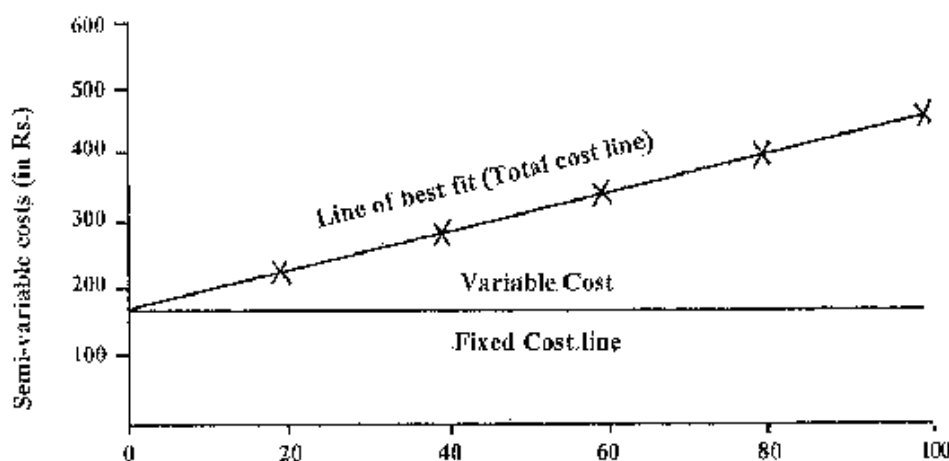
$$\text{Rs. } \frac{204 \times 80}{120} = \text{Rs. } 136$$

Hence, the total semi-variable expenses for January, 2003 are Rs. 136 + Rs. 136 = Rs. 272.

Scattergraph Method

In this method the given data are plotted on graph paper and line of best fit is drawn. The method is explained below:

- The volume of production is plotted on the horizontal axis and the costs are plotted on the vertical axis.
- Corresponding costs of each volume of production are then plotted on the paper, thus several points are shown on it.
- A straight line of best fit is then drawn through the points plotted. This is the total cost line. The point where this line intersects the vertical axis is taken to be the amount of fixed element.
- A line parallel to the horizontal axis is drawn from the point where the line of best fit intersects the vertical axis. This is the fixed cost line.
- The variable cost at any level can be known by noting the difference between fixed cost and total cost lines.





An observation of the graph tells us that fixed expenses are Rs. 170 approximately.

For the month of January 2003, the semi-variable expenses are Rs. 290 (which can be ascertained from the line of best fit in the graph at the level of 40 units). As such, the variable expenses will be Rs. 120 (Rs. 290-170).

Method of least squares

This method is based on the mathematical technique of fitting an equation with the help of a number of observations. The linear equation, i.e, a straight line equation, can be assumed as:

$y = a + bx$ and the various sub-equations shall be

$$\sum y = na + b \sum x;$$

$$\sum xy = a \sum x + b \sum x^2;$$

An equation of second order, i.e, a curvilinear equation can be drawn as

$y = a + bx + cx^2$ and the various sub-equations to solve it (i.e., to find out the values of constants a, b and c, shall be:

$$\sum y = na + b \sum x + c \sum x^2;$$

$$\sum xy = a \sum x + b \sum x^2 + c \sum x^3;$$

$$\sum x^2y = a \sum x^2 + b \sum x^3 + c \sum x^4.$$

A linear equation can be obtained with the help of the following values, thus:

Months	Production Expenses		x^2	xy
	(units) x	Rs. y		
July 2002	100	300	10,000	30,000
August 2002	60	264	3,600	15,840
September 2002	160	400	25,600	64,000
October 2002	120	340	14,400	40,800
November 2002	200	460	40,000	92,000
December 2002	140	380	19,600	53,200
Total	$\sum x = 780$	$\sum y = 2,144$	$\sum x^2 = 1,13,200$	$\sum xy = 2,95,840$

Assuming the equation as $y = a + bx$, we have to find the values of constants a and b with the help of above figures. The other two equations are:



$$\begin{aligned}\Sigma y &= na + b\Sigma x \\ \Sigma xy &= a\Sigma x + b\Sigma x^2\end{aligned}$$

Putting the values in these equations, we have

$$\begin{aligned}2,144 &= 6a + 780b \\ 2,95,840 &= 780a + 1,13,200b\end{aligned}$$

Multiplying equation (iii) by 130 and deducting it from (iv), we get

$$17120 = 11800b; \text{ or } b = 1.45 \text{ (approx.)}$$

Putting the value of b in equation (iii), we can know the value of a:

$$a = \frac{2144 - (780 \times 1.45)}{6} = 168.83 \text{ (approx.)}$$

∴ The desired equation is:

$$y = 168.83 + 1.45x$$

Rs. 168.83 is the amount of fixed element and Rs. 1.45 is the rate per unit for variable element.

