Example 17.9 (Differential Cost Computation)

A company has an installed production capacity of 1,00,000 units and presently it is working at 70% capacity utilisation. As production capacity utilisation increases, cost per unit decreases as follows:

Capacity utilisation	*Cost per unit*
70%	Rs 97
80%	Rs 92
90%	Rs 87
100%	Rs 82

The company has received three export orders from different sources as under:

Source *A*–5000 units at Rs. 55 per unit

Source *B*–10000 units at Rs. 52 per unit

Source *C*–10000 units at Rs. 51 per unit

Advise the company whether any or all the export orders should be accepted or not.

(B. Com. (Hons.) Delhi 2000)

Solution:

Statement showing Differential Costs at Different Capacity Utilisation Levels (Installed Capacity 100,000 units)

Capacity Utilisation (Percent)	*Production at different levels capacity utilisation* (Units)	*Unit cost* Rs.	*Total cost* Rs.	*Differential cost* Rs.	*Differential cost per unit* Rs.
70	$70{,}000\left(1{,}00{,}000\times\frac{70}{100}\right)$	97	67,90,000	–	–
80	$80{,}000\left(1{,}00{,}000\times\frac{80}{100}\right)$	92	73,60,000	5,70,000	$57\left[\frac{5{,}70{,}000}{10{,}000}\right]$
90	$90{,}000\left(1{,}00{,}000\times\frac{90}{100}\right)$	87	78,30,000	4,70,000	$47\left[\frac{4{,}70{,}000}{10{,}000}\right]$
100	1,00,000	82	82,00,000	3,70,000	$37\left[\frac{3{,}70{,}000}{10{,}000}\right]$

Statement showing Profit or Loss Accepting the Various Export Orders

Export order source	*Export order unit*	*Capacity utilisation percent*	*Differential costs*		*Price per unit Rs.*	*Sales revenue from the order export Rs.*	*Profit or (loss) Rs.*
			Per unit Rs.	*Total Rs.*			
A	5000	75	57	2,85,000	55	2,75,000	(10,000)
B	10000	85	First 5000 units being upto 80% @ Rs. 57 Next 5000 units Rs @ Rs. 47	5,20,000	52	5,20,000	Nil
C	10000	95	First 5000 units being upto 90% @ Rs. 47 Next 5000 units @ Rs. 37	4,20,000	51	5,10,000	90,000
Total	25000	95%		12,25,000		13,05,000	80,000

It is clear from the above statement that it is advantageous for the company only when it accepts all the export orders. If the company accepts export orders only for one or two of three sources, it will suffer a loss. Therefore, the company should accept export orders from all the three sources to earn additional profits.

Example 17.10 (Material Procurement Decision)

A Company has the option to procure a particular material from two sources:

Source I assures that defectives will not be more than 2% of supplied quantity.

Source II does not give any assurance, but on the basis of past experience of supplies received from it, it is observed that defective percentage is 2.8%.

The material is supplied in lots of 1,000 units. Source II supplies the lot at a price, which is lower by Rs. 100 as compared to Source I. The defective units of material can be rectified for use at a cost of Rs. 5 per unit.

You are required to find out which of the two sources is more economical.

(CA Inter May 2001)

Solution:

Comparative Statement of Procuring Material from Two Sources

	Material source I	*Material source II*
Defectives (in%)	2 *(Future estimate)*	2.8 *(Past experience)*
Units supplied *(in one lot)*	1,000	1,000
Total defective units in a lot	20 *(1,000 units × 2%)*	28 *(1,000 units × 2.8%)*
Additional price paid per lot (Rs.): (A)	100	–
Rectification cost of defect (Rs.) (B)	100 *(20 units × Rs. 5)*	140 *(28 units × Rs. 5)*
Total additional cost per lot (Rs.): {(A) + (B)}	200	140

Decision: On comparing the total additional cost incurred per lot of 1,000 units, we observe that it is more economical, if the required material units are procured from material Source II.

Example 17.11 (Selling Price Decision)

The accounts of a company are expected to reveal a profit of Rs. 14,00,000 after charging fixed costs of Rs. 10,00,000 for the year ended 31st March, 2000. The selling price of the product is Rs. 50 per unit and variable cost per unit is Rs. 20.

Market investigations suggest the following responses to the price changes:

Alternatives	*Selling Price reduced by*	*Quantity Sold increased by*
I	5%	10%
II	7%	20%
III	10%	25%

Evaluate these alternatives and state which of the alternatives, on profitability consideration, should be adopted for the forthcoming year. *(CA Inter Nov. 2000; B. Com. (Hons) Delhi 2001)*

Solution

Statement for Evaluating three Alternatives on Profitability Consideration

	Alternatives		
	I	*II*	*III*
Selling price per unit (Rs.)	47.50 (Rs. 50 – 5% of Rs. 50)	46.50 (Rs. 50 – 7% of Rs. 50)	45.00 (Rs. 50 – 10% of Rs. 50)
Less: Variable cost per unit (Rs.)	20.00	20.00	20.00
Contribution per unit (Rs.)	27.50	26.50	25.00
Revised quantity of units to be sold *(Refer to Working Note 3)*	88000	96000	100,000
Total contribution (Rs.)	24,20,000 (88000 units × Rs. 27.50)	25,44,000 (96000 units × Rs. 26.50)	25,00,000 (100,000 units × Rs. 25)

Recommendation: An evaluation of the above three alternatives on profitability consideration clearly shows that alternative II is the best as it gives maximum contribution and hence profitability. Therefore this alternative should be adopted.

Working Notes:

1. *Contribution per unit*

   = Rs. Selling price per unit – Variable cost per unit

   = Rs. 50 – Rs. 20 = Rs. 30

2. *Expected quantity of units to be sold*

	(Rs.)
Profit	14,00,000
Add: Fixed costs	10,00,000
Total contribution	24,00,000

$$\text{Quantity of units sold} = \frac{\text{Total contribution}}{\text{Contribution per unit}} = \frac{\text{Rs. } 24,00,000}{\text{Rs. } 30} = 80000 \text{ units}$$

3. *Revised quantity of units to be sold*

Alternatives	*Units to be sold*
I	80000 units + 10% of 80000 units = 88000 units
II	80000 units + 20% of 80000 units = 96000 units
III	80000 units + 25% of 80000 units = 100,000 units

Example 17.12 (Cost Indifference Point)

XYZ Company is considering hiring a machine at an annual charge of Rs. 12,000 to increase the output of a product from its present level of 6,000 units. It is anticipated that with the introduction of the machine the variable cost per unit will be reduced by Re. 1.00 due to savings in labour cost. The new machine will not affect fixed cost in total, except for the hiring charges. The selling price of the product is Rs. 12 per unit. The present cost structure of the product is—Variable cost Rs. 9 per unit and fixed cost Re. 1.00 unit.

You are required to calculate the number of extra units, which must be produced and sold to justify hiring the machine, (that is the cost indifference point for the new machine). *(CA Inter)*

Solution:

Contribution per unit:

	Current	*Proposed*
Selling price per unit	Rs. 12.00	Rs. 12.00
Variable cost per unit	(Rs. 9.00)	(Rs. 8.00)
Contribution per unit	Rs. 3.00	Rs. 4.00
Total contribution required:		
Current contribution	6,000 × Rs. 3.00	Rs. 18,000.00
Hiring charges of the machine		12,000.00
Total		Rs. 30,000.00

Number of units to be sold: $\frac{\text{Total contribution required}}{\text{Proposed contribution per unit}} = \frac{\text{Rs. 30.000}}{\text{Rs. 4.00}} = 7{,}500$

Additional number of units to be sold: (7,500 – 6,000) units = 1,500 units

Thus, 1,500 extra units to be manufactured and sold to justify hiring the machine.

Notes:

(i) Indifference point for the new machine refers to the extra units to be produced and sold to maintain the current level of profit. Additional contribution from extra units should equal the hiring charges, the incremental fixed cost.

(ii) Fixed cost per unit is irrelevant because that represents average fixed cost. Incremental fixed cost is relevant for decision making.

Example 17.13 (Capacity Decision)

A Ltd. Co. has capacity to produce 100,000 units of a product every month. It works cost at varying levels of production is as under:

Level	*Works cost per unit*
	Rs.
10%	400
20%	390
30%	380
40%	370
50%	360
60%	350
70%	340
80%	330
90%	320
100%	310

Its fixed administration expenses amount to Rs. 1,50,000 and fixed marketing expenses amount to Rs. 2,50,000 per month respectively. The variable distribution cost amount to Rs. 30 per unit.

It can market 100% of its output at Rs. 500 per unit provided it incurs the following further expenditure:

(a) it gives gift items costing Rs. 30 per unit of sale;

(b) it has lucky draws every month giving the first prize of Rs. 50,000; 2nd prize of Rs. 25,000, 3rd prize of Rs. 10,000 and three consolation prizes of Rs. 5,000 each to customers buying the product.

(c) it spends Rs. 1,00,000 on refreshments served every month to its customers;

(d) it sponsors a television programme every week at a cost of Rs. 20,00,000 per month.

It can market 30% of its output at Rs. 550 per unit without incurring any of the expense referred to in (a) to (d) above.

Advise the company on its course of action. Show the supporting cost sheets. *(CA Inter Nov. 1998)*

Solution:

Statement of Cost

Capacity Level	*30%*		*100%*	
Output Level (Units)	*30000*		*100,000*	
	Per unit Rs.	*Total* Rs.	*Per unit* Rs.	*Total* Rs.
Works cost	380.00	1,14,00,000	310.00	3,10,00,000
Add: Fixed Administration Expenses	5.00	1,50,000	1.50	1,50,000
Cost of Production	385.00	1,15,50,000	311.50	3,11,50,000
Add: Fixed Marketing Expenses	8.33	2,50,000	2.50	2,50,000
Add: Variable Distribution Cost	30.00	9,00,000	30.00	30,00,000
Add: Special cost:				
Gift items cost	—	—	30.00	30,00,000
Customer's prizes	—	—	1.00	1,00,000
Refreshments	—	—	1.00	1,00,000
Television programme Sponsorship cost	—	—	20.00	20,00,000
Cost of Sales	423.33	1,27,00,000	396.00	3,96,00,000
Profit	126.67	23,00,000	104.00	1,04,00,000
Sales	550.000	1,50,00,000	500.00	5,00,00,000

Advice

A Ltd. makes an extra profit of Rs. 81 lakhs (Rs. 104 lakhs – Rs. 23 lakhs) if it works at 100% capacity to produce 100,000 units of a product per month. Hence, the company is advised to produce 100,000 units and incur the special costs required for marketing its 100% output.

Example 17.14 (Product Mix Decision)

A company produces three products. The cost data are as under:

		A	B	C
Direct Materials	Rs.	64	152	117
Direct Labour:				
Deptt.	Rate per hour Rs.	hrs.	hrs.	hrs.
1	5	18	10	20
2	6	5	4	7
3	4	10	5	20
Variable Overheads		Rs. 16	9	21
Fixed Overheads		Rs. 4,00,000 per month		

The budget was prepared at a time, when the market was sluggish. The budgeted quantities and selling prices are as under:

Product	*Budgeted Qty.*	*Selling Price (Rs.)/Unit*
A	9,750	270
B	7,800	280
C	7,800	400

Later the market improved and the sales quantities could be increased by 20% for product A and 25% each for products B and C. The sales manager confirmed that the increased quantities could be acheived at the prices originally budgeted. The production manager stated that the output cannot be increased beyond the budgeted level due to limitation of direct labour hours in Department 2.

Required:

(i) Present a statement of budgeted profitability.

(ii) Set optimal product mix and calculate the optimal profit. *(CA Inter May 1998)*

Solution

Statement of Budgeted Profitability

Products		*A*	*B*	*C*	*Total*
Budgeted Quantity (Units)	(1)	9750	7800	7800	
	(2)	Rs.	Rs.	Rs.	
Selling Price per unit		270	280	400	
Variable Cost per unit:					
Direct Materials		64	152	117	
Direct Labour		160	94	222	
Variable Overheads		16	9	21	
Total Variable Cost per unit	(3)	240	255	360	
Contribution per unit	(4) = ((2) – (3))	30	25	40	
Total Contribution	(1) × (4)	2,92,500	1,95,000	3,12,000	7,99,500
Less: Fixed Cost					4,00,000
Profit					3,99,500

(2) Statement of Optimal Product Mix and Profit

Products		*A*	*B*	*C*	*Total*
Contribution per unit	(1)	30	25	40	
Direct Labour hours in Department 2	(2)	5	4	7	
Contribution per direct labour hour (1)/(2)	(Rs.)	6	6.25	5.71	
Ranking		II	I	III	

(Contd.)

Products	*A*	*B*	*C*	*Total*
Optimal Product Mix Units (3)	11,700 (58,500 hrs.)	9,750 (39,000 hrs.)	5,292 (37,044 hrs.)	
Total Contribution (Rs.) (1) × (3)	3,51,000	2,43,750	2,11,680	8,06,430
Less: Fixed Cost (Rs.)				4,00,000
Optimal Profit				4,06,430

Working Notmes:

1. Total hours available in Department 2

Products (a)	*Units (b)*	*Hrs per unit (c)*	*Total Hrs. (d) = (b) × (c)*
A	9,750	5	48,750
B	7,800	4	31,200
C	7,800	7	54,600
Total			1,34,550

2. Maximum Sales Quantities of Products (under improved market conditions)

Products	*Units*	*Increase in percentage*	*Total number of units*
A	9,750	20	11,700
B	7,800	25	9,750
C	7,800	25	9,750

Example 17.15 (Product Mix Decision)

M/s. Mars Ltd. are manufacturing three products. The cost details are as follows:

Particulars	*Products*					
	A		*B*		*C*	
	Units	*Rs.*	*Units*	*Rs.*	*Units*	*Rs.*
Direct Materials	4	12	5	15	6	18
Direct Labour		5		6		6
Direct Expenses		8		9		11
		25		30		35
Selling Price		35		40		50
		10		10		15
No. of Units sold	20,000		40,000		20,000	
Contribution		2,00,000		4,00,000		3,00,000
Total Contribution				Rs. 9,00,000		
Less: Fixed Costs				Rs. 7,50,000		
				Rs. 2,50,000		

The direct materials were all imported. Due to foreign exchange restrictions, henceforth, the company can import only 300,000 units of raw materials. The company can produce in all 100,000 units maximum (all products). However, they can market only 20000 units of product A & C each. There is a local substitute material which is available at a price of Rs. 3.75 per unit. Besides, the company has to spend Rs. 50,000 on intermediaries and consumables, if local substitute material is used in the production process. There was also a third party who was willing to take a part of the plant on lease upto 50000 units capacity of B and willing to pay lease charges of Rs. 2,75,000.

You are required to advise the management:

(i) What should be the quantum of production/sales mix of products with existing import restrictions?

(ii) Whether the company can optimise production of 100,000 units with local substitute materials?

(iii) Whether the company can enhance profits by leasing out a part of the plant to the thrid party and restricting its own production? *(CA Inter May 1999)*

Solution:

(i) Statement of Quantum of Productions/Sales Mix of Products
(with existing import restrictions)

Products	*A*	*B*	*C*	*Total*
Selling price per unit (Rs.)	35	40	50	
Less: Variable Cost per unit	25	30	35	
Contribution per unit of product (Rs.) (1)	10	10	15	
Units of Materials (2)	4	5	6	
Contribution per unit of material (Rs.) (3) = (1)/(2)	2.50	2	2.50	
Ranking	I	II	I	
Units made (4)	20,000	20,000	20,000	
(Materials consumed)	(80000 units)	100,000 units)	120,000 units)	
Total Contribution (Rs.) (5) = (1) × (4)	2,00,000	2,00,000	3,00,000	Rs. 7,00,000
Less: Fixed Costs (Rs.)				Rs. 7,50,000
Profit (Loss)				Rs. (50,000)

(ii) *Use of Local substitute of Material* (Output 100,000 units)

	Rs.	Rs.
Contribution per unit of product B on using local substitute material (Rs. 10 – Rs. 3.75)	6.25	
Total Contribution on 40,000 units of product B (40000 units × Rs. 6.25)		2,50,000
Less: Intermediaries Expenses		50,000
Net additional Contribution		2,00,000
Loss on Present Output of 60000 units (as per (1))		50,000
Net Profit		1,50,000

Thus, the company can have optimum production of 100,000 units by using local substitute of material.

(iii) *Evaluation of Leasing Out a part of the Plant*

	Total contribution on sale of 20000 units of Products A and C and 10000 units of Product B by using imported material (20,000 units × Rs. 10 + 10000 units × Rs. 10 + 20000 units × Rs. 15)	6,00,000
Less:	Fixed Assets	7,50,000
	Profit (Loss)	(1,50,000)
Add:	Lease Rent received	2,75,000
	Net Profit	1,25,000

Conclusion: The net profit is Rs. 1,50,000 in case the company uses local substitute of material and the plant capacity fully for producing 1,00,000 units, whereas by leasing out the plant capacity upto 50,000 units of Product B for a rent of Rs. 2,75,000, the company makes a profit of Rs. 1,25,000. A comparative study of the two alternatives suggests that it will be better for the company to have optimum production of 100,000 units by using local substitute of material.