After putting the value of x, i.e. 80 units, for January 2003, the total semi-variable expenses for the month can be ascertained as follows:

$$\text{Rs. } 168.83 + (\text{Rs. } 1.45 \times 80), \text{ i.e. Rs. } 284.83$$

8.7 CONTRIBUTION

It has already been stated earlier in the unit that the difference between selling price and variable cost (i.e. the marginal cost) is known as 'Contribution' or 'Gross Margin'. In other words, contribution is the sum of fixed costs and the amount of profit. It can be expressed by the following formula.

$$\begin{aligned}\text{Contribution} &= \text{Selling Price} - \text{Variable Cost} \\ &\text{or} = \text{Fixed Cost} + \text{Profit}\end{aligned}$$

From the above, we can conclude that profit cannot result unless contribution exceeds fixed costs. In other words, the point of no profit no loss will be at a level where contribution is equal to fixed costs. Let us take an example.

Variable cost	Rs. 5,000
Fixed cost	Rs 2,000
Selling Price	Rs. 8,000
Contribution	= Selling Price – Variable cost
	= Rs. 8,000 – Rs. 5,000
	= Rs. 3,000
Profit	= Contribution – Fixed cost
	= Rs. 3,000 – Rs. 2,000
	Rs. 1,000

As contribution exceeds fixed cost there is a profit of Rs. 1,000. If fixed cost is assumed at Rs. 4,000, the position will change as under:

$$\begin{aligned}\text{Contribution} - \text{Fixed Cost} &= \text{Profit (Loss)} \\ \text{Rs. } 3,000 - \text{Rs. } 4,000 &= (\text{Rs. } 1,000)\end{aligned}$$

The sum of Rs. 1,000 represents the extent of loss since the fixed costs are more than



contribution. At the level of fixed cost of Rs. 3,000, there shall be no profit and no loss. The concept of Break-even Analysis emerges out of this basic fact.

8.8 BREAK-EVEN ANALYSIS

The term 'Break-even Analysis refers to a system of determination of that level of activity where total cost equals total selling price. However, in the broader sense, it refers to that system of analysis which determines the probable profit at any level of activity. The relationship between cost of production, volume of production, profit and sales value is established by break-even analysis. The analysis is also known as 'Cost-Volume-Profit analysis.

Break-even analysis is useful for a manager in the following ways:

- It helps him in forecasting the profit fairly accurately.
- It is helpful in setting up flexible budgets, since on the basis of Cost-Volume Profit relationship, one can ascertain the costs, sales and profits at different levels of activity.
- It assists in performance evaluation for purposes of management control.
- It helps in formulating price policy by projecting the effect which different price structures will have on costs and profits.
- It helps in determining the amount of overhead cost to be charged at various levels of operations, since overhead rates are generally pre-determined on the basis of a selected volume of production.

Thus, cost-volume-profit analysis is an important medium through which one can have an insight into effects on profit due to variations in costs (both fixed and variable and sales (both volume and value). This enables us to take appropriate decisions. This aspect will be discussed in detail in the next unit of this course. However, it will be expedient for us to understand at this stage the meaning of and the technique of determining the break-even point.

Break-even Point

It refers to that level of activity where the income of the business exactly equals its expenditure. In other words, it is a 'no profit, no loss' point. If production is increased beyond this level, profit shall accrue to the business and if it is decreased below this level, loss shall be suffered.