Example 17.16 (Export order, Outsourcing)

Novina Industries Ltd. has received an export order for its only product that would require the use of half of the factory's present capacity of 400,000 units per annum. The factory is currently operating at 60% level to meet the demand of its domestic market.

As against current price of Rs. 6.00 per unit, the export order offers @ Rs. 4.50 per unit, which is less than the cost of production, the details of which are given below:

Direct Materials	Rs. 2.50 per unit
Direct Labour	Rs. 1.00 per unit
Direct Expenses	Re. 0.50 per unit
Fixed Overheads	Re. 1.00 per unit

The condition of the export is that it has either to be accepted in full or totally rejected.
The company is considering the following alternatives:

(a) Accept the order and keep domestic sales unfulfilled to the excess demand for the same
(b) Increase factory capacity by installing a few balancing machinery and equipments and also by working extra time to meet the balance of the required capacity. This will increase fixed overheads by Rs. 20,000 annually and the additional cost of overtime will work out to Rs. 40,000 per annum.
(c) Out source the production of additional requirements by supplying direct materials and paying conversion charges of Rs. 1.75 per unit to a small converter, and engaging one supervisor at a cost of Rs. 3,000 per month to look after quality, packing and despatch.
(d) Reject export order and continue with domestic market.

As a Management Accountant, you are required to make comparative analysis of various proposals and suggest which of the alternative proposals is the most attractive to Novina Industries Ltd.

(ICWA, Inter, Stage 1, June 2006)

Solution:

Novina Industries Ltd
Analysis of four alternative proposals

			Rs.
Proposal-A: (Accept Export order and domestic sale of 20000 units)			
Export Sales – 200,000 units @ Rs. 4.50 per unit.			9,00,000
Domestic Sales – 200,000 units @ Rs. 6.00 per unit.			12,00,000
Total	400,000 units		21,00,000
Less: Direct cost of sales (variable) @ Rs. 4			16,00,000
Contribution			5,00,000
Less: Fixed costs (60% level that is 240,000 units × 1)			2,40,000
Profit			2,60,000
Proposal-B			
			Rs.
Export Sales	200,000 units @ Rs. 4.50 per unit		9,00,000
Domestic Sales	240,000 units @ Rs. 6.00 per unit.		14,40,000
	440,000 units	Total	23,40,000
Variable cost of sales @ Rs. 4	= Rs. 17,60,000		Rs.
Additional cost of overtime	Rs. 40,000		18,00,000
Contribution			5,40,000
Less: Fixed overheads (240,000 + Additional 20,000)			2,60,000
Profit			2,80,000
Proposal-C			Rs.
Export Sales	200,000 units @ Rs. 4.50 per unit.		9,00,000
Domestic Sales	240,000 units @ Rs. 6.00 per unit		14,40,000
	440,000 units	Total	23,40,000
Less: Direct cost of Sales (Variable) 4,00,000 × 4		= Rs. 16,00,000	
Direct Material cost of 40000 units × 2.50		= Rs. 1,00,000	
Conversion charges of 40000 units × 1.75		= Rs. 70,000	
Supervision charges @ 3000 × 12		= Rs. 36,000	
Total		18,06,000	18,06,000
Contribution			5,36,000
Less: Fixed overheads			2,40,000
Profit			2,94,000
Proposal-D: (Rejecting export order and remaining with domestic market)			
			Rs.
Domestic Sales 240,000 units @ Rs. 6.00 per unit.			14,40,000
Less: Direct cost of Sales (240,000 × 4)			9,60,000
Contribution			4,80,000
Less: Fixed overheads			2,40,000
Profit			2,40,000

Decision: On making comparative analysis of four alternative proposals (A, B, C and D), it is revealed that for accepting export order proposal-C is most profitable and should be accepted by Novina Industries Ltd.

Example 17.17 (Shut Down Decision)

The annual flexible budget of TBA Ltd. is as follows:

Production Capacity	40%	60%	80%	100%
Costs:	Rs.	Rs.	Rs.	Rs.
Direct wages	20,000	30,000	40,000	50,000
Direct material	16,000	24,000	32,000	40,000
Production overheads (Fixed and variable)	11,400	12,600	13,800	15,000
Administrative overheads (Fixed and variable)	5,800	6,200	6,600	7,000
Selling and distribution overheads (Fixed and variable)	6,200	6,800	7,400	8,000
Total:	59,400	79,600	99,800	1,20,000

The company is presently passing through a period of very lean market demand and operating at 50% capacity and have also selling its product at a discounted price generating a sales revenue of Rs. 60,000 at that level.

It is expected that the market scenario will improve in the next year and, on a conservative rate, the company is likely to operate at 70% capacity level with increased sales revenue of Rs. 20,000.

As an option, the management is considering to close down the operation for one year and start operation after one year when the market conditions are likely to improve. If closed down for one year it is estimated that

(i) the present fixed costs will reduce by 60%;
(ii) there will be a cost of Rs. 10,000 towards closing down operations;
(iii) to maintain a skeleton maintenance service for which Rs. 24,000 to be incurred;
(iv) an initial cost of re-opening of Rs. 20,000 to be incurred.

The other option is to keep the factory operational for one year and wait for better time next year. You are required to work out the profitability under the two options and give your comment.

(ICWA, Inter Stage 1, June 2005)

Solution:

TBA Ltd.

Cost Structure

	Total Cost at 100%	*Variable Cost at 100%*	*Fixed Cost*
	(Rs.)	(Rs.)	(Rs.)
Direct Wages	50,000	50,000	Nil
Direct Material	40,000	40,000	Nil
Production over head	15,000	6,000	9,000
Admn. over head	7,000	2,000	5,000
Selling and Distribution. over head	8,000	3,000	5,000
	1,20,000	1,01,000	19,000

Comparative Profitability of two Options

	Current Operation 50% Level (Rs.)	*Closure for one year (Rs.)*	*Operation after one year 70% Level (Rs.)*
Revenue	60,000	Nil	1,20,000
Variable Costs:			
Direct Materials	20,000		28,000
Direct Wages	25,000		35,000
Production over head	3,000		4,200
Admn. over head	1,000		1,400
Selling and Distribution over head	1,500		2,100
	50,500	Nil	70,700
Fixed Costs	19,000	7,600 (40%)	19,000
Closing down costs	–	10,000	–
Maintenance cost	–	24,000	–
Re-opening cost	–	20,000	–
Total cost	69,500	61,600	89,700
Profit/ Loss	(9,500)	(61,600)	30,300

Comment: In the light of assessment of comparative profitability, it is better to continue with operation in current year and wait for the next year.

Example 17.18 (Mode of Conveyance Decision)

ACME Company is considering three proposals for conveyance facilities for its sales staff, who normally travels on an average 20000 kilometres per annum locally. The proposals are as follows:

I. Purchase and maintain own fleet of cars. Average cost of a car is Rs. 2.50 lakhs. Petrol consumption is @ 12 km/litre. Each has a resale value of Rs. 50,000 at the end of five years.

II. Allow the executive to use their own car and reimburse expenses @ Rs. 5 per km and insurance premia.

III. Hire cars from outside agency for Rs. 30,000 per year per car, the company shall also bear the cost of petrol (Rs. 3.75 per km), taxes and tyres etc.

Following cost data are available for consideration

(i) Petrol– Rs. 45 per litre
(ii) Repairs and maintenance– @ 50 paise per km
(iii) Insurance – Rs 4,800 per year per car
(iv) Taxes – Rs. 2,400 per year per car
(v) Tyres – @ 40 paise km
(vi) Driver's wages and Bonus Rs. 30,000 per annum per car

Which of the proposals is acceptable? *(ICWA Inter, Stage 1, June 2005)*

Solution:

Acme Company
Statement Showing Comparative cost of Operation per car Per Annum and Per KM. (20000 Kilometres p.a)

Particulars of Expenses	*Company's Purchased and own car (I)* (Rs.)	*Executive Car (II)* (Rs.)	*Hire Car (III)* (Rs.)
Petrol @ Rs. 45 per litre/12 km per litre	75,000.00	–	75,000.00
Repairs and Maintenance @ 50 p/km	10,000.00	–	–
Tyre @ 40 paise/ km	8,000.00	–	8,000.00
Insurance Rs. 4,800 per year/car	4,800.00	4,800.00	–
Taxes @ Rs. 2,400 p.a. per car	2,400.00	–	2,400.00
Depreciation			
Rs. (2,50,000 – 50,000)/5	40,000.00	–	–
Re-imbursement of Expenses			
@ Rs. 5 per km	–	1,00,000.00	–
Driver's Wages and Bonus @ Rs. 30000 p.a	30,000.00	–	–
Hire charges	–	–	30,000.00
Total cost: (A)	1,70,200.00*	1,04,800.00	1,15,400.00
Cost per kilometer (A/20000 km)	8.51	5.24	5.77

*This cost will go up, because company would have earned interest, if it invested Rs. 2.50 lakhs elsewhere.

Comment: In consideration of the comparative analysis as stated in the tabulated statement, second proposal (allow executives to use their own cars) is most economic and recommended to accept.

Example 17.19 (Sell or Process Further)

Modern Mills Ltd. manufactures certain grades of products known as M, B_1 and B_2. In course of manufacture of product M (main product), by products B_1 and B_2 emerge. The joint expenses of manufacture amount to Rs. 2,37,600.

All the three products are processed further after separation and sold as per details given below:

	Product M	*(By products)*	
		Product B_1	*Product B_2*
Sales	Rs. 2,00,000	1,20,000	80,000
Cost incurred after separation	Rs. 20,000	15,000	10,000
Profit as percentage on sales	25	20	15

Total fixed selling expenses are 10% of total cost of sales which are apportioned to the three products in the ratio of 20 : 40 : 40.

Required:

(i) Prepare a statement showing the apportionment of joint costs to the products (M, B_1 and B_2).

(ii) If the Product B_1 (by product) is not subject to further processing and is sold at the point of separation, for which there is a market at Rs. 1,00,440 without incurring any selling expenses. Would you advise its disposal at this stage? Show the workings. *(ICWA, Inter, Stage 1, June 2005)*

Solution:

Modern Mills Ltd.

Statement of Apportionment of Joint Cost

(Fig. in Rs.)

	Total	*Product M*	*(By-products)*	
			Product B_1	*Product B_2*
Sales	4,00,000	2,00,000	1,20,000	80,000
Less: Profit	86,000	50,000	24,000	12,000
Cost of Sales	3,14,000	1,50,000	96,000	68,000
Less: Selling and distribution expenses (10 % of Rs. 3,14,000) apportioned in the ratio of 20 : 40 : 40	31,400	6,280	12,560	12,560
Cost of production	2,82,600	1,43,720	83,440	55,440
Less: After Split-off cost (Separation Cost)	45,000	20,000	15,000	10,000
Joint Cost Apportioned	2,37,600	1,23,720	68,440	45,440

(iii) If product B_1 (By-product) is sold after further processing, a profit of Rs. 24,000 is earned on this product as shown in the statement above. However if it is sold at the point of separation, its profit will be as follows:

Sales of product B_1	Rs. 1,00,440
Less: Share in joint cost	Rs. 68,440
Profit	32,000

Recommendation:

It reveals from the comparative assessment of profitability as stated above that when Product B_1 is sold at the point of separation, profit to the tune of Rs. 32,000 is earned resulting in enhancement of profit by Rs. 8,000 (that is, Rs. 32,000 – Rs. 24,000). Hence, it is advisable to sell the product B_1 at the point of separation instead of selling after further processing.

Example 17.20 (Limiting Factor Decision)

A company has plans to manufacture five different types of product using a common raw materials which is locally available according to requirement at Rs. 16 per kg. However skilled labour required for manufacture is in short supply and current availability is only 30000 hours per month @ Rs. 20 per hour.

Variable production overheads amounts to Rs. 10 per labour hour and variable selling and distribution cost is 10% of sales value.

Total fixed costs of selling, distribution and administration is estimated to be Rs. 3,00,000 per month. Further details relating to the products are given below:

Product	*Current demand (units)*	*Selling price per unit (Rs.)*	*Raw material required (kg/unit)*	*Direct labour required (hrs/unit)*
A	8,000	100	2	1
B	6,000	120	2.5	1.2
C	5,000	160	3	2
D	3,000	220	4	3
E	2,000	300	5	4

Required:

(a) Contribution Analysis statement showing the relative profitability of the products under:

(i) Normal conditions without any constrains on resources.

(ii) When skilled labour hours are in short supply.

(b) Production plan for optimum profit when available labour hours is only 30000. What is the expected profit?

(c) If the company decides to produce and sell even relatively less profitable products to meet at least 10% of the current demand, what revised plan will you suggest? What is the anticipated profit?

(ICWA, Inter, Stage 1, Dec. 2005)

Solution:

(a) Contribution Analysis Statement

(i) Under Normal Condition and (ii) Under – When skilled Labour hours is in short supply

	Products				
	A	*B*	*C*	*D*	*E*
Raw material required (kg/unit)	2	2.5	3	4	5
Direct labour required (hrs.unit)	1	1.2	2	3	4
Variable cost per unit (Rs.):					
Raw materials @ Rs. 16 per kg.	32	40	48	64	80
Direct Labour @ Rs. 20 per hr.	20	24	40	60	80
Production overhead @ Rs. 10 per hr.	10	12	20	30	40
Selling and Distribution Cost	10	12	16	22	30
Total (A)	72	88	124	176	230
Selling price per unit Rs. (B)	100	120	160	220	300
Contribution per unit (Rs.) (B–A):	28	32	36	44	70
P/V Ratio (Contribution/sales)	28%	26.7%	22.5%	20%	23.3%
(i) Profitability Ranking	I	II	IV	V	III
Contribution per labour hour (Rs.) (Contribution/Labour hour per unit)	28.00	26.67	18.00	14.67	17.50
(ii) Ranking	I	II	III	V	IV

(Contd.)

(b) Expected Profit (Under Production Plan for Optimum Profit)

	Products					Total
	A	B	C	D	E	
Total labour hours available						30000
Contribution per labour hr. (Rs.)	28	26.67	18.00	14.67	17.50	
Ranking	I	II	III	V	IV	
Allocation of labour hours	8000	7200	10000		4800	
No. of units to be produced (Maximum)	8000	6000	5000		1200	
Total contribution (Rs.)	2,24,000	1,92,000	1,80,000		84,000	6,80,000
Less: Fixed cost (Rs.)						3,00,000
Expected Profit (Rs.)						3,80,000

(c) Profitability Statement

(When at least 10% of current demand of product D is to be maintained)

Total labour hours available: 30000 hrs.

Products	Rank of contribution per hr.	No. of units to be produced	Labour hrs required	Contribution per unit (Rs.)	Total contribution (Rs.)
A	I	8000 (max)	8000	28	2,24,000
B	II	6000 (max)	7200	32	1,92,000
C	III	5000 (max)	10000	36	1,80,000
D	V	300 (10%)	900	44	13,200
E	IV	975	3900	70	68,250
Total			30000		6,77,450
Less:	Fixed cost				3,00,000
Anticipated	Profit				3,77,450

Comments: Since total profit is declined by Rs. 2,550, this revised plan can not be recommended.

Example 17.21 (Sell or Process Further Decision)

A certain raw material on undergoing a chemical process yield three product A, B and C and a by-product X. The relevant particulars of the process for a month are given below:

Joint processing cost:

Raw materials input	: 20,000 kg @ Rs. 15
Other materials	: Rs. 30,600
Direct labour	: 4000 hours @ Rs. 20
Production overheads	: Rs. 1,00,000

Output, selling price and other particulars:

Product	Output (kg)	Selling price/kg if sold without further processing	Further processing cost	Selling price/kg after further processing
A	8000	Rs. 28	Rs. 56,000	Rs. 38
B	6000	30	60,000	42
C	5000	32	60,000	43
X	500	6	1,500	8

Required:

(a) If the company apportions the joint cost after taking credit for the sale value of the by-product, in proportion to the sale value of the three main products at the point of separation, what is the cost per kg of each production at that stage?

(b) Which of the products should be processed further? Show workigns.

(c) What is the profit earned if all the main products are sold without further processing? Give productwise details.

(d) If further processing is done as suggested in (b), what is the total profit earned? Give productwise details.

(ICWA, Inter, Stage 1, June 2004)

Solution:

(a) Joint Processing Cost.

	Rs.
Raw materials input: 200,000 kg @ Rs. 15	3,00,000
Other materials	30,600
Direct labour: 4000 hrs. @ Rs. 20	80,000
Production overheads	1,00,000
	5,10,600
Less: Sale value of by-product X (500 kg @ Rs. 6)	3,000
Total (Net)	5,07.600

Apportionment of Joint Cost among main products and Determination of cost per kg.

Product	Output/Sales (kg)	Sale value (Rs.)		Apportionment of joint cost of Rs. 5,07,600 (Rs.)	Cost/kg (Rs.)
		per kg	Total		
A	8000	28	2,24,000	2,01,600	25.2000
B	6000	30	1,80,000	1,62,000	27.0000
C	5000	32	1,60,000	1,44,000	28.8000
	19000		5,64,000	5,07,600	26.7158

(b) Incremental sale value and additional cost, if processed further.

Product	Output/Sales (kg.)	Incremental sale value (Rs.) per kg.	Incremental sale value (Rs.) Total	Further Processing cost (Rs.)	Net Gain/(Loss) (Rs.)
A	8000	10	80,000	56,000	24,000
B	6000	12	72,000	60,000	12,000
C	5000	11	55,000	60,000	(5,000)
X	500	2	1,000	1,500	(500)

In the light of above statement, only Product A and Product B should be processed further.

(c) Determination of Profit earned if all products sold without further processing.

Product	Quantity (kg)	Share of Joint Cost (Rs.)	Sale Value (Rs.) Per kg	Sale Value (Rs.) Total	Profit/(Loss) (Rs.)
A	8000	2,01,600	28	2,24,000	22,400
B	6000	1,62,000	30	1,80,000	18,000
C	5000	1,44,000	32	1,60,000	16,000
Total		5,07,600		5,64,000	56,400

(d) Determination of total profit earned if sold after further processing as suggested in (b).

Product	Quantity (kg)	Share of Joint Cost (Rs.)	Further Processing Cost (Rs.)	Total Cost (Rs.)	Sale Value (Rs.) per kg	Total (Rs.)	Profit/(Loss) (Rs.)
A	8.000	2,01,600	56,000	2,57,600	38	3,04,000	46.400
B	6.000	1,62,000	60,000	2,22,000	42	2,52,000	30.000
C	5.000	1,44,000		1,44,000	32	1,60,000	16,000
Total		5,07.600	1,16,000	6,23.600		7,16.000	92.400

Example 17.22 (Alternative Plan Decisions)

A company manufactures and sells two standards products X and Y using the same raw material, labour and identical machines. Further particulars are given below:

	X		Y	
Selling price/unit	Rs.	80	Rs.	100
		Per unit		
Direct Materials @ Rs. 20/kg	Rs.	20	Rs.	30
Direct Labour @ Rs. 15/hr	Rs.	15	Rs.	15
Variable Overheads	Rs.	15	Rs.	15

Machine hours required		1/2 hr		3/4 hr
Fixed Overheads (allocated)	Rs.	12	Rs.	18
		Per annum		
Maximum Demand (units)		18000		15000
Current Production (units)		15000		12000

Labour and materials are available according to requirements. But machine capacity cannot be increased immediately and the available capacity has been fully utilised by the current production plan.

Required:

(i) Current contribution analysis.
(ii) Profit currently earned by the company.
(iii) Alternative production plan, if any, more profitable to the company.
(iv) Profit expected to be earned under the suggested plan. *(ICWA, Inter, Stage 1, Dec. 2003)*

Solution:

(i) Analysis of Current Contribution of two product

Products	*X* Rs.		*Y* Rs.	
Selling price unit (S)		80.00		100.00
Less: Variable costs:				
Direct Materials	20.00		30.00	
Direct Labour	15.00		15.00	
Direct Overheads	15.00	50.00	15.00	60.00
Contribution per unit (C)		30.00		40.00
P/V Ratio = C/S × 100		37.50%		40.00%
Machine hours required per unit (hrs.)		1/2		3/4
Contribution per Machine Hour (limiting factor) (Rs.)		60.00		53.33

(ii) Profitability Statement for current year

Products	*X*	*Y*	*Total*
Production (current) in units	15,000	12,000	
Contribution/unit (Rs.) as above	30	40	
Total contribution (Rs.)	4,50,00	4,80,000	9,30,000
Less: Fixed Overheads (Rs.)			(3,96,000)
15,000 × 12 = 1,80,000			
12,000 × 18 = 2,16,000			
Profit (Earned)			5,34,000

(iii) Alternative Production Plan Since Machine hour is the limiting factor, maximum demand and contribution per machine hour for Product X and Y are to be given weightage for preparation of Production Plan — more profitable to the company.

Production Plan

Products	*X*	*Y*	*Total*
Maximum demand (units)	18000	15000	
Available Machine hours: (15000 × 0.5 + 12000 × 0.75)			16,500
Optimum Product Mix			
Production (units)	18000	10000	28,000
Allocation of M/c hours	9000	(bal.) 7,500	16,500

(iv) Profit expected to be earned under the suggested Plan

Products	*X*	*Y*	*Total*
Production (suggested) in units vide Ref. (iii)	18000	10000	28000
Contribution/unit (Rs.)	30	40	
Total Contribution (Rs.)	5,40,000	4,00,000	9,40,000
Less: Fixed Ovd. cost (Rs.)			(3,96,000)
Profit (expected)			5,44,000

Example 17.23 (Alternative Proposals)

A review, made by the top management of M/s. Sweat and Struggle Ltd., which makes only one product, of the result of first quarter of the year revealed the following:

Sales in units	10000
Loss in Rs.	10,000
Fixed cost (for the year Rs. 1,20,000) in Rs.	30,000
Variable cost per unit in Rs.	8

The Finance Manager who feels perturbed suggests that the company should atleast break-even in the second quarter with a drive for increased sales. Towards this, the company should introduce a better packing which will increase the cost by Re. 0.50 per unit.

The Sales Manager has an alternate proposal. For the second quarter additional sales promotion expenses can be increased to the extent of Rs. 5,000 and a profit of Rs. 5,000 can be aimed at for the period with increased sales.

The Production Manager feels otherwise. To improve the demand, the selling price per unit has to be reduced by 3 percent. As a result, the sales volume can be increased to attain a profit level of Rs. 4,000 for the quarter.

The Managing Director asks you as a Cost Accountant to evaluate these three proposals and calculate the additional Sales Volume that would be required in each case, in order to help him take a decision.

(ICWA, Stage 2, June 2006)

Solution:

Results of the first quarter: Sales 10000 units

Particulars	*Per unit (Rs.)*	*Amount (Rs.)*
Variable cost (V)	8	80,000
Fixed cost	3	30,000
Total cost	11	1,10,000
Loss	1	10,000
Sales (S)	10	1,00,000
Contribution (S-V) =	2	20,000

Comparative Statement of three Proposals

Particulars	*Proposal of Finance Manager (Rs.)*	*Sales Manager (Rs.)*	*Production Manager (Rs.)*
Selling Price per unit	10.00	10.00	9.70
Variable Cost per unit (8.00 + 0.50)	8.50	8.00	8.00
Contribution per unit	1.50	2.00	1.70
Fixed Cost	30,000	35,000	30,000
Profit Required	Nil	5,000	4,000
B.E.P. (unit) = $\frac{\text{F.C.}}{\text{Contribution}}$		= 30,000/1.50 = 20,000	
Sales (unit) = (F + P)/C per unit		(35,000 + 5,000)/2.00 = 20,000	(30,000 + 4,000)/1.70 = 20,000
Additional Sales Volume required In second quarter as compared to first quarter	10,000	10,000	10,000

Example 17.24 (Export Order Decision)

Following data are in respect of a firm manufacturing a single product for a particular period:

	Rs.
Sales (20000 units)	2,00,000
Cost of production (20000 units)	1,20,000
Selling and distribution expenses	30,000
Maximum capacity 25000 units	

Fixed costs included in cost of production are Rs. 40,000 and only variable cost included in selling and distribution expenses are commission @ 10% on sales and packing expenses @ 20 p. per unit.

(1) An offer for purchase of 4000 units is received from outside India. No sales commission is payable on such foreign order but packing costs will be 80 p. per unit.

What minimum price may be quoted for the foreign offer?

(2) What should be the minimum price had the offer size been 8000 units instead of 4000 units?

(ICWA Stage 2, June 2005)

Solution:

		Rs. (Total)	***Per unit (Rs.)***
Sales value of 20000 units at Rs. 10 each		2,00,000	10.00
Variable Costs:	Rs.		
Cost of Production	80,000		
Selling and distribution 10% of Sales	20,000		
Packing expenses @ 20 p/unit for 20000 units	4,000	1,04,000	5.20
Contribution		96,000	4.80
Fixed Costs			
Cost of Production	40,000		
Selling and Distribution Expenses	6,000	46,000	
Profit		50,000	

(i) When foreign offer is 4000 units

Additional production of 4000 units for foreign offer is within the maximum capacity so no additional fixed cost is to be incurred. To occupy the foreign market the minimum price would be the variable cost per unit.

Variable cost per unit for 4000 units for foreign demand:

Production	Rs.
(Rs. 80,000/20,000)	4.00
Packing cost	0.80
Minimum price to be quoted	Rs. 4.80

(ii) When foreign offer is 8000 units, to meet this, the domestic market is to be sacrificed of 3000 units, as maximum production is 25000 units. So contribution loss on these 3000 units is also to be added to the variable cost to determine the minimum price to be quoted for foreign offer:

	Rs.
Variable cost for 8000 units @ Rs. 4.80	= 38,400
Contribution loss on 3000 unit @ Rs. 4.80	= 14,400
Total cost to be covered by 8000 units	= 52,800
Minimum price 52,800/8,000	= Rs. 6.60/per unit

Example 17.25 (Profitability Decision)

A company produces a single product which is sold by it presently in the domestic market at Rs. 75 per unit. The present production and sale is 40000 units per month representing 50% of the capacity available. The cost data of the product are as under:

Variable costs per unit Rs. 50

Fixed costs per month Rs. 10 lakhs.

To improve the profitability, the management has 3 proposals on hand as under:

(a) to accept an export supply order for 30000 units per month at a reduced price of Rs. 60 per unit, incurring additional variable costs of Rs. 5 per unit towards export packing, duties, etc.;

(b) to increase the domestic market sales by selling to a domestic chain stores 30000 units at Rs. 55 per unit, retaining the existing sales at the existing price;

(c) to reduce the selling price for the increased domestic sales as advised by the sales department as under:

Reduce selling price per unit by Rs.	*Increased in sales expected (in units)*
5	10000
8	30000
11	35000

Prepare a table to present the results of the above proposals and give your comments and advice on the proposals. *(ICWA Inter June 1996)*

Solution:

The three proposals can be studied by differential cost analysis. The present capacity utilisation is only 50% and as such there is a scope to increase the sales up to another 4000 units. The comparison of proposals will depend on contribution generated since the fixed cost is not affected upto full utilisation and as such not relevant for decision-making.

Statement showing Contribution at Various Price Levels

Particulars	*Proposal (a)*		*Proposal (b)*	*Proposal (c)*		
	Present Level	*Export Order*	*Domestic Order*	*Price Reduction*		
Selling Price per unit Rs.	75	60	55	70	67	64
Variable Cost per unit Rs.	50	55	50	50	50	50
Contribution per unit Rs.	25	05	05	20	17	14
Quantities in units	40000	30000 (addl.)	30,000 (addl.)	50,000 (total)	70,000 (total)	75,000 (total)
Existing Contribution (Rs. in lakh)	10	–	–	–	–	–
Additional Contribution (Rs. in lakh)		1.5	1.5			
Total Contribution for revised quantity (Rs. in lakhs)				10.0	11.9	10.5
Total Contribution Rs in lakhs	10.00	11.5	11.5	10.0	11.9	10.5
Proposal		(a)	(b)	c(i)	c(ii)	c(iii)

Comments and Advice:

(1) In case only cost considerations are considered, proposal to reduce selling price by Rs. 8 to get a gross sales of 7000 units is most profitable since it yields a total contribution of Rs. 11.9 lakhs.

(2) In between export order as per proposal (a) and increased domestic order as per proposal (b) there is no change in additional profitability since both yield same results.

(3) However keeping in mind the impact on other domestic sale, if a part of production alone is sold at a drastically reduced price of Rs. 55 per unit, it is desirable to go for export order. This will also enable gaining valuable foreign exchange. Besides with exchange rate fluctuations it may result in higher profits, in case the selling price is quoted in foreign currency.

(4) Reduction in selling price against possible increased sales is full of doubt and has only a marginal effect of Rs. 40,000 as additional profit. (Rs 11,90,000—11,50,000).

Thus, on the whole it is better to go for export order.

Example 17.26 (Product Priority Decision)

Sum Toys (P) Ltd. manufactures and sells children's toys of high quality over an extensive market, utilising the services of skilled artists who are paid at an average rate of Rs. 15 per hour. The total no. of skilled labour hours available in a year is only 14000. The details of planned production for 1996–97, estimated cost and unit selling prices are given below:

Toy	*Production*	*Cost of Production per Unit*			*Selling Price*
	Plan (unit)	*Direct Materials* Rs.	*Direct Labour* Rs.	*Fixed Overheads* Rs.	*perunit* Rs.
	A	3,000	20	10	
15	70				
	B	4,000	24	12	
18	92				
	C	4,000	32	12	
18	95				
	D	3,000	40	16	
24	110				
E	2,400	60	20	30	180

Variable overhead costs amount to 50% of the direct labour cost.
The company has estimated the following maximum and minimum demands for each product:

	A	*B*	*C*	*D*	*E*
	Maximum (units)	5,000	6,000	6,000	
4,000	4,000				
Minimum (units)	1,000	1,000	1,000	500	500

(ICWA Inter June 1996)

Solution: Basic Calculations

Statement of Priority of Production Taking Labour Time as Key Factor

(Rs.)

Product	*Selling*	*Total Variable Cost*				*Contribution*		
	Price per unit	*Direct materials*	*Direct labour*	*Variable overheads*	*Total*	*Per unit*	*Per Labour hour*	*Production priority*
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
A	70	20	10	5	35	35	52.50	IV
B	92	24	12	6	42	50	62.50	II
C	95	32	12	6	50	45	56.25	III
D	110	40	16	8	64	46	43.13	V
E	180	60	20	10	90	90	67.50	I

Contribution per labour hour has been derived as follows:

$$\frac{\text{Product per unit contribution} \times \text{Rs. 15 average labour rate}}{\text{Product direct labour cost}}$$

Product

$$A = \frac{\text{Rs } 35 \times 15}{10} = 52.5$$

$$B = \frac{50 \times 15}{12} = 62.5$$

$$C = \frac{45 \times 15}{12} = 56.25$$

$$D = \frac{46 \times 15}{16} = 43.13$$

$$E = \frac{90 \times 15}{20} = 67.50$$

(a) Statement of Estimated Profit for 1996-97
(As per Company's Production Plan)

Product	*Vol. of Sales (units)*	*Contribution per unit (Rs.)*	*Total Contribution (Rs.)*	*Total Fixed cost (Rs.)*	*Profit (Rs.)*
A	3,000	35	1,05,000	45,000	60,000
B	4,000	50	2,00,000	72,000	1,28,000
C	4,000	45	1,80,000	72,000	1,08,000
D	3,000	46	1,38,000	72,000	66,000
E	2,400	90	2,16,000	72,000	1,44,000
			8,39,000	3,33,000	5,06,000

(b) Production Plan for Maximum Profits

Product	*Volume of Sales (units)*		*Hours required*		*Contribution per unit (Rs.)*	*Total Contribution (Rs.)*	*Priority*
E	4,000	(Max.)	5,334		90	3,60,000	I
B	6,000	(Max.)	4,800		50	3,00,000	II
C	3,331	(Balance)	2,665	(Bal. hrs.)	45	1,49,895	III
A	1,000	(Minimum)	667		35	35,000	IV
D	500	(Minimum)	534		46	23,000	V
			14,000			8,67,895	

(c) The maximum profit under plan (b) suggested would amount to Rs. 8,67,895 – Rs. 3,33,000
= Rs. 5,34,895.

Example 17.27 (Buy Decision)

Stirling Industries Ltd. manufactures a product Z by making and assembling three components A, B and C. The components are made in a machine shop using three identical machines each of which can make any of the three components. However, the total capacity of the three machines is only 12,000 machine-hours per month and is just sufficient to meet the current demand. Labour for assembling is available according to requirements. Further details are given below:

Components	*Machine-hours required per unit*	*Variable cost per unit*	*Market price at which the component can be purchased if required*
A	4	Rs. 48	Rs. 64
B	5	60	75
C	6	80	110
Assembling	15	30	–
(per unit of Z)		218	

Fixed costs per month amount to Rs. 50,000. Product Z is sold at Rs. 300 per unit. From next month onwards the company expects the demand for Z to rise by 25%. As the machine capacity is limited, the company wants to meet the increase in demand by buying such numbers of A, B or C which is most profitable.

You are asked to find out the following:

(a) Current demand and profit made by the company.
(b) Which component and how many units of the same should be bought from the market to meet the increase in demand?
(c) Profit made by the company if suggestion in (b) is accepted. *(ICWA Inter Dec. 1998)*

Solution:

(a) Total Machine Hours required per unit of Z = 15 hrs.
Hence, with 12,000 hours available 800 units of Z can be produced.