The Break-even point can be determined according to the following formulae:

$$\begin{aligned}
 \text{Break-even Point in output} &= \frac{\text{Fixed Cost}}{\text{Contribution per unit}} \\
 \text{Break-even Point (in sales)} &= \frac{\text{Fixed Costs}}{\text{Contribution per unit}} \times \text{Selling price per unit} \\
 \text{Or} &= \frac{\text{Fixed Costs}}{\text{Total Contribution}} \times \text{Total Sales} \\
 \text{Or} &= 1 - \frac{\text{Fixed Costs}}{\text{Variable cost per unit} \times \text{Selling price per unit}} \\
 \text{Or} &= \frac{\text{Fixed Costs}}{\text{P/V Ratio}}
 \end{aligned}$$

At the break-even point the profit is zero. In case the volume of output of sales is to be computed for 'a desired profit'. The amount of 'desired profit' should be added to fixed costs in the formulae given above. For example.



$$\text{Units for a desired profit} = \frac{\text{Fixed Costs} + \text{Desired Profit}}{\text{Contribution per unit}}$$

$$\text{Sales for a desired profit} = \frac{\text{Fixed Costs} + \text{Desired Profit}}{\text{P/V Ratio}}$$

This will be clear from the following illustration:

Illustration 8.10

A factory manufacturing fans has the capacity to produce 250 fans per annum. The marginal (variable) cost of a fan is Rs. 400 which is sold for Rs. 500. Fixed overheads are Rs. 12,000 per annum. Let us calculate the break-even points for output and sales and show what profit will result if output is 90% of capacity?

Contribution per fan is Rs. 500 - Rs. 400 Rs. 100.

Break-even Point for Output

(Output which will give 'contribution' equal to fixed costs Rs. 12,000).

$$\begin{aligned} \text{BEP (for output)} &= \frac{\text{Total Fixed costs}}{\text{Contribution per unit}} \\ &= \frac{12,000}{100} = 120 \text{ fans} \end{aligned}$$

Break-even Point for Sales

$$\begin{aligned} \text{BEP (for sales)} &= \text{Output} \times \text{Selling price per unit} \\ &= 120 \times \text{Rs. } 500 = \text{Rs. } 60,000 \end{aligned}$$

Break-even point for sales can also be calculated with the help of any of the following formulae:

$$\begin{aligned} \text{i) B.E.P.} &= 1 - \frac{\frac{\text{Total fixed cost}}{\text{Variable cost per unit}}}{\text{Selling price per unit}} \\ &= \frac{12,000}{1 - \frac{400}{500}} \\ &= \frac{12,000}{1/5} = \text{Rs. } 60,000 \end{aligned}$$



OR

$$\begin{aligned} \text{ii)} \quad &= \frac{\text{Total Fixed Costs} \times \text{Total Sales}^*}{\text{Total Contribution}^*} \\ &= \frac{12,000 \times 1,25,000}{25,000} = \text{Rs. } 60,000 \end{aligned}$$

(*have been calculated on full capacity of 250 units)

OR

$$\begin{aligned} \text{iii)} \quad \text{B.E.P.} &= \frac{\text{Total Fixed Cost} \times \text{Selling Price per unit}}{\text{Contribution per unit}} \\ &= \frac{12,000 \times 500}{100} = \text{Rs. } 60,000 \end{aligned}$$

$$\begin{aligned} \text{iv)} \quad \text{B.E.P.} &= \frac{\text{Total Fixed Costs}}{\text{P/V Ratio}} \\ &= \frac{12,000}{20\%} = \text{Rs. } 60,000 \end{aligned}$$

$$\text{P.V. Ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{25,000}{1,25,000} \times 100 = 20\%$$

Profit at 90% of the capacity has been calculated as follows:

Capacity	250 fans
Output at 90% capacity	225 fans
Break-even point of output	120 fans

Since fixed overheads will be recovered in full at the break-even point, the entire contribution beyond the break-even point will be the profit. The profit on 225 units, therefore, will be:

$$= \text{Rs. } 100 \times (225 - 120) = \text{Rs. } 10,500$$

Activity 8.2

Consider any profit-oriented organisation. Talk to a well informed functionary of Accounting and Finance Department of such an organisation regarding its break-even point. At what percentage of the capacity the organisation is having its break-even point presently? Analyse in terms of the break-even point it had 3-5 years ago. Has break-even point moved downward or upward? Why?

.....

.....

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.....

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8.9 UTILITY OF MARGINAL COSTING

The technique of Marginal Costing is of immense use to the management in taking various decisions, as explained below:



Helps in determining the volume of production: Marginal Costing helps in determining the level of output which is most profitable for a running concern. The production capacity, therefore, can be utilised to the maximum possible extent. It helps in determining the most profitable relationship between cost, price and volume in the business which helps the management in fixing best selling price for its products. Thus, maximisation of profit can be achieved. This has been explained in greater detail in a separate unit.

Helps in selecting production lines. The technique of Marginal Costing helps in determining the most profitable production line by comparing the profitability of different products. Certain products or activities may turn out to be unprofitable with the passage of time. Production of such products can be discontinued while production of those products which are more profitable can be taken up. It can help in the introduction of new products and work as a good guide for deciding the optimum mix of products keeping in mind the available capacity and resources.

Helps in deciding whether to produce or procure: The decision whether a particular product should be manufactured in the factory or procured from outside source can be taken by comparing price at which it can be had from outside. In case the procurement price is lower than the margin cost of production, it will be advisable to procure the product from outside rather than manufacture it in the factory.

Helps in deciding method of manufacturing: In case a product can be manufactured by two or more methods, ascertaining the marginal cost of manufacturing the product by each method will be helpful in deciding as to which method should be adopted.

Helps in deciding whether to shut down or continue: Marginal Costing, particularly in periods of trade depression, helps in deciding whether the production in the

plant should be suspended temporarily, or continued in spite of low demand for the firm's products. This can be understood with the help of following illustration.

Illustration 8.11

A company has a manufacturing capacity of 1,000 units per month. The cost details are as under:

Direct Material	Rs. 3 per unit.
Direct labour	Rs. 2 per unit.
Variable overheads	Rs. 1 per unit.
Fixed overheads	Rs. 2,000 per month.

The Company has been selling its products at Rs. 10 per unit.

Due to depression in the market, the product can now be sold only at Rs. 7 per unit. The depression is expected to continue for a period of three months. The accountant advises you to discontinue production since the selling price is less than the total cost of the product. What would be your reaction?

The accountant of the company seems to have calculated the total cost per unit according to Absorption Costing technique as under:

Rs.	
Direct material	3
Direct labour	2
Variable overheads	1
Fixed overheads	2
(2,000/1000)	
Total cost	8

As the cost per unit is Rs. 8 compared to the expected selling price of Rs. 7, the accountant obviously has advised the management to suspend the production till the



situation returns to normal.

However, the decision to suspend production even in this unusual situation is not in the interest of the company. The fact of the matter is that in spite of suspending production, the company will still have to incur fixed cost of Rs. 2,000 per month. If the company continues to manufacture and sell the product, it will be in a position to reduce its loss to Rs. 1,000 per month, as shown below:

	Rs.	Rs.
Selling price per unit		7
Less: Variable Cost	3	
Direct material		
Direct labour	2	
Variable overheads	1	6
Contribution	<u> </u>	<u> </u>
		1

The total contribution on 1,000 units will amount to Rs. 1,000 and this will go to some extent in recovering the fixed cost per month of **Rs. 2,000**. As such the net loss will be limited to Rs. 1,000 only as compared to Rs. 2,000, if production is suspended.

8.10 LIMITATIONS OF MARGINAL COSTING

Marginal Costing technique has some limitations as explained below:

Difficulty in classification of costs between fixed and variable elements: It is a tough job to analyse costs under 'fixed' and 'variable' elements. The nature of costs in several cases may not be very clear. Moreover, some items of costs may be partly

fixed and partly variable. Splitting of such costs into fixed and variable components may have to be based on assumptions. Besides, some overheads may have no relation either with the volume of output or with the time factor. As such, they cannot logically be categorised either as fixed or variable. The decisions of the management regarding bonus to workers, facilities to administrative staff, etc. are some such examples.

Difficult application: Marginal Costing technique is difficult to apply in many firms. Its scope is highly circumscribed where job costing is the need.

Notwithstanding the above-mentioned limitations of marginal costing it is regarded as a highly useful technique for analysis of several business decisions.

8.11 SUMMARY

Marginal Costing and Absorption Costing are the two techniques which can be used for ascertaining the cost of a product, job or a process. Absorption Costing is also termed as Traditional or full Cost method. According to this technique, the cost of a product is determined after considering both fixed and variable costs. In other words, all costs are identified with or absorbed into the manufactured products. Marginal Costing is a technique where only the variable costs are considered while computing the cost of products. The fixed costs are met against the total contribution of all the products taken together.