Statement of Current Profit
(Output and Sales 800 Units)

Particulars	*Rs.*
Selling Price per unit	300
Less: Variable Cost including assembling	218
Contribution per unit	82
Total Contribution from 800 units @ Rs. 82	65,600
Less: Fixed Costs	50,000
Current Net Profit	15,600

(b) Statement of Additional Cost per Hour if Components are Purchased from the Market

	A	B	C
Market Price per unit	Rs. 64	Rs. 75	Rs. 110
Less: Variable Cost of making per unit	Rs. 48	Rs. 60	Rs. 80
(i) Additional Cost of purchasing per unit	Rs. 16	Rs. 15	Rs. 30
(ii) Hours saved by purchasing	4	5	6
Additional Cost per hour-saved (i) ÷ (ii)	Rs. 4	Rs. 3	Rs. 5

Thus, to save machine hours it is best to purchase B which has the least additional cost per hour. In the next month demand will be 25% more that is, (800 units + 25%) or 1,000 units. This can be met as follows:

	Hrs required	
Make 1,000 units of C	6,000	
Make 1,000 units of A	4,000	
Make 400 units of B	2,000	(Balance)
	12,000	hours

The balance of 600 units (1,000 – 400) of B can be purchased from the market.

(c) Statement of Profit
as per plan given in (b)

			Rs.	Rs.
Sale Value of 1,000 units of Z	@	Rs. 300		3,00,000
Cost of making 1,000 units of C	@	Rs. 80	Rs 80,000	
Cost of making 1,000 units of A	@	Rs. 48	Rs 48,000	
Cost of making 400 units of B	@	Rs. 60	Rs 24,000	
Cost of buying 600 units of B	@	Rs. 75	Rs 45,000	
Assembling 1,000 units Z	@	Rs. 30	Rs 30,000	2,27,000
Contribution				73,000
Fixed Costs				50,000
Net Profit				23,000

Example 17.28 (Diversification Decision)

A company produces 30,000 units of product A and 20,000 units of product B per annum. The sales value and costs of the two products are as follows:

	Rs.
Sales value	7,60,000
Direct Material	1,40,000
Direct Labour	1,90,000
Factory Overheads	1,90,000
Administrative and Selling Overheads	1,20,000

50% of factory overheads are variable and 50% of administrative and selling overheads are fixed. The selling price of A is Rs. 12 per unit and B is Rs. 20 per unit.

The direct material and labour ratio for product A is 2 : 3 and for B is 4 : 5. For both the products the selling price is 400% of direct labour. The factory overheads are charged in the ratio of direct labour and administrative and selling overheads are recovered at a flat of Rs. 2 per unit of A and Rs. 3 per unit of B.

Due to fall in demand of the above products the company has a plan to diversify and make product C using 40% capacity. It has been estimated that for C direct material and direct labour will be Rs. 2.50 and Rs. 3 per unit respectively. Other variable costs will be same as applicable to product A. The selling price of product C is Rs. 14 per unit and production will be 30,000 units.

Assuming 60% capacity is used for manufacture of A and B calculate

(a) present cost and profit,
(b) cost and profit after diversification, and
(c) give your recommendation as to whether to diversify or not.

(ICWA Inter June 1999)

Solution:

Computation of Unit Variable Cost of Products A and B

	Particulars	*A*	*B*	*Total*
		Rs.	Rs.	Rs.
(i)	Selling Price per unit	12.00	20.00	32.00
(ii)	Variable Cost per unit:			
	Direct Material	2.00	4.00	6.00
	Direct Labour (1/4th of Selling Price)	3.00	5.00	8.00
	Factory Overhead (50%)	1.50	2.50	4.00
	Administrative and Selling Overhead (50%)	1.00	1.50	2.50
	Total Variable Cost	7.50	13.00	20.50
(iii)	Contribution (i) – (ii)	4.50	7.00	11.50

(a) Computation of Cost and Profit before Diversification

Particulars		*A*	*B*	*Total*
1. Production and Sales (in units)		30,000	20,000	50,000
		Rs.	Rs.	Rs.
2. Sales Value (Rs.)		3,60,000	4,00,000	7,60,000
3. Variable Costs:				
Direct Material		60,000	80,000	1,40,000
Direct Labour		90,000	1,00,000	1,90,000
Factory Overheads		45,000	50,000	95,000
Administrative & Selling Overhead		30,000	30,000	60,000
Total Variable Costs		2,25,000	2,60,000	4,85,000
4. Contribution (2) – (3)		1,35,000	1,40,000	2,75,000
5. Fixed Costs:				
Factory Overhead	95,000			
Administrative & Selling Overhead	60,000			1,55,000
6. Net Profit				1,20,000

(b) Cost and Profit after Diversification

Particulars	*Capacity Levels*		
	60%		*40%*
Products	A	B	C
1. Production and Sales (in units)	18,000	12,000	30,000
	Rs.	Rs.	Rs.
2. Sales Value (Rs.)	2,16,000	2,40,000	4,20,000
3. Variable Costs:	Rs.	Rs.	Rs.
Direct Material	36,000	48,000	75,000
Direct Labour	54,000	60,000	90,000
Factory Overhead	27,000	30,000	45,000
Administrative & Selling Overheads	18,000	18,000	30,000
Total Variable Costs	1,35,000	1,56,000	2,40,000
4. Contribution (2) – (3) (Rs.)	81,000	84,000	1,80,000
5. Total Contribution (Rs.)		(Rs.)	
Product A		81,000	
B		84,000	
C		1,80,000	
			3,45,000
6. Fixed Overheads:			
Factory Overheads		95,000	
Administrative & Selling Overheads		60,000	
			1,55,000
7. Net Profit			1,90,000

Recommendation: The company should immediately implement the proposed diversification. This is because this has increased the net profit from Rs. 1,20,000 to Rs. 1,90,000 and improve the overall P/V Ratio from 36.18% to 39.38%.

Example 17.29 (Production Plan Decision)

XY Ltd. is manufacturing three household products A, B and C and selling them in a competitive market. Details of current demand, selling price and cost structure are given below:

Particulars	*A*	*B*	*C*
Expected Demand (units)	10,000	12,000	20,000
Selling Price per unit (Rs.)	20	16	10
Variable Cost per unit (Rs.):			
Direct Materials (Rs. 10/kg)	6	4	2
Direct Labour (Rs. 15/hr.)	3	3	1.50
Variable Overheads	2	1	1
Fixed Overhead per unit (Rs.)	5	4	2

The company is frequently affected by acute scarcity of raw material and high labour turnover. During the next period, it is expected to have one of the following situations:

(a) Raw materials available will be only 12,100 kg.
(b) Direct labour hours available will be only 5,000 hrs.
(c) It may be possible to increase sales of any one product by 25% without any additional fixed costs but by spending Rs. 20,000 on advertisement. There will be no shortage of materials or labour.

Suggest the best production plan in each case and the resultant profit that the company would earn according to your suggestion.

(ICWA Inter June 1998)

Solution:

Statement of Cost and Profit

Particulars	*Products*		
	A	*B*	*C*
Selling Price/unit (Rs.)	Rs. 20	Rs. 16	Rs. 10
Variable Cost/unit (Rs.):			
Direct Material	6	4	2.00
Direct Labour	3	3	1.50
Variable Overheads	2	1	1.00
Total Variable Cost/Unit	11	8	4.50
Contribution/Unit	9	8	5.50
P/V Ratio or Contribution/Sales	45%	50%	55%

Ranking

(i) As per profitability
With no limiting factor
(On the basis of profitability) III II I

(ii) With raw material as limiting factor

Raw Material required per unit $\left(\frac{\text{Raw Material Cost}}{\text{Price per kg}}\right)$	0.6 kg	0.4 kg	0.2 kg
Contribution per kg. of Raw Material	Rs. 15	Rs. 20	Rs.27.50
Ranking	III	II	I

(iii) With labour as limiting factor:

Labour hours required per unit $\left(\frac{\text{Labour Cost}}{\text{Wages per kg}}\right)$	1/5 hr.	1/5 hr.	1/10 hr.
Contribution per labour hour	Rs. 45	Rs. 40	Rs. 55
Ranking	II	III	I

Evaluation of Alternatives

(a) Raw material available is 12,100 kg. In such a case, the Production Plan will be as follows:

Product	*No. of Units*	*Raw Material required*	*Contribution per unit*	*Total Contribution*
C	20,000	4,000 kg	Rs. 5.50	Rs. 1,10,000
B	12,000	4,800 kg	Rs. 8.00	Rs. 96,000
A	5,500	3,300 kg	Rs. 9.00	Rs. 49,500
Total:		12,100 kg		Rs. 2,55,500
Less: Total Fixed Costs				Rs. 1,38,000*
Net Profit				Rs. 1,17,500

*Total Fixed Cost

A: 10,000 × Rs. 5 = Rs. 50,000
B: 12,000 × Rs. 4 = Rs. 48,000
C: 20,000 × Rs. 2 = Rs. 40,000
Rs. 1,38,000

(b) When Labour Hours available are 5,000 hours. In such a case the Production Plan will be as follows:

Product	*No. of Units*	*Labour Hours required*	*Contribution per unit*	*Total Contribution*
C	20,000	2,000	Rs. 5.50	Rs. 1,10,000
A	10,000	2,000	Rs. 9,00	Rs. 90,000
B	5,000	1,000	Rs. 8.00	Rs. 40,000
Total:	5,000			Rs. 2,40,000
Less: Fixed Cost				Rs. 1,38,000
Net Profit				Rs. 1,02,000

(c) No shortage of Material and Labour: The most profitable product is C and hence its 25% more production will be raised by 25% that is 5,000 units. The total production of C will be 25,000 units i.e. 25% of 20,000 or 5,000 units.

The extra production of 5,000 units of C will fetch an additional contribution of Rs. (5,000 × Rs. 5.50) or Rs. 27,500. The solution will now be as under than additional expenditure on advertisement of Rs 20,000.

Product	*No. of units*	*Contribution per unit*	*Total Contribution*
A	10,000	Rs. 9.00	Rs. 90,000
B	12,000	Rs. 8.00	Rs. 96,000
C	25,000	Rs. 5.50	Rs. 1,37,500
			Rs. 3,23,500
Less: Fixed Costs		1,38,000	
Advertisement Expenses		20,000	Rs. 1,58,000
Net Profit:			Rs. 1,65,500

Example 17.30 (Replacement of a Product)

A multi product company has the following costs and output data for the last year.

	Product		
	X	Y	Z
Sales mix	40%	35%	25%
	Rs.	Rs.	Rs.
Selling price	20	25	30
Variable cost per unit	10	15	18
Total fixed cost			1,50,000
Total sales			5,00,000

The company proposes to replace product Z by product S. Estimated cost and output data are:

Sales mix	50%	30%	20%
Selling price	20	25	28
Variable cost per unit	10	15	14
Total fixed costs			1,50,000
Total sales			5,00,000

Analyse the proposed change and suggest what decision the company should take.

(ICWA, Inter)

Solution:

(I) Computation of Present Profit and BEP

Particulars	*Products*		
	X	Y	Z
	Rs.	Rs.	Rs.
Selling price	20	25	30
Variable cost	10	15	18
Contribution	10	10	12

P/V ratio	50%	40%	40%	
Sales mix	40%	35%	25%	100%
Contribution per rupee of sales: (P/V ratio × Sales mix)	20%	14%	10%	44%
Sales				Rs. 5,00,000
Total contribution Rs. (5,00,000 × 44/100)				2,20,000
Fixed costs				1,50,000
Profit				Rs. 70,000
Break-even point (Rs. 1,50,000 × 100/44)				Rs. 3,40,909

(2) Computation of Proposed Profit and BEP

Particulars	*Products*			*Total*
	X	Y	Z	
	Rs.	Rs.	Rs.	
Selling price	20	25	28	
Variable cost	10	15	14	
Contribution	10	10	14	
P/V Ratio	50%	40%	50%	
Sales mix	50%	30%	20%	100%
Contribution per rupee of sales (P/V ratio × Sales mix)	25%	12%	10%	47%
Sales				Rs. 5,00,000
Total contribution 5,00,000 × 47/100				2,35,000
Fixed cost				1,50,000
Profit				Rs. 85,000
Break-even point (1,50,000 × 100/47)				3,19,149

A comparison of the present situation and the proposed situation shows that if product Z is replaced by product S, profit would increase by Rs. 15,000 (Rs. 85,000 – 70,000) and break-even point will reduce by Rs. 21,760 (Rs. 3,40,909 – 3,19,149). The change is beneficial and, therefore, product Z may be dropped. provided all other relevant factors remain constant.

Example 17.31 (Alternative Proposals Decision)

AB Ltd. manufactures three products X, Y and Z. Standard selling prices and costs have been established for 2003 as follows:

	X	*Y*	*Z*
Selling price per unit	Rs. 28	Rs. 60	Rs. 125
Direct materials per unit	8	15	20
Direct wages per unit	10	20	50
Variable overheads per unit	5	10	25

Direct wages are paid at the rate of Rs. 2 per hour in each case. Fixed overheads are budgeted at Rs. 25,000 for the coming year. In the short run, the company cannot increase its direct labour strength and as a result, only 35,000 direct labour hours will be available in the coming year. The company has commitments to produce 500 units of each product. It has been suggested that after meeting the minimum requirements for X, Y and Z, the balance of available direct labour hours should be used to produce product Z.

You are required:

(a) To prepare an income statement showing the expected results if the proposal is adopted.
(b) Comment on the statement you have produced in (a) and prepare an income statement for any alternative policy, which you consider would be more profitable.
(c) Basing your calculations on your suggestion in (b), show the company's break-even point in terms of units and sales value.
(d) Show the sale value which is required to produce an after tax return of 10% on capital employed of Rs. 1,00,000 assuming tax rate of 50%.

(ICWA, Final year)

Solution:

(a) Income Statement Showing Results if the Proposal is Adopted Rs. '000)

	Product X	*Product Y*	*Product Z*	*Total*
1. Sales value	14.00	30.00	137.50	181.50
2. Variable costs:				
Direct materials	4.00	7.50	22.00	33.50
Direct wages	5.00	10.00	55.00	70.00
Variable overheads	2.50	5.00	27.50	35.00
Total	11.50	22.50	104.50	138.50
3. Contribution fund (1 – 2)	2.50	7.50	33.00	43.00
4. Fixed overheads				25.00
5. Opening profit (3 – 4)				18.00

Thus, the operating profit will be Rs. 18,000.

Notes: (i) Total available direct labour hours 35000

Labour hours to be utilised to meet commitments:
(500 × 5 + 500 × 10 + 500 × 25) 20000

Balance hours available 15000

(ii) Additional units of Z to be produced 15,000/25, that is 600 units
Thus, total production of Z will be (500 + 600), that is 1100 units

(iii) Required direct labour hours for each unit of production of
X: 10/12, that is 5 hours, Y: 20/2, that is 10 hours and Z: 50/2, that is 25 hours.

(b) Profitability Statement

	Product X	*Product Y*	*Product Z*
1. Selling price	Rs. 28	Rs. 60	Rs. 125
2. Variable costs per unit:			
Direct materials	8	15	20

(Contd.)

	Direct wages	10	20	50
	Variable overheads	5	10	25
	Total	Rs. 23	Rs. 45	Rs. 95
3.	Contribution per unit (1 – 2)	Rs. 5	Rs. 15	Rs. 30
4.	Required labour hours per unit	5	10	25
5.	Contribution per labour hour (3/4)	Re. 1.00	Rs. 1.50	Rs. 1.20
6.	Ranking	III	I	II

Availability of labour hours being limited, AB Ltd. should produce as many unit of T as possible. There being no restriction on the units of Y that can be sold, available labour hours, after meeting the commitments for products X and Z should be allocated to Y. Thus, optimal product mix is:

Product	*Units to be produced*	*Allocated labour hours*	
X	500	2,500	
Y	2,500	20,000	(Balancing figure)
Z	500	12,500	
		35,000	

Income Statement with the above Alternative

	Products			*Total*
	X	*Y*	*Z*	*(Rs. '000)*
Contribution	2.5	30.00	15.00	47.50
Fixed costs				25.00
Operating profit (1 – 2)				22.50

(c) Break-even point in terms of units and sales

Contribution from committed production and sales:

Production X:	500 × Rs. 5.00	Rs. 2,500
Production Y:	500 × Rs. 15.00	7,500
Production Z:	500 × Rs. 30	15,000
		Rs. 25,000

Fixed cost being Rs. 25,000, break-even sales of AB Ltd. is sales of 500 units of each of the three products X, Y and Z. Break-even sales in terms of value is (500 × 28 + 500 × 60 + 500 × 125), i.e. Rs. 1,06,500.

(d) Sales value to earn a post-tax return of 10% on capital employed

Required return 10% of Rs. 1,00,000 i.e. Rs. 10,000

Required operating profit =

$$\frac{\text{Required return}}{(1-\text{tax rate})} = \frac{\text{Rs. } 10{,}000}{(1-0.50)} = \frac{\text{Rs. } 10{,}000}{0.50} = \text{Rs. } 20{,}000$$

Committed sales will earn contribution enough to meet fixed costs. Therefore, to earn an operating profit of Rs. 20,000 additional units of Y is to be sold to earn a contribution of Rs. 20,000. Thus, the total number of units of Y to be sold is (500 + Rs. 20,000/15) that is 1,833.33 or 1,834 units.