Marginal Costing is regarded as superior to traditional costing so far as managerial decision-making is concerned. It identifies only such costs with the jobs or products which directly vary with the level of output. The uncertainty and irrationality associated with apportionment of fixed cost in traditional costing is thus avoided.

The technique of Marginal costing greatly helps the management in taking appropriate managerial decisions, viz., dropping a product line, making or buying a component,



shut-down or continuation of operations in periods of trade depression, fixation of minimum selling price of a product, etc.

Marginal Costing involves computation of marginal cost. The term marginal cost is synonymous with the term 'variable cost'. It comprises of direct material, direct labour, variable direct expenses and variable overheads.

The semi-variable overheads are also segregated into fixed and variable categories according to some suitable method. Such segregation of costs into fixed and variable categories helps also in determining the break-even or no profit no loss point. A firm will start making profits only after it reaches the break even level. The sooner it reaches this level, the better it will be. Hence, the break-even level of activity is also of considerable significance to management.

Marginal Costing technique has some limitations. The categorisation of costs into fixed and variable elements is a difficult and tedious task. However, in spite of these limitations, marginal costing is regarded as a highly useful technique of analysis for several business decisions.

8.12 KEY WORDS

Absorption Costing: A technique where all costs, fixed as well as variable, are allotted to cost units.

Break-even Point : It refers to the level of activity where the income of the business exactly equals its expenditure. It is also termed as 'no profit, no loss' point.

Contribution It refers to the excess of selling price over variable cost.

Marginal Cost The variable cost of one more unit of a product or service, i.e. a cost which would be avoided if the unit was not produced or service not provided.

Marginal Costing: A technique whereby marginal cost of a product is ascertained. Only variable costs are charged to production. Fixed costs are charged against the contribution of the period. It is also termed as 'variable costing'.

8.13 SELF-ASSESSMENT QUESTIONS/EXERCISES

1. Explain briefly the technique of Marginal Costing. In what ways you consider this technique useful in Management Accounting?
2. a) Explain and bring out in a comparative form the means of income determination under marginal and traditional costing systems.
- b) Explain the different methods for segregating semi-variable overheads.
3. What benefits are gained from Marginal Costing? Are there any pitfalls in its application?
4. State whether each of the following statements is True or False:
 - a) Fixed costs are included in the valuation of work-in-progress and finished goods stocks under marginal costing. ☐ True ☐ False
 - b) The valuation of stock is higher in absorption costing as compared to marginal costing. ☐ True ☐ False
 - c) Semi-variable costs form a part of product cost in marginal costing. ☐ True ☐ False
 - d) Absorption costing is not as suitable for decision-making as marginal costing is. ☐ True ☐ False



5. From the following choose the most appropriate answer:
- Contribution margin is also known as
(a) Marginal Income; (b) Gross Profit; (c) Net Income.
 - Period cost means:
(a) Variable cost; (b) Fixed Cost; (c) Prime cost.
 - If fixed cost is Rs. 10,000 and P/V ratio is 50%, the break-even point will be: (a) Rs. 20,000 (b) Rs. 40,000 (c) Rs. 50,000 (d) None of these.
 - If Profit-Volume Ratio is 40% and sales value Rs. 10,000, the variable costs will be:
(a) Rs. 4,000 (b) Rs. 40,000 (c) Rs. 10,000 (d) None of these.
 - If sales are Rs. 2 lakhs, fixed cost Rs. 30,000, P/V ratio 40%, the amount of profit will be:
(a) Rs. 50,000 (b) Rs. 80,000 (c) 12,000.
6. Fill in the blanks:
- The technique of Marginal Costing is based on classification of costs into.....costs.
 - Contribution is the difference between sales and
 - In marginal costing stock of finished goods is valued at.....cost.
 - Both fixed and variable costs are charged to products under.....costing.
 - Profit-Volume ratio shows the relationship between.....and.....
 - At break-even point, total cost is equal to.....
 - At break-even point, the contribution will be equal to
7. Hansa Ltd. produces a standard type of article. The results of the last four quarters of the year 2003 are as follows:

Quarters	Output (Units)
I	200
II	300
III	400
IV	600

The cost of direct material is Rs.60 and direct labour is Rs. 40 per unit. Variable expenses are Rs. 20 per unit. Fixed expenses are Rs. 1,20,000 per annum. Find out cost per unit of each quarter.