Thus, total sale value is	X:	500 × Rs. 28	= Rs. 14,000
	Y:	1,834 × Rs. 60	= Rs. 1,10,040
	Z:	500 × Rs. 125	= Rs. 62,500
		Total	= Rs. 1,86,540

THEORY QUESTIONS

1. What is meant by the term "differential costing"? Does differential cost mean the same thing as variable cost?
2. What is incremental cost? Does incremental cost mean the same thing as variable cost?
3. Give examples of how incremental costs are used in decision-making.
4. A departmental store is thinking of eliminating one of its departments because the accountant using the total cost basis to profitability analysis, says the department is operating at a loss. What should be investigated before the final decision is made?
5. Explain the meaning and features of relevant costs. Give suitable examples to support your explanation. *(B. Com (Hons) Delhi 1997)*
6. Ventilators Ltd. wants to stabilise its production through the year. The approaches recommended are:
   (a) Maintan production at an even pace throughout the year, and get the off-season production stored on the premises.
   (b) Maintain production at an even pace but offer dealers a special discount for off-season purchases.
   (c) Extend special terms to dealers, but maintain prices at a level that will enable regular movement of goods throughout the year.

   Discuss the relative merits and disadvantages of the above proposals. *(CA Inter)*
7. What do you mean by 'make or buy' decision. State the quantitative as well as qualitative considerations in inflnencing a make or buy decision. *(B. Com (Hons), Delhi, 2002)*
8. Cost-benefit analysis is needed for resolving many managerial problems. List the various items of cost and benefits that you will quantify in respect of managerial decisions:
   (a) Add or drop a product
   (b) retain or replace
   (c) shutdaun or continue
9. Explain the basic characteristics of costs involved in decision-making. *(B Com (Hons), Delhi)*
10. State the costing data required for (i) determining the priority of products, and (ii) make or buy decisions. *(B Com (Hons), Delhi)*
11. How would you go about determining the point at which a manufacturing company that is facing a period of operating losses should shut assuming that profitability of operations is the only point to be considered?
12. Why is the contribution that a product makes towards the recovery of non-escapable costs a bettr measure of its profitability than the profit or loss reported on its sale after it has been charged with its fair share of all costs?

SELF EVALUATION QUESTIONS

Choose the correct answer for the following multiple-choice questions:

(i) The type of costs presented to management for a non-routine decision should be limited to
   (a) Relevant costs
   (b) Standard costs

(c) Controllable costs

(d) Conversion costs

(ii) Other things remaining the same, ideal product mix is determined in terms of

(a) Sales

(b) Variable costs

(c) Total costs

(d) Contribution margin

(iii) In a make or buy decision

(a) Only variable costs are relevant

(b) Fixed costs that can be avoided in the future are relevant

(c) Fixed costs that will continue regardless of the decision are relevant

(d) (a) and (b)

(iv) Relevant costs are

(a) Future costs

(b) Standard costs

(c) Controllable costs

(d) Historical costs

(v) The decision maker should consider in case of limiting factor(s) to maximise the profit

(a) Sales

(b) Contribution margin

(c) Variable costs

(d) Fixed costs

(vi) The measurable value of an alternative use of resources is referred to as a (an)

(a) Opportunity cost

(b) Imputed cost

(c) Differential cost

(d) Sunk cost

(vii) A manager of a company reported the total additional cost required for the proposed increased production level. The increase in total cost is known as

(a) Controllable cost

(b) Incremental cost

(c) Opportunity cost

(d) Out-of-pocket cost

(viii) Which of the following is usually an incremental cost.

(a) Conversion cost

(b) Period cost

(c) Manufacturing overhead cost

(d) Direct product cost

(ix) A cost incurred in the past and hence irrelevant for current decision making is a

(a) Fixed cost

(b) Discretionary cost

(c) Sunk cost

(d) Direct cost

(x) A cost that cannot be changed by any decision made now or in the future is a (an)

(a) Indirect cost

(b) Uncontrollable cost

(c) Opportunity cost

(d) Sunk cost

PROBLEMS

1. (Dropping a product)

The costs per unit of three products X, Y and Z are given below:

Products	X	Y	Z
Direct Material (Rs.)	20	16	18
Direct Labour (Rs.)	12	14	12
Variable Overheads (Rs.)	8	10	6
Fixed Expenses (Rs.)	6	6	4
	Rs. 46	46	40
Profit	18	14	12
Selling Price (Rs.)	64	60	52
No. of units produced	10,000	5,000	8,000

Production arrangements are such that if one product is given up the production of the others can be raised by 50%. The directors propose that product Z should be given up because the contribution from the product is the lowest. Present suitable analysis of the data indicating whether the proposal should be accepted.

(B. Com (Hons) Delhi 1998)

Ans: The profit under proposed situation will increase by Rs. 42,000. Hence the proposal for discontinuance of product Z should be accepted.

2. (Revised selling price)

Merry-make Cassets Co., is expecting a profit of Rs. 2,50,000 for the current year. The following further information is available from records.

Selling price per unit	Rs. 20
Variable cost per unit	Rs.10
Fixed cost for the year	Rs. 1,00,000

The company's production capacity is not fully utilised and market research suggests following alternative strategies for the forthcoming year.

Strategy 1: Reduction in selling price by 5%. Expected increase in sales volume 10%.

Strategy 2: Reduction in selling price by 7%. Expected increase in sales volume 20%.

Strategy 3: Reduction in selling price by 10%. Expected increase in sales volume 25%.

Required:

(a) Evaluate the alternative strategies and state which is the most profitable. Assume the same cost structure as in the current year.

(b) Suggest other factors, which must be considered by management before taking a decision.

Ans: Strategy 2 is most profitable.

3. (Profitability of two orders)

X limited has been offered an order from A Ltd. for 10000 units of output @ Rs. 100 each which has a variable cost of Rs. 60 and will involve an outlay of Rs. 60,000 to set-up jigs and dies. At the same time, there is another offer of B Ltd., for 8000 units of output at Rs. 110 each. Variable costs are estimated at Rs. 68 each and involves an outlay of Rs. 50,000 to set-up jigs and dies. Which offer should the company accept?

Ans: A Ltd. offer should be accepted.

4. (Decision to Increase Sales)

Quality Product Limited has drawn up the following budget for the year 1998–99:

	Rs.
Raw Materials	20,00,000
Labour, stores, power and other variable costs	6,00,000
Fixed Manufacturing Overheads	7,00,000
Packing and variable distribution cost	4,00,000
Fixed general overheads including selling	3,00,000
	40,00,000
Sales Revenue @ Rs. 50 per unit	50,00,000
Budgeted Profit	Rs. 10,00,000

The General Manager suggests to reduce selling prices by 5% and expects to achieve an additional volume of 5%. The more intensive manufacturing programme will involve additional costs of Rs. 15,000 for production planning. It will also be necessary to open an additional sales office at the cost of Rs. 1,00,000 per annum.

The Sales Manager, on the other hand, suggests to increase selling price by 10% which it is estimated will reduce sales volume by 10%. At the same time a saving in manufacturing overheads and general overheads of Rs. 50,000 and Rs. 1,00,000 per annum respectively is expected on this reduced volume.

Which of these two proposals would you accept and why? Show complete working.

(B. Com. (Hons) Delhi 1998)

Ans: The proposal of sales manager should be accepted.

5. (Minimum Price Decision)

An umbrella manufacturer makes an average profit of Rs. 2.50 per unit on a selling price of Rs. 14.30 by producing and selling 60,000 units at 60 per cent of potential capacity.

His cost of sales per unit is as follows:

Direct Materials	Rs. 3.50
Direct Wages	Rs. 1.25
Factory Overhead	Rs. 6.25 (50% fixed)
Sales Overhead	Re. 0.80 (25% variable)

During the current year, he intends to produce the same number but estimates that his fixed costs would go up by 10 per cent while the rates of direct wages and direct materials will increase by 8% and 6% respectively. However, the selling price cannot be changed.

Under this situation, he obtains an offer for a future 20% of his potential capacity.

What minimum price would you recommend for acceptance of the offer to ensure the manufacturer an overall profit of Rs. 1,67,300?

(B. Com. (Huns), Delhi, 1996)

Ans: Rs. 11.30

6. (Deciding Mode of Conveyance)

A company is considering three alternative proposals for conveyance facilities for its sales personnel who have to do considerable travelling, approximately 20000 kilometres every year.

The proposals are as follows:

(i) Purchase and maintain its own fleet of cars. The average cost of car is Rs. 1,00,000.

(ii) Allow the Executive use his own car and reimburse expenses at the rate of Rs. 1.60 paise per kilometre and also bear insurance costs.

(iii) Hire cars from an agency at Rs. 20,000 per year per car. The company will have to bear costs of petrol , taxes and tyres.

The following further details are available:

Petrol Re. 0.60 per kilometre

Repairs and maintenance Re. 0.20 per kilometre

Tyre Re. 0.12 per kilometre

Insurance Rs. 1,200 per car per annum

Taxes Rs. 800 per car per annum

Life of the car : 5 years with annual milage of 20,000 kilometres.

Resale value : Rs. 20,000 at the end of the fifth year.

You are required to work out the relative costs of the three proposals and rank them.

(B. Com. (Hons.) Delhi, 2001)

Ans: The proposal should be accepted in order of (ii) (iii) and (i)

7. (Dropping a Product)

A company manufactures three products A, B and C. There are no common processes and the sale of one product does not affect price or volume of sales of any other.

The company's budgeted profit/loss for 2002 has been abstracted as follows:

	Total	*A*	*B*	*C*
Sales	**Rs. 3,00,000**	**Rs. 45,000**	**Rs. 2,25,000**	**Rs. 30,000**
Production cost: Variable	1,80,000	24,000	1,44,000	12,000
Fixed	60,000	3,000	48,000	9,000
Factory cost	2,40,000	27,000	1,92,000	21,000
Selling and administration costs: Variable	24,000	8,100	8,100	7,800
Fixed	6,000	2,100	1,800	2,100
Total cost	2,70,000	37,200	2,01,900	30,900
Profit	30,000	7,800	23,100	(–) 900

On the basis of the above, the Board had almost decided to eliminate product C, on which a loss was budgeted. Meanwhile, they have sought your opinion. As the company's Cost Accountant what would you advice? Give reasons for your answer.

(ICWA Inter)

Ans: P/V ratio, A 28.7%, B 32.4%, C 34%

It is found that product C, though has the highest P/V Ratio, seems to be non-profitable because it has to bear a higher percentage of fixed cost as compared to its total cost. The percentage comes to about 36

$\left(\text{that is, } \frac{11,100}{30,900} \times 100\right)$ which in case of other products is too less. Since the surplus capacity generated by one

product canot be used for other products, there seems to be no justification for discontinuing product C till some new product is developed which will have a higher P/V ratio than product C. In the present circumstances, since C has a higher P/V ratio, and if the sales continue to rise, C may start giving profit too.

8. (Foreign Market Sales Decision)

A factory produces 24000 units. The cost sheet gives the following information:

Direct material	Rs. 1,20,000
Direct wages	84,000
Variable overheads	48,000
Semi-variable overheads	28,000
Fixed overheads	80,000
Total Cost	3,60,000

The product is sold at Rs. 20 per unit. The management proposed to increase the production by 3000 units for sales in the foreign market. It is estimated that semi-variable overheads will increase by Rs. 1,000. But the product will be sold at Rs. 14 per unit in the foreign market. However, no additional capital expenditure will be incurred. The management seeks your advice as cost accountant. What will you advise them?

(B. Com (Hons) Delhi 1997)

Ans: Sales of additional units 3000 in the foreign market will give a profit of Rs. 9,500.
Hence the proposal should be accepted

9. (Export Order)

A machine tool manufacturing company sells its lathes at Rs. 36,500 each made up as follows:

Direct materials	Rs. 16,000	
Direct labour	2,000	
Variable factory overheads	5,000	
Fixed factory overheads	3,000	
Variable selling overheads	500	
Royalty	1,000	
Profit	5,000	32,500
Central excise duty		1,000
Sales tax		3,000
		36,500

There is enough idle capacity.

(a) A firm in Arabia has offered to buy 10 company's lathes at Rs. 28,500 each. Should the company be interested in the business?

(b) It has been decided to sell 5 such lathes to an engineering company under the same management at bare cost. What price should you charge?

Ans:

(a)

Contribution	Rs. 4,000
Less: Sales tax	2,340
Savings	Rs. 1,660

Company may accept the export order.

(b) The company may charge Rs. 31,000 (Rs. 36,000 – Rs. 5,500)
(profit and selling overheads)

10. (Changing Product Mix Decision)

The budgeted results for X Co. include the following:

	Rs. in lakhs	*Variable cost as % of sales value*
Sales: Product A	60	50%
Product B	50	60%
Product C	80	65%
Product D	40	80%
Product E	30	70%
	260	

Fixed overheads for the period Rs. 100.00 lakhs.

You are required to (a) Prepare a statement showing the amount of loss expected, (b) assuming that the sale of only one product can be increased at a time, you are asked to recommend a change in the sales volume of each product which will eliminate the expected loss. *(C.A. Inter)*

Ans: (a) Total loss Rs 5,00,000.

(b) Additional sales required to break-even, assuming sales of only one product is increased at a time, to give the additional contribution of Rs. 5,00,000, is calculated as follows:

$$\text{Sales required} = \frac{\text{Under-recovery of fixed overheads}}{\text{P/V ratio of the product}}$$

Product	Rs.	Rs.
A	5,00,000	10,00,000
	50%	
B	5,00,000	12,50,000
	40%	
C	5,00,000	14,28,571
	45%	
D	5,00,000	25,00,000
	20%	
E	5,00,000	16,66,667
	30%	

The company should utilise the spare capacity available for Product A to achieve maximum profitability as its P/V ratio is highest. Fixed costs remaining the same at every level of production, this combination will lead to maximum profitability.

11. (Alternative Proposals Decision)

Quality Products. Ltd. manufactures and markets a single product. The following data are available:

	Per unit		*Per unit*
Materials	Rs. 16	Dealer's margin	Rs. 4
Conversion costs (Variable)	12	Selling price	40

Fixed cost: Rs. 5 lakhs
Present sales: 90000 units
Capacity utilisation: 60 per cent

There is acute competition. Extra efforts are necessary to sell. Suggestions have been made for increasing sales:

(a) By reducing sales price by 5 per cent.

(b) By increasing dealer's margin by 25 per cent over the existing rate.

Which of these two suggestions you would recommend, if the company desires to maintain the present profit? (Give reasons)

Ans: Present profit Rs. 2.20,000

(a) Units required to maintain the same profit 1,16,111 units

(b) Units required to maintain the same profit 1,02,857 units. Second proposal is recommended.

(C.A. Inter)

12. (Product Profitability)

The following particulars are taken from the records of a company engaged in manufacturing two products, A and B, from a certain material:

Particulars	*Product A (per unit) Rs.*	*Product B (per unit) Rs.*
Sales	2,500	5,000
Material cost (Rs. 50 per kg)	500	1,250
Direct labour (Rs. 30 per hour)	750	1,500
Variable overhead	250	500
Total fixed overheads: Rs. 10,00,000		

Comment on the profitability of each product when:

(i) Total sales in value is limited.

(ii) Raw materials is in short supply.

(iii) Production capacity is the limiting factor.

(iv) Total availability of raw materials is 20000 kg and maximum sales potential of each product is 1000 units, find the product mix to yield maximum profits.

(CA Inter Nov 1998)

Ans.(i) Prodct A is more Profitable. (ii) Prodct A is more Profitable. (iii) Prodct A is more Profitable. (iv) Prodct A 1000 unit,B 400 units.

13. (Decision about New Market)

A company annually manufactures 10000 units of a product at a cost of 4 per unit and there is home market for consuming the entire volume of production at the sale price of 4.25 per unit. In the year 2002, there is a fall in the demand for home market which can consume 10000 units only at a sale price of Rs. 3.72 per unit. The analysis of cost per 10000 units is:

Materials	Rs. 15,000
Wages	11,000
Fixed overheads	8,000
Variable overheads	6,000

The foreign market is explored and it is found that this market can consume 20000 units of the product if offered at sale price of 3.55 per unit. It is also discovered that for additional 10000 units of the product (over initial 10000 units) the fixed overheads will increase by 10 per cent. Is it worthwhile to try to capture the foreign market?

Ans: It is advisable to sell goods in the foreign market.

14. (Export Offer)

Due to industrial depression, a plant is running, at present, at 50% of its capacity. The following details are available.

	Cost of production per unit
Direct material	Rs. 200
Direct labour	100

	Rs.
Variable overhead	300
Fixed overhead	200
	800
Production per month	20000 units
Total cost of production	Rs. 1,60,00,000
Sale price	1,40,00,000
Loss	Rs. 20,00,000

An exporter offers to buy 5000 units per month at the rate of Rs. 650 per unit and the company hesitates to accept the offer for fear of increasing its already large operating losses.

Advise whether the company should accept or decline this offer.

Ans: The company should accept the offer

15. (Decision about Mechanisation)

Management of a manufacturing unit is considering extensive modernisation of the factory through progressive mechanisation which would result in improved productivity and reduced strength. Through negotiations with the union, it was agreed that for every 1% increase in productivity, workers would be paid 0.5% incentive wages. It was also agreed that through voluntary retirement the staff strength would be reduced to 300 from the present level of 400. The following further comparative data are available before and after the proposed mechanisation:

	Before mechanisation	*After mechanisation*
No. of articles produced per month	50,000	48,000
Fringe benefits	50% of wages	
Wages paid per month	Rs. 4,00,000	
Sales per month (value)	Rs. 24,00,000	
P/V ratio	25%	

Based on the above data, you are required to work out the annual financial implication of the proposal.

(ICWA Inter)

Ans: There will be increase in annual contribution due to mechanisation.

16. (Special Order)

Nubo Manufacturing Company is presently operating at 50% of practical capacity producing about 50,000 units annually of a patented electronic component. Nubo recently received an offer from an overseas market to sell 30,000 components at Rs 6.00 per unit FOB Nubo's Plant. Nubo has not previously sold components in the market. Budgeted production costs for 50000 and 80000 units of output are as follows:

Units	50000	80000
Costs:	Rs.	Rs.
Direct material	75,000	1,20,000
Direct labour	75,000	1,20,000
Factory overheads	2,00,000	2,60,000
	3,50,000	5,00,000
Cost per unit	Rs. 7.00	Rs. 6.25

The sales manager thinks the order should be accepted, even if it results in a loss of Re 1.00 per unit, because he feels the sales may build up future markets. The production manager does not wish to have the order accepted primarily because the order would show a loss of Re 0.25 per unit when computed on the new average unit cost. The cost accountant has made a quick computation indicating that accepting the order will actually increase profit. You are required to:

(a) Explain what apparently caused the drop in cost from Rs. 7.00 per unit to Rs. 6.25 per unit when budgeted production increased from 50000 to 80000 units. Show supporting computations.

(b) Should the order be accepted?

(ICWA Inter)

Ans: The order of overseas market be accepted.

17. (Profitable Product Mix)

A manufacturing company produces and sells three products P, Q and R. It has an available machine hour capacity of one lakh hours, interchangeable among the three products. Presently, the company produces and sells 20000 units of P and 15000 units each of Q and R. The unit selling price of the three products are Rs. 25, Rs 32 and Rs. 42 for P, Q and R respectively. With this price structure and the aforesaid sales-mix the company is incurring loss. The total expenditure, exclusive of fixed charges (presently Rs. 5 per unit), is Rs. 13.75 Lakhs. The unit cost ratio among the products P, Q and R is 4 : 6 : 7. Since the company desires to improve its profitablity without changing its cost and price structures, it has been considering the following three mixes so as to be within its total available capacity.

Products	*Mix I (in units)*	*Mix II (in units)*	*Mix III (in units)*
P	25000	20000	30000
Q	15000	12000	5000
R	10000	18000	15000

You are required to compute the quantum of loss now incurred and advise the most profitable mix which could be considered by the company. *(I.C.W.A. Inter Dec. 1995)*

Ans: Loss Rs.15,000.Mix III gives the highest contribution and is therefore, recommended.

18. (Export Proposals)

Vinak Ltd. operating at 75% level of activity produces and sells two products A and B. The cost sheets of the two products are as under:

	Product A	*Product B*
Units produced and sold	600	400
Direct materials	Rs. 2.00	Rs. 4.00
Direct labour	4.00	4.00
Factory overheads (40% fixed)	5.00	3.00
Selling and administration overheads (60% fixed)	8.00	5.00
Total cost per unit	19.00	16.00
Selling price per unit	23.00	19.00

Factory overheads are absorbed on the basis of machine hour which is the limiting (key) factor. The machine hour rate is Rs. 2 per hour.

The company receives an offer from Canada for the purchase of product A at a price of Rs. 17.50 per unit. Alternatively, the company has another offer from the Middle East for the purchase of product B at a price of Rs. 15.50 per unit.

In both the cases, a special packing charge of 50 p. per unit has to be borne by the company.
The company can accept either of the two export orders and in either case the company can supply such quantities as may be possible to be produced by utilising the balance of 25% of its capacity.
You are required to prepare:

(i) A statement showing the economics of the two export proposals giving your recommendations as to which proposal should be accepted.

(ii) A statement showing the overall profitability of the company after incorporating the export proposal recommended by you. *(CA Inter)*

Ans: (i) Order from the middle East should be accepted
(ii) Over all profitablity Rs.5094.

19. (Product Profitability Decision)

Zenith Enterprises Ltd. is engaged in manufacturing and selling two products A and B. The following information are available from the records of the company:

Budgeted Data (Monthly):				
Products		A		B
Capacity		40%		30%
Production in units		4000		6,00
Cost per unit:	Rs.	Rs.	Rs.	Rs.
Direct Material	150		80	
Conversion Cost:				
Variable	360		300	
Fixed	90	600	120	500
Selling Price per unit		750		425
Profit/Loss per unit		150		(75)

(i) In the subsequent period, the following changes are envisaged:

(a) Direct Material Cost of Products A and B to increase by 20%;
(b) Selling Price of Product A to increase by 10%;
(c) Selling Price of Product B to increase by 30%.

(ii) The management is contemplating to utilise 30% capacity presently lying idle and for this the following alternative proposals are to be considered:

(a) Further sale of Product A is possible, but the additional out put can be sold at Rs 600 per unit. Efficiency for this additional production, will decrease by 10%;
(b) Product B is expected to have a ready market at a price of Rs 510 per unit. The additional output is possible at the same efficiency level as budgeted;
(c) A new product C may be introduced for which the following data are available:

Direct Material Cost per unit	Rs. 480
Selling Price per unit	Rs. 1,200

Conversion Cost of Product C is same as that of Product B. However, an additional amount of Rs. 50,000 is to be incurred for advertisement. Production rate of C is also same as that of Product B.

(iii) The following additional information also needs to be considered:

(a) Present allocation of capacity of 40% to Product A and 30% to Product B cannot be altered. However, the idle capacity of 30% can be utilised for any of the Products A, B and C.
(b) Fixed expenses are not to increase on account of utilisation of additional 30% capacity (except for the advertisement expenses as statedm above).

You are required to prepare a comparative statement for providing information to the management giving your comments on the profitability of the three proposals as stated above. *(ICWA Inter Dec. 1997)*

Ans: Proposal C is the most profitable proposal.

20. (Production Subcontracting Decision)

New Bharat Industries is manufacturing several consumer durables which have good demand in the market. The firm has been established only very recently and currently it is in the final stage of production. It has ambitious plans to expand production after earning income in the market. However, the company is having problems to get adequate power supply. Moreover, most of its labourers are casual workers and labour-absenteeism is also affecting production. In view of these unstable conditions the firm has adopted the practice of preparing quarterly flexible budgets.

For the quarter ending 31st December, 1996 flexible budgets for three possible levels of production were prepared as follows. The company wanted to achieve 90% capacity utilisation as its products had good demand.

Particulars	*Flexible Budgets*		
	60%	*80%*	*90%*
	(in lakhs of rupees)		
Budgeted Sales	50.00	66.00	75.00
Budgeted Costs:			
Direct Materials	12.00	16.00	18.00
Direct Labour	15.00	20.00	22.50
Production Overheads	11.80	14.00	15.10
Administration Overheads	2.00	2.00	2.00
Selling Overheads	7.80	9.80	10.20

Soon after the decision to attain 90% capacity utilisation, available power was reduced by the State Electricity Board and the reduced supply was sufficient to meet 50% capacity production.

The position has been immediately reviewed and the firm is considering the following possible options to meet the situation.

(a) Stop production for the quarter. As regular employees are only very few, lay-off compensation payable will be only Rs. 1.20 lakhs. Further, overheads can be reduced by as much as 60%.

(b) Continue production at 50% level. Estimated sales income at this level will be Rs. 40 lakhs.

(c) A private agency in the area has offered surplus captive power available with it. With this additional supply production can be maintained at 90% level. However, the overall variable production overhead will increase by 40%.

(d) Sub-contract the balance 40% which cannot be made by the firm to two small industrial units in the area, which have the necessary facilities, equally at a cost of Rs. 15 lakhs each.

Evaluate each of the above options and recommend the best plan. Indicate the other important points, if any, to be considered.

(ICWA Inter Dec. 1996)

Ans: The form should accept option (C).

21. (Buy Decision)

Household Equipments Ltd. is producing a kitchen equipment from five components three of which are made using general purpose machines and two by manual labour. The data for the manufacture of the equipment is as follows:

Components	*A*	*B*	*C*	*D*	*E*	*Total*
Machines Hours reqd. per unit	10	14	12	—	—	36
Labour Hours reqd. per unit	—	—	—	2	1	3
Variable Cost per unit (in Rs.)	32	54	58	12	4	160
Fixed Cost per unit (apportioned)	48	102	116	24	36	316
Total Component Cost	80	156	174	36	30	476
Assembly Cost per unit (all variable)						Rs. 40
Selling Price per unit						Rs. 600

The marketing department of the company anticipates 50% increase in demand during the next period. General purpose machinery used to manufacture A, B and C is already working to the maximum capacity of 4752 hours and there is no possibility of increasing this capacity during the next period. But labour is available for making components D and E and also for assembly according to demand. The management is considering the purchase of one of the components A, B or C from the market to meet the increase in demand. These components are available in the market at the following prices:

Component A	:	Rs.	80
Component B	:	Rs.	160
Component C	:	Rs.	125

Required:

(a) Profit made by the company from current operations.

(b) If the company buys any one of the components A, B or C, what is the extent of additional capacity that can be created?

(c) Assuming 50% increase in demand during the next period, which component should the company buy from the market.

(d) The increase in profit, if any, if the component suggested in (c) is purchased from the market.

(ICWA Inter Dec 1995)

Ans: (a) Rs. 11088 (b) Additional capacity created by component A 38.5%, Buy component B 63.6%, Buy component C 50% (c) The cheaper between the components B and C should be purchased (d) Increase in profit Rs. 24,222.

22. (Product Mix Decision)

Vinak Ltd. which produces three product furnishes you the following data for 2005–06.

	Products		
	A	*B*	*C*
Selling Price per unit (Rs.)	100	75	50
Profit/Volume Ratio (%)	10	20	40
Maximum Sales potential (Units)	40000	25000	10000
Raw material content as percentage of variable costs (%)	50	50	50

The Fixed Expenses are estimated at Rs. 6,80,000. The company uses a single raw material in all the three products. Raw material is in short supply and the company has a quota for the supply of raw materials of the value of Rs. 18,00,000 for the year 2005–06 for the manufacture of its products to meet its sales demand.

You are required to

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

(ii) Compute that maximum profit. *(CA, Inter)*

Ans: (i) A 20,000 units, B 25,000units C 10,000 units.(ii) Profit Rs. 95,000.

PRICING DECISIONS

Learning Objectives

After reading this chapter, you should be able to:

1. describe factors influencing pricing decisions;
2. discuss different methods of pricing;
3. understand circumstances when a business firm can sell a product below the variable cost, and
4. explain the concept of target pricing, prices indifference point.

The chapter on 'Alternative Choices Decisions' has discussed how cost and revenue analysis and relevant information help management in making various alternative choices decisions such as make or buy, add or drop product, product mix, sell or process further, operate or shutdown, replace or retain, buy or lease, special order, export proposals, etc. The present chapter discusses 'pricing decisions' which is one of the most crucial and difficult decisions which a business firm has to make, and determine how cost information can be useful to management in framing suitable pricing policy.

FACTORS INFLUENCING PRICING DECISIONS

Pricing of a product or service refers to the assignment of a selling price to a product or service provided by a firm. The pricing decisions are influenced by internal and external factors both. Some such factors (determinants) are as follows:

1. Cost data of the product which may be actual, replacement, standard or any other cost base.
2. Firm's profit and other objectives.
3. Demand for the product or service and its elasticity.
4. Nature of product and its life expectancy.
5. Pricing decision as a long-run decision or short term decision or a one-time spare capacity decision.
6. Type of competition for the product or service and availability of close substitutes.
7. Number of suppliers in the market.
8. Economic and political climate and trends and likely changes in them in future.
9. Type of industry to which the product belongs and future outlook of the industry.
10. Government guidelines, if any.

DIFFERENT METHODS OF PRICING

The different methods of pricing are generally the following:

1. Total Cost-Plus or Full Cost-Plus Pricing

Total cost-plus or full cost-plus pricing involves all costs plus a profit margin. It includes not only the product's direct costs but also the indirect costs incurred by the overall company which have to be allocated to different products in case different products are manufactured. An example of price calculation using full cost-plus method is as follows:

	(Rs.)	(Rs.)
Direct material		10
Direct labour		20
Factory overheads:		
Fixed	15	
Variable	5	20
Total manufacturing cost		50
Non-manufacturing overheads:		
Fixed	10	
Variable	0	10
Total cost		60
Add: Profit margin (25% on total cost)		15
Selling price		75

Full cost-plus method has the following advantages:

1. It is simple to operate if cost structures of products are known.
2. The pricing decision under full cost approach becomes standardised and such decisions can easily be delegated to lower management.
3. It ensures recovery of total costs and also provides a reasonable rate of returns to the firm.
4. It helps a business firm to predict the selling prices of other competitive firms, specially of those firms who are having similar cost structures.
5. This pricing method is important in contracting industries where price of the contracts needs to be determined considering fixed costs also.
6. This brings stability in the pricing policy and selling price can be justified to customers.
7. Full cost pricing is consistent with absorption costing system.

Full cost-plus method has the following disadvantages too:

1. It ignores demand and competition and may result into underpricing or overpricing of products.
2. Fixed costs are likely to be distributed on some arbitrary basis as there are different methods of apportionment and thus total costs of different products will be different depending on which apportionment method is used.
3. In full cost pricing, the choices of volume or capacity base is very important. Different unit products costs will emerge under different concepts of capacity.
4. This method does not distinguish between relevant costs (for example, variable costs and incremental fixed costs) and irrelevant costs (fixed costs).
5. This method cannot always shield the firm from a loss. If sales demand falls below the volume level used to calculate the fixed cost per unit, the total sales revenue will be inadequate to cover the total costs.

Within full cost-plus method, some other cost bases can used be for determining the selling price such as manufacturing cost plus or conversion cost plus.

Manufacturing cost (or product cost) plus pricing includes cost incurred specifically for manufacturing the product plus a profit margin. The profit margin added to this cost must cover all operating expenses and generate a satisfactory level of profit. Using the information given in the earlier example, a cost of Rs. 50 will be used. To this cost a higher profit margin needs to be added to cover non-manufacturing overheads as well as to provide a satisfactory level of profit to the firm. For example, selling price calculation may be as follows:

	Total manufacturing costs	Rs. 50
Add:	Profit margin (50% on manufacturing cost)	Rs. 25
	Selling price	Rs. 75

Conversion cost plus pricing uses conversion cost for determining the selling price and to this cost a profit margin is added. This pricing method is generally followed when the customer provides the materials. This method depends on the assumption that greater profits can be realised if efforts are directed to products requiring less labour and overhead because more units can be produced and sold.

2. Marginal Cost-Plus Pricing

This method, also known as contribution approach, uses only variable costs as the basis for pricing. Fixed costs are not added to the product, service or contract. However, fixed costs should be taken into account in determining the profit margin to be added to variable costs to arrive at the selling price.

Marginal cost approach helps a business firm to enter into new markets easily, to increase its competitive position in the existing markets, to survive during trade depressions, to utilise spare available capacity, to dispose off surplus or obsolete stock.

Marginal cost-plus pricing brings some disadvantages to the firm as well. For instance, recovery of fixed costs may be doubted. There is likely to be undesirable competition for cutting prices to a lower level. In case management decides to increase lower marginal cost pricing, it may face dissatisfaction from the consumers.

Using the information given in the earlier example, marginal costs of Rs. 35 can be used to set the selling price. Obviously, it indicates the cost below which the price should not fall, otherwise the company would have losses. Also, a higher profit margin can be added to marginal cost which may work as a long term selling price even for normal sales. For instance, if the profit margin of 100% is added to marginal costs of Rs. 35, the selling price will be Rs. 70.

3. Differential Cost-Plus Pricing

This method involves adding a mark up on differential cost which is the increase in total cost resulting from the production of additional units. Differential cost pricing differs from variable cost pricing in which a mark up on variable cost is added, whereas both variable costs and fixed costs are included in the differential costs on which a mark up is determined. This method can be applied where some revenue above differential cost may be received rather than no revenue at all. Such additional revenue makes some contribution towards the recovery of fixed costs which are already incurred.