8. From the following data, prepare statements of cost according to both absorption costing and marginal costing technique:

Sales	Product X	Products Y	Product Z
	Rs. 15,000	Rs. 30,000	Rs. 40,000
Direct Material	6,000	12,500	18,000
Direct Labour	4,000	5,000	7,000
Factory overheads:	3,000	4,000	3,000
Fixed			
Variable	1,000	1,500	2,500
Administrative overheads	500	1,000	1,000
Fixed			
Selling Overheads	1,000	1,000	1,500
Fixed			
Variable	500	1,500	1,500



9. Production costs of Ambitious Enterprises Limited are as follows:

	Levels of Activity		
	60%	70%	80%
Output (in Units)	2,400	2,800	3,200
Cost (in Rs)			
Direct Materials	24,000	28,000	32,000
Direct Labour	7,200	8,400	9,600
Factory overheads	12,800	13,600	14,400
Works Cost			
	<u>44,000</u>	<u>50,000</u>	<u>56,000</u>

The management is considering a proposal to increase production to 90% level of activity. The proposal is not expected to involve any increase in fixed factory overheads.

You are required to prepare a statement showing the prime cost, total marginal cost and total factory cost at 90% level of activity.

(Hint: Fixed Overheads Rs. 8,000)

10. The following figures relate to the repairs and maintenance costs incurred in a machine shop and the corresponding machine hours for a period of six months:

Month	Machine hours	Repairs & Maintenance
January	2,000	3,000
February	2,200	3,200
March	1,700	2,700
April	2,400	3,400
May	1,800	2,800
June	1,900	2,900
Total	<u>12,000</u>	<u>18,000</u>

You are required to segregate the repairs & maintenance cost into fixed and variable elements.

11. The following data are obtained from the records of a company:

	First year	Second year
Sales	Rs. 1,60,000	Rs. 1,80,000
Profit	20,000	28,000

Calculate the break-even point.

12. From the following data, calculate:

- Break-even point expressed in rupee sales.
- Number of units that must be sold to earn a profit of Rs. 1,00,000 per year.

Selling price	Rs. 20 per unit
Variable manufacturing costs	Rs. 10 per unit
Variable selling costs	Rs. 5 per unit
Fixed Factory overheads	Rs. 5,00,000 per year
Fixed selling costs	Rs. 2,00,000 per year

13. Ahmed Khan sells a popular brand of men's sports shirts at an average price of Rs.28 each. He purchases the shirt from a supplier at a unit cost Rs.18. The costs of operating his shop are all fixed costs and amount to Rs.54,000 a year. He pays commission to his salesmen at the rate of Re. 1 on each shirt sold.



- Required: i) How many shirts must be sold in a year to break-even?
 ii) Compute the sales revenue at the break-even.
 iii) Compute the monthly sales revenue required to earn a net profit before tax of Rs.45,000 a year.

Answer to Activity 8.1

	Year II		Year III	
	Absorption Costing	Marginal Costing	Absorption Costing	Marginal Costing
Inventory	133.20	126	54.60	49
Profit	93.20	88	86.40	88

While Profit under Marginal Costing is the same for all the three years, it is different under Absorption costing. Why? Please read the text and attempt the answer:

Answers to Self-assessment Questions/Exercises

- (a) False; (b) True; (C) False; (d) True
- (i) a (Marginal Income); (ii) b (Fixed Cost) (iii) a (Rs.20,000); (iv) d (Rs.6,000) (v) a (Rs. 50,000)
- (a) Fixed and variable; (b) variable costs; (c) marginal; (d) absorption; (e) contribution, sales, (f) total sales; (g) fixed costs
- (i) Rs.270, (ii) Rs.220, (iii) Rs.195.0, (iv) Rs.170.0
- Absorption Costing Profit: Product X Rs(-) 1,000, Product Y Rs.3,500; Product Z Rs.5,500; Marginal Costing Contribution: Product X Rs. 3,500 Product Y Rs.9,500, Products Z Rs. 11,000
- Prime cost Rs. 46,800; Marginal Cost Rs. 54,000; Works Cost Rs. 62,000
- Fixed Cost Rs.1,000
- Rs. 1,10,000
- (1) Rs. 28,00,000; (ii) 1,60,000 units,
- (i) 6,000 shirts (ii) Rs. 1,68,000 (iii) Rs. 25,667

8.14 FURTHER READINGS

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Audio Programme

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