4. Standard Costs

Standard costs represent the costs that should be attained under efficient operating conditions at a normal capacity. The cost-based methods discussed above have some adverse implications and include costs due to inefficient manufacturing, wasteful operations, etc. That is, it is likely that unnecessary costs may be assigned to the product. On the other hand, standard costs use costs from efficient operations plus the agreed profit. Also, pricing can be done more quickly.

FIXING SELLING PRICE BELOW VARIABLE COST

The situations where a business firm is justified to sell its products at a price below the variable cost are as follows:

(i) when a new product is introduced in the market or to popularise a new product.
(ii) When foreign market is to be explored.
(iii) When a weaker competitor is to be driven out of market.
(iv) When it is feared that future market will go out of hand.

TARGET PRICING

A target price is the estimated price for a product or service that potential customers will be willing to pay. This estimate is based on an understanding of customers' perceived value for a product and competitors' responses. The target price forms the basis for calculating target costs. A target cost is the estimated long-run cost of a product or service that when sold enables the company to achieve targeted profit. It is derived by subtracting the target profit from the target price. Developing target prices and target costs requires the following four steps:

Step 1 – Develop a product that satisfies the needs of potential customers.
Step 2 – Choose a target price based on customers' perceived value for the product and the prices competitors charge.
Step 3 – Derive a target cost by subtracting the desired profit margin from the target price.
Step 4 – Estimate the actual cost of the product.
Step 5 – If estimated actual cost exceeds the target cost, investigate ways of driving down the actual cost to the target cost.

PRICES INDIFFERENCE POINT

A price indifference point is the sales level at which a firm's net income is same between two pricing alternatives. The price indifference point indicates the volume of sales at which the new price gives a profit equal to the profit of old sales volume and price. In case, sales volume at new price is lower than sales volume at old price (when there is price indifference point), firm should reject the price increase since firm's profit will decrease. In contrary to this, if expected sales volume with price increase is greater than the price indifference point, profit will increase. Price indifference point's concept is very useful in short-term decision making situations.

Example 18.1 (Computing New Price)

Suman Ltd., manufactured and sold 1000 Electric Irons last year at a price of Rs. 800 each. The cost structure of Electric Irons is as follows:

Materials	200
Labour	100
Variable cost	50
Marginal cost	350
Factory Overhead (fixed)	200
Total Cost	550
Profit	250
Sale Price	800

Due to heavy competition, price has to be reduced to Rs. 750 for the coming year. Assuming no change in costs, state the number of Electric Irons that would have to be sold at the new price to ensure the same amount of total profits as that of the last year. *(B.Com.(Hons), Delhi 2004)*

Solution:

Profit on sale of 1000 electric irons = Rs. 250 × 1000 = Rs. 2,50,000

Reduced Sales Price		Rs. 750
Less: Material	Rs. 200	
Labour	Rs. 100	
Variable Cost	Rs. 50	
Contribution per unit		350
		400

No. of units to be sold to earn Rs. 2,50,000

$$= \frac{\text{Fixed Cost + Required Profit}}{\text{Contribution per unit}}$$

$$= \frac{\text{Rs. 2,00,000 + Rs. 2,50,000}}{400}$$

$$= \frac{\text{Rs. 4,50,000}}{400} = 1125 \text{ units to be sold}$$

Verification:

Sales – VC – Fixed Cost
(1125 × 750) – (350 × 1125) – 2,00,000
Rs. 8,43,750 – Rs. 3,93,750 – 2,00,000
Rs. 8,43,750 – Rs. 5,93,750 = Rs. 2,50,000

Example 18.2 (Using Price Elasticity of Demand in Selling Price)

A company decides to manufacture 100,000 units of its product. The variable cost per unit is Rs. 10 and fixed costs amount to Rs. 600,000. In Board meeting the finance manager suggests that the full-cost method should be used in fixing selling price for the company's product. He has also suggested a profit margin of 25% on total costs. The marketing manager while disagreeing with the finance manager's proposal presents the following information regarding possible demand of product at different prices:

Price per unit (Rs.)	*Demand (units)*
18	84000
20	76000
22	70000
24	64000
26	54000

Which proposal (Finance Manager's or Marketing Manager's) will be useful for the company?

Solution:

(A) Finance manager's proposal	(Rs.)
Variable cost	10
Fixed cost	6

Total cost	16
Profit margin (25%)	4
Selling price	20

No. of units to be sold at a price of Rs. 20 per unit (as given in the question)

= 76000 units

Total contribution = 76000 units × Rs. 10 =	Rs. 7,60,000
Less: Fixed Costs	6,00,000
Net Profit	Rs. 1,60,000

(B) Before evaluating marketing manager's proposal, a profitability statement at different selling price needs to be prepared.

Profitability Statement

Selling price per unit (Rs.)	*Units demanded*	*Contribution per unit (Rs.)*	*Total contribution (Rs.)*	*Fixed cost (Rs.)*	*Net profit (Rs.)*
18	84000	8	6,72,000	(6,00,000)	72,000
20	76000	10	7,60,000	(6,00,000)	1,60,000
22	70000	12	8,40,000	(6,00,000)	2,40,000
24	64000	14	8,96,000	(6,00,000)	2,96,000
26	54000	16	8,64,000	(6,00,000)	2,64,000

It can be found that at a selling price of Rs. 20 (Finance manager's proposal), the net profit is Rs. 1,60,000. But if the company fixes a selling price of Rs. 24 per unit, the maximum profit of Rs. 2,96,000 will be earned. Therefore the finance manager's proposal is rejected and marketing manager's proposal is recommended. In fact while making the proposal the finance manager has not considered the price elasticity of demand of company product which can be an important factor in fixing the selling price.

Example 18.3 (Considering Opportunity Costs in Selling Price)

V Ltd. Manufactures small chairs for children. The following information is provided:

	Per unit (Rs.)
Material (3 kg @ Rs. 2 per kg)	6
Labour	5
Variable overheads	4
Allocated fixed overheads	2

Material is currently used to make desks which provide contribution of Rs. 5 per unit, 2 kg of material are required for each desk. What is the minimum price per chair if

(i) material is plentiful
(ii) material is scarce

Solution:

The minimum price of product is determined in different manners depending on different situations as listed below:

(i) When the product has been made—The minimum price will be whatever is recoverable subject to recovering any disposal costs. All costs incurred in manufacturing the product are sunk costs and therefore not relevant in pricing decisions.

(ii) When the product is to be made and there are no scarce resources—In this case, the minimum price will be equal to incremental costs of making the product.

(iii) When the product is to be made and there are scarces resources—In this case, the minimum price is calculated as follows:

Minimum price = Incremental costs of making product (external opportunity costs) + Opportunity costs of scarce resources (internal opportunity cost)

Using the above guidelines, the minimum price per chair will be as follows:

(i) *Material is plentiful*

Minimum price = Incremental cost of making chairs
= 6 + 5 + 4 = Rs. 15 per chair.

(iii) *Material is scarce*

Minimum price = Incremental costs + Internal opportunity costs of scarces resources

$$=15 + \left(\frac{\text{Contribution}}{\text{kg of material}} = \frac{\text{Rs. } 5}{2 \text{ kg}} \times 3 \text{ kg} \right)$$

= 15 + 7.50
= Rs. 22.50 per chair

Example 18.4 (Minimum Price)

ACE Ltd. has an inventory of 5000 units of a product left over from last year's production. This model is no longer in demand. It is possible to sell these at reduced prices through the normal distribution channels. The other alternative is to ask someone to take them on "as is where is" basis. The latter alternative will cost the company Rs. 5,000.

The company produced 240,000 units of the product, last year, when the unit costs were as under:

	Rs.	Rs.
Manufacturing Costs		
Variable	6.00	
Fixed	1.00	7.00
Selling and Distribution Cost:		
Variable	3.00	
Fixed	1.50	4.50
Total Cost		11.50
Selling Price per Unit		14.00

Required:

Should the company scrap the items or sell them at a reduced price? If you suggest the latter, what minimum price would you recommend? *(CA, Final, May 1998)*

Solution:

Minimum recommended price per unit of 5000 units of a product (obsolete model) of ACE Ltd.

(i) Historical cost of Rs. 11.50 per unit of 5000 units of a product is irrelevant (as it is a sunk cost) for determining the recommended price per unit.

(ii) If at all this model is sold in the market through normal distribution channels it will entail a variable selling and distribution cost of Rs. 3 per unit.

(iii) If the stock is disposed off by asking someone to take them on "as is where is basis", the company would have to spend Rs. 5000 over 5,000 units that is Re. 1/- per unit.

(iv) In view of (ii) and (iii), the option of selling 5000 obsolete units of model using regular channels will have a differential cost of Rs. 2 (Rs. 3 – Re. 1) per unit.

Recommendation:

Hence, if the company can get anything more than Rs. 2/- per unit, then it is worthwhile to sell the stock of 5,000 units and earn an additional contribution.

Example 18.5 (Export Order Price)

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

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

The indirect costs as per his budget projections are:

Indirect costs	20000 units (80% capacity) Rs.	22500 units (90% capacity) Rs.	25000 units (100% capacity) Rs.
Variable	80,000	90,000	1,00,000
Semi-variable	40,000	42,500	45,000
Fixed	80,000	80,000	80,000

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

Arrive at the price to be quoted for the export order to give him a profit margin of 10% on the export price. *(CA Final, May 1996)*

Solution:

Working Notes:

1. Direct Cost per unit

	Rs.
Selling price per unit (Rs. 400,000/20000 units)	20
Less: Profit margin (20% × Rs. 20)	4
Total cost	16
Less: Indirect costs (Rs. 2,00,000 / 20000 units)	10
Direct cost per unit	6

2. Statement of differential cost for 4000 units (20% of 20000 units)

	Present production 20000 units	Proposed production 24,000 units	Differential for 4000 units
Direct cost @ Rs. 6/- p.u.	Rs. 1,20,000	Rs. 1,44,000	Rs. 24,000
Indirect Cost:			
Variable @ Rs. 4 p.u.	80,000	96,000	16,000
Semi-variable	40,000	44,000	4,000
Fixed	80,000	81,000	1,000
Total	3,20,000	3,65,000	45,000

Computation of the price to be quoted for the export order of 4,000 units

	Rs.
Differential cost (Refer to Working Note 2)	45,000
Add: Profit (10% of export price or 1/9th cost)	5,000
Price to be quoted	50,000

Export price per unit Rs. 12.50
(Rs. 50000/4000 units)

THEORY QUESTIONS

1. "In the long run, selling price will tend to equal costs plus reasonable profits." Discuss. *(ICWA)*
2. List the factors taken into consideration in fixing the selling price by a business firm.
3. Discuss full cost-plus and marginal cost-plus methods of pricing. Which pricing method can be useful to a firm and under what situations.
4. Product pricing is an important area for management decision making. State briefly the broad objectives of pricing policy. Mention specifically situations where prices are fixed below the variable cost.
(ICWA Inter, Stage 1, Dec. 2004)

PROBLEMS

1. An Electronics Company has the following cost structure for an electronic product.

	Rs.
Direct material	50
Direct labour	75
Variable overheads	30
Fixed overheads	45
Total unit cost	200

Fixed selling and administrative costs Rs. 6,00,000.
Additional information:
(i) Budgeted production and sale for the next year is 20000 units.
(ii) The management feels that a minimum return of 20% is required on equity investments of Rs. 20,00,000. What price should it charge for one unit of its output.

Ans. Rs 250

2. MPC Ltd. of Mumbai presently sells as equipment for Rs. 42,000. Increase in prices of material and labour cost are anticipated to the extent of 10% and 20% respectively in the coming year. Material cost represents 40% of cost of sales and labour cost 30% of cost of sales. The remaining relate to overheads.
If the existing selling price is retained, despite the increase in labour and material prices, the company would face a 25% decrease in the existing amount of profit on the equipment.
Required:
(i) Calculate a selling price so as to give the same percentage of profit on increased cost of sales, as before.
(ii) Prepare a statement of profit/loss per unit showing the new selling price and cost per unit in support of your answer. *(ICWA, Inter, Stage 1, June 2005)*

Ans. (i) Rs. 46,200
(ii) Percentage of profit on sales, Existing 40%, New 40%.

3. A company presently sells an equipment for Rs. 35,000. Increase in prices of labour and material costs are anticipated to the extent of 15% and 10% respectively in the coming year. At present material cost represents 40% of cost of sales and labour cost 30% of the cost of sales. The remaining relate to overheads. If the existing selling price is retained, despite the increase in labour and material prices, the company would face 20% decrease in the existing amount of profit on the equipment.
   You are required to arrive at a selling price so as to give the same percentage of profit on increased cost of sales, as before. Prepare a statement of profit/loss per unit, showing the new selling price and cost per unit in support of your answer. *(ICWA, Stage 2, Dec. 2006)*
   Ans: Revised selling price Rs. 37,975
   Percentage of profit on cost of sales 42.5%.

STANDARD COSTING

Learning Objectives

After reading this chapter, you should be able to:

1. explain historical costing and its limitations;
2. define standard costs and its differences with estimated cost, standard costing and its advantages and limitations;
3. understand different types of standards and explain how tight should standards be;
4. describe developing or setting standards; revision of standards;
5. explain the procedure of computing material cost variances, labour cost variances, overhead cost variances and sales variances;
6. discuss disposition of variance, managerial uses of variances, and
7. understand different types of control ratios.

Control of cost is one of the most important objectives of cost accounting and cannot be achieved without some standard against which actual can be compared. This chapter introduces the concepts and basic procedures of standard costing and also explains the techniques used in standard cost variance analysis. However, before discussing standard costing it will be appropriate to evaluate briefly historical cost accounting and its limitations.

HISTORICAL COSTING AND ITS LIMITATIONS

Historical cost systems are principally associated with recording of historical, or as they are commonly called, actual cost. Historical costing is the ascertainment of costs after they have been incurred. Historical costs have the following limitations:

1. Historical costs are collected after they have been incurred and therefore are ineffective in cost control. The costs have been incurred, they cannot be undone and no steps can be taken to correct inefficiencies.
2. Historical costs are not helpful in cost reduction since they contain no standards or goals towards which employees can work.

3. Historical costs do not provide reliable guides to management in the tasks of budgeting, planning, and decision-making because they reflect a situation in a previous period. But the enterprise, in fact, may be working under conditions different from those prevailing during that previous period.

DEFINITION OF STANDARD COST, STANDARD COSTING

A standard cost is a planned cost for a unit of product or service rendered. Standard costs represent excellent target costs that should be obtained. The Institute of Cost and Management Accountants (UK) defines standard cost as "a predetermined cost which is calculated from management's standards of efficient operation and the relevant necessary expenditure. It may be used as a basis for price fixing and for cost control through variance analysis." Standard cost expresses what costs should be under attainable good performance.

Standard costing is the setting of predetermined cost estimates in order to provide a basis for comparison with actual costs. The Institute of Cost and Management Accountants (UK) defines standard costing as "the preparation and use of standard costs, their comparison with actual costs, and the analysis of variances to their causes and points of incidence."

STANDARD COSTS AND ESTIMATED COSTS

The term "standard costs" should not be confused with "estimated costs". Standard cost and estimated costs differ in the following respects:

First, estimated costs are frequently less accurately determined. Estimated costs are developed from projections using averages of past data regarding performance. Standard costs are predetermined realistically and much more scientifically through the use of time and motion studies, engineering estimates and specifications, selected measures of plant capacity, cost behaviour patterns.

Second, estimated costs are not helpful to management in accomplishing managerial functions as they are not scientifically predetermined costs. But standard costs involve more sophistication, operation analysis and evaluation and comprehensive review of internal and external factors and provide reliable measures for product costing, product pricing, planning, coordination and cost control purposes.

Third, estimated cost emphasises on actual cost with which it is compared at the end of the accounting period. If the estimated costs are found higher or lower than actual costs they are revised for use in the next accounting period. In standard costing, the emphasis is on standard costs, that is, what costs of material, labour and overhead should be incurred if the factory is to be operated as a highly efficient unit with each manager, foreman, worker, plant and machine functioning as an efficient part of the production process. Under standard costing, actual costs are ascertained only to facilitate their comparison with standard costs.

ADVANTAGES OF STANDARD COSTING

Among the many advantages generally attributed to standard costing, the most important may be listed as follows:

1. *Managerial planning* Planning is a process of using all resources in such a manner that maximises business profits. Standard costs are more convenient than actual costs for budget preparation because the standard costs at different production levels and for different product-mixes are readily built up into total costs as called for by the budget. On the other hand, using actual costs requires a great deal of analysis and adjustment when extensive changes in product volume or product-mixes take place.

2. *Coordination* The establishment of standards coordinates all functions—manufacturing, marketing engineering, research, and accounting towards the achievement of a common goal. Setting standards involves defining and communicating targets so that they can work towards the attainment of the goal.
3. *Cost control* Cost control and cost reduction are probably the most important aims of any costing system; and standard costing gives due recognition to this fact. Cost control has the objective of production of the required quality at the lowest cost attainable under existing conditions. Standards enable management to make periodic comparison of actual costs with standard costs in order to measure performance and to take action to maintain control over costs.
4. *Economical means of costing and record-keeping* The use of standard costs can reduce clerical labour and expense by avoiding the detailed record-keeping which is necessary when actual costs alone are used.
5. *Formulating price and production policies* Standard costs as compared to actual costs can be used for estimating selling prices. When standard unit costs are available, expected costs and sales prices can be computed on the basis of standard costs. Standards already established can easily be modified to reflect current conditions and changes in material prices or labour rates and the price of the product can be determined on a realistic basis.

   Actual costs, on the other hand, may reflect excessive usage of material, abnormal labour times or an inequitable charge for overhead. Actual overhead cost per unit at any given time may be so influenced by temporary fluctuations in production levels as to make actual cost entirely unusable for pricing.
6. *Standards as incentives to employees* If standards are reasonable and attainable they act as incentives to employees to improve their performances and to maintain the quality of the product. Standards motivate workers, supervisors and foremen to work more efficiently in the accomplishment of their respective standards.

DIFFERENT TYPES OF STANDARDS

The two principal considerations affecting the classification of standards are: (i) attainability of standards, that is, the ease with which it is possible to achieve the standards, and (ii) frequency with which the standards are revised. On the basis of these two factors, it is possible to classify standards as ideal, normal, basic, current or expected actual standards.

Ideal, Perfect, Maximum Efficiency or Theoretic Standards

Ideal standards (costs) are the standards which can be attained under the most favourable conditions possible. The level of performance under ideal standards would be achieved through the best possible combination of factors—the most favourable prices for materials and labour, highest output with best equipment and layout, and maximum efficiency in the utilisation of the production resources—in other words, maximum output at minimum cost. Such standards reflect only goals or targets without any hope of performance being currently achieved. These standards are extremely tight and do not provide for waste and inefficiency in any form; no material is wasted; no units are spoiled; there are no idle hours; operators work at predetermined speed; the available capacity is fully utilised.

Normal Standards

Normal standards are the average standards which (it is anticipated) can be attained during a future period of time, preferably long enough to cover one business cycle. These standards are not revised until the cycle has

run its full course. This generally results in an incorrect valuation of inventories and consequent errors in the profit disclosed, as the inventories are understated in periods of high prices, and over-stated when prices are low. Normal standards are mainly used as a device to solve the problem of absorbing fixed overhead rather than in connection with material cost and wages. Since these standards do not reflect the goals to be attained, they are not often used.

Basic Standards

The Institute of Cost and Management Accountants (UK) defines a basic standard as the standard which is established for use unaltered for an indefinite period which may be a long period of time. Basic standards are seldom revised or updated to reflect current operating costs and price level changes.

Currently Attainable or Expected Actual Standards

Current standards are standards which are established for use over a short period of time, and are related to current conditions. They represent current costs to be expected from efficient operations. Currently attainable standards are formulated after making allowance for the cost of normal spoilage, cost of idle time due to machine breakdowns, and the cost of other events which are unavoidable in normal efficient operations. They take the place of actual cost and are recorded in account books and financial statements. Any deviation from these standards reflect inefficiencies in the production activities, unless the variances have occurred due to uncontrollable factors. These standards are most accurate and very useful to management in product costing, inventory valuations; estimates, analyses, performance evaluation, planning, employee motivation, and for managerial decision making and external financial reporting.

HOW TIGHT SHOULD STANDARDS BE

It can be rightly said that a single standard may not be suitable for all purposes. For the purposes of cost control, tight standards need to be established. The attainable (good) performance standards are useful for purposes of inventory valuation, product costing and income determination.

High Standards

A high standard helps in cost reduction and motivating employees to try to reach the targets established. High standards represent the best possible performance and, if achieved, raise the levels of performance and efficiency as compared to poor or loose standards. High standards being unattainable in practice may not be good for the employees. Employees may not seriously accept them because they know that they are unattainable and impossible to achieve. High standards are also not realistic and therefore cannot be used in product costing, inventory valuation, financial statement, planning, and capital investment decisions.

Low (Loose) Standards

A standard which is low or loose can be attained by poor performance. However, it defeats the purpose of standard costing and fails to disclose inefficiencies. Such standards do not help management in cost control as they are not accurate measures to compare actual results.

In conclusion, it can be said that accountants generally seem to favour currently attainable standards which are most appropriate for performance appraisal, accounting purposes, cost control and decision-making. Such standards produce good performance, promote employee motivation and include unavoidable elements, such as spoilage, lost time, capacity not utilised in setting standards.

DEVELOPING OR SETTING STANDARD

All factors related with standards-setting should be considered in the establishment of standards. Whatever method is used, standards must be established for a definite period of time so that they can be effective in performance evaluation, control and analysis of costs. Standards are usually set for a six- or twelve-month period. Sometimes a longer period is used but rarely a shorter period. Standards are developed for:

1. Materials.
2. Labour, and
3. Overhead.

Materials Standards

Two standards must be developed for materials:

1. Materials quantity (usage) standard
2. Materials price standard

Labour Standards

As in the case of direct materials, labour standards are also established for both cost and quantity (efficiency). For standard cost purposes, direct labour is treated separately from indirect labour, which is included in the factory overhead. Two standards are usually developed for labour costs;

1. Labour usage (or efficiency) standard
2. Labour cost (or rate) standard

Factory Overhead Cost Standards

Setting Overhead Standards

Setting standard overhead cost requires the determination of: (1) standard capacity and (2) standard overhead costs for this capacity. The standard overhead costs can be computed using normal capacity. The normal or expected actual capacity aims at a production level according to an existing set of conditions. This capacity does not require complete utilisation of all available facilities but is based on the efficient utilisation of resources and operations.

After standard capacity is determined, overhead—variable and fixed—to be incurred at that capacity is prepared. The standard overhead rate is found by dividing the standard or budgeted overhead at standard capacity by the volume selected to represent standard capacity. Volume may be measured in units of product, standard productive hour (labour or machine) or some standard cost, such as direct labour.

$$\text{Standard overhead rate} = \frac{\text{Standard overhead}}{\text{Standard production}}$$

REVISION OF STANDARDS

Standard costs require continuous review and, at times, frequent change. Changing prices, technological advances, new personnel, new machinery, changing quality of materials and new labour negotiations, all influence standards and make them obsolete resulting in unrealistic budgets, poor cost control, and unreasonable unit cost for inventory valuation and income determination.

A company should establish a programme to revise standards whenever required so that standards can be set at a currently attainable level. Labour rate standards should be revised for any change in labour rates; material quantity standards for any change in type, quality of material or method of production. If a new

machine is purchased to replace an old machine, labour time standards and material quantity standards should be updated. In addition to these obvious revisions, in every business firm there should be a system for revising standards for adequacy and suitability at least once a year. A periodic review of standards is desirable to accomplish the objectives of standard costing.

VARIANCE ANALYSIS

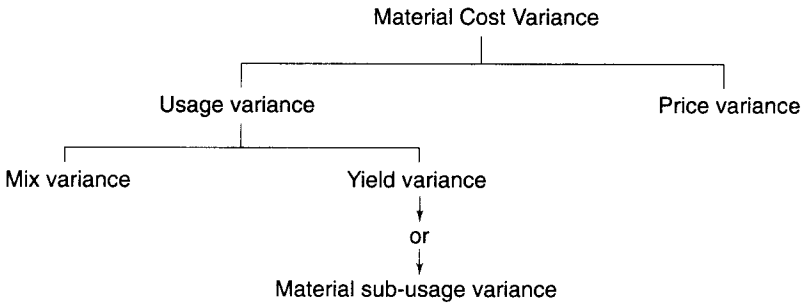
The function of standards in cost accounting is to indicate variances between standard costs which are allowed and actual costs which have been recorded. The Institute of Cost and Management Accountants (UK) defines variance as the difference between a standard cost and the comparable actual cost incurred during a period. Variance analysis can be defined as the process of computing the amount of, and isolating the cause of variances between actual costs and standard costs. Variance analysis involves two phases:

1. Computation of individual variances, and
2. Determination of the cause(s) of each variance

First, we concentrate on the computation of material, labour and factory overhead variances. Analysis of causes, reporting variances to managers, and accounting disposition of variances conclude the study of standard costing in this chapter.

MATERIALS VARIANCE

The following variances constitute materials variances:



Material Cost Variance

Material cost variance is the difference between the actual cost of direct materials used and standard cost of direct materials specified for the output achieved. This variance results from differences between quantities consumed and quantities of materials allowed for production and from differences between prices paid and prices predetermined. This can be computed by using the following formula.

Material cost variance= $(AQ \times AP) - (SQ \times SP)$

where AQ = Actual quantity

AP = Actual price

SQ = Standard quantity for the actual output

SP = Standard price

Materials Usage Variance

The material quantity or usage variance results when actual quantities of raw materials used in production differ from standard quantities that should have been used to produce the output achieved. It is that portion

of the direct materials cost variance which is due to the difference between the actual quantity used and standard quantity specified. As a formula this variance is shown as:

Materials quantity variance = (Actual quantity – Standard quantity) × Standard price

A material usage variance is favourable when the total actual quantity of direct materials used is less than the total standard quantity allowed for the actual output.

Example

Compute the materials usage variance from the following information:

Standard material cost per unit	Materials issued
Material A 2 pieces @ Re 1.00 = 2.00	Material A 2050 pieces
Material B 3 Pieces @ Rs 2,00 = 6.00	Material B 2980 pieces.
Rs 8.00	
Units completed 1000	

Solution:

Materials usage variance = (Actual quantity – Standard quantity) × Standard price

Material A = (2050 – 2000) × Re 1.00 = Rs. 50 (Adverse or Unfavourable)

Material B = (2980 – 3000) × Rs 2.00 = Rs 40 (Favourable)

Total = Rs 10 (Unfavourable)

It should be noted that the standard rather than the actual price is used in computing the usage variance. Use of actual price would have introduced a price factor into a quantity variance. Because different departments are responsible, these two factors must be kept separate.

As a general principle, actuals (cost, quantity, price, output, etc.) are compared with respective standard data to compute variances. Therefore, any formula to calculate, mathematically, any variance would be as follows:

(Actual–Standard)

However, one may use variance formula as Standard–Actual as it does not influence in any way the variance figure calculated by using the formula 'Actual–Standard'.

Materials Price Variance

A materials price variance occurs when raw materials are purchased at a price different from standard price. It is that portion of the direct materials which is due to the difference between actual price paid and standard price specified and cost variance multiplied by the actual quantity. Expressed as a formula,

Materials price variance (Actual price – Standard price) × Actual quantity

Materals price variance is unfavourable when the actual price paid exceeds the predetermined standard price. It is advisable that materials price variance should be calculated at the time of materials purchase rather than when materials are used. Purchase of matrials is an earlier event than the use of materials. Therefore, a variance based on quantity purchased is basically an earlier report than a variance based on quantity actually used. This is quite beneficial from the viewpoint of performance measurement and corrective action.

Example

Assuming in above example that material A was purchased at the rate of Re 1.00 and material B was purchased at the rate of Rs 2.10 the material price vriance will be as follows:

Materials price variance = (Actual price – Standard price) × Actual quantity

Material A = (1.00 – 1.00) × 2,050 = Zero

Material B = (2.10 – 2.00) × 2,980 = Rs. 298 (Unfavourable)

The total of materials usage variance and price variance is equal to materials cost variance.

Materials Mix Variance

The materials usage or quantity variance can be separated into mix variance and yield variance.

A mix variance will result when materials are not actually placed into production in the same ratio as the standard formula. For instance, if a product is produced by adding 100 kg of raw material A and 200 kg of raw material B, the standard material mix ratio is 1 : 2. Actual raw materials used must be in this 1 : 2 ratio, otherwise a materials mix variance will be found.

Materials mix variance is that portion of the materials quantity variance which is due to the difference between the actual composition of a mixture and the standard mixture. It can be computed by using the following formula:

Materials mix variance = (Standard cost of actual quantity of the actual mixture – Standard cost of actual quantity of the standard mixture)

or

Materials mix variance = (Actual mix – Revised standard mix of actual input) × Standard price

Revised standard proportion is calculated as follows:

$$\frac{\text{Standard mix of a particular material}}{\text{Total standard quantity}} \times \text{Actual input}$$

Example

A product is made from two raw materials, material A and material B. One unit of finished product requires 10 kg of material. The following is standard mix:

Material A	20%–	2 kg @	Rs. 2.00	=	Rs 4.00
Material B	80%–	8 kg @	Rs. 1.00	=	Rs 8.00
	100%–	10 kg	Rs. 1.20		Rs 12.00

During a period one unit of product was produced at the following costs:

Material A	8 kg @	Rs 2.00	=	Rs. 16.00
Material B	4 kg @	Rs 1.25	=	Rs. 15.00
	12 kg	Rs 1.75		Rs. 21.00

Compute the materials mix variance.

Solution:

Materials mix variance = (Actual proportion – Revised standard proportion of actual input) × Standard price

Revised standard proportion:

$$\frac{\text{Standard proportion of a particular mix}}{\text{Total standard quantity}} \times \text{Actual input}$$

Revised standard proportion:

$$\text{Material A} = \frac{2}{10} \times 12 = 2.40 \text{ kg}$$

$$\text{Material B} = \frac{8}{10} \times 12 = 9.60 \text{ kg}$$

Materials mix variance:

Material A = (8 kg – 2.40 kg) × 2.00
= 5.60 × 2.00 = Rs. 11.20 (Unfavourable)
Material B = (4 kg – 9.60) × 1.00
= 5.60 × 1.00 = Rs. 5.60 (Favourable)
Total mix variance = Rs. 5.60 (Unfavourable)

Materials Yield Variance

Materials yield variance explains the remaining portion of the total materials quantity variance. It is that portion of materials usage variance which is due to the difference between the actual yield obtained and standard yield specified (in terms of actual inputs). In other words, yield variance occurs when the output of the final product does not correspond with the output that could have been obtained by using the actual inputs.

The total of materials mix variance and materials yield variance equals materials quantity or usage variance. When there is no materials mix variance, the materials yield variance equals the total materials quantity variance.

The formula for computing yield variance is as follows:

Yield variance = (Actual yield – Standard yield specified) × Standard cost per unit

or

Yield variance = (Actual loss – Standard loss on actual input) × Standard cost per unit

Example

Standard input = 100 kg, standard yield = 90 kg, standard cost per kg of output = Rs. 20. Actual input 200 kg, actual yield 182 kg. Compute the yield variance.

Solution:

$$\text{Standard yield for the actual input} = \frac{90}{100} \times 200 = 180 \text{ kg}$$

Yield variance = (Actual yield – Standard yield for the actual input) × Standard cost per unit.
= (182 – 180) × Rs. 20
= 2 × 20 = 40 (Favourable)

The above yield variance can be computed by using another formula also, for example,

Yield variance = (Actual loss – Standard loss on actual input) × Standard cost per unit
= (18 kg – 20 kg) × Rs. 20
= Rs. 40 (Favourable)

In this example there is no mix variance and therefore, the materials usage variance will be equal to the materials yield variance.

The above formula uses output or loss as the basis of computing the yield variance. Yield variance can also be computed on the basis of input factors only. The fact is that loss in inputs equals loss in output. A lower yield simply means that a higher quantity of inputs have been used and the anticipated or standard output (based on actual inputs) has not been achieved. Yield, in such a case, is known as sub-usage variance

(or Revised usage variance) which can be computed by using the following formula:

Sub-usage or revised usage variance = (Revised standard proportion of actual input—Standard quantity) × Standard cost per unit of input

Important Note

Variances, generally, can be computed by using two approaches namely by comparing the actuals with standards or comparing standard with actuals as displayed below.

Actual — Standard

or

Standard — Actual

A survey of relevant literature, books and publications on cost and management accounting in India and abroad reveals that both the above approaches have been recognised by the authors. In this text, both the methods have been followed in calculating variances to avoid any confusion among the students and readers. The use of only one of the above two approaches may create some doubt among the students.

Example 19.1

Finolex Co. uses a standard cost system and manufactures product Z. Standard cost per 1000 kg of output is as under:

Material	*Quantity (in kg)*	*Price (in Rs.)*
A	800	2.50
B	200	4.00
C	200	1.00

In March 2007, the company produced 2,00,000 kg of output. Actual consumption was:

Material:

A – 1,57,000 kg @ Rs. 2.40
B – 38,000 kg @ Rs. 4.20
C – 36,000 kg @ Rs. 1.10

Calculate material variances *(B.Com.(Hons), Delhi ,2007)*

Solution:

Standards Material Cost of 2,00,000 kg of output

		Standard Quantity (Kg)	*Standard Price (Rs.)*	*SQ X SP (Rs.)*
A	800 × 200 =	1,60,000	2.50	4,00,000
B	200 × 200 =	40,000	4.00	1,60,000
C	200 × 200 =	40,000	1.00	40,000
		2,40,000		6,00,000

Actual Material Cost of 2,00,000 kg of output

	AQ (kg)	*AP (Rs.)*	*AQ * AP (Rs.)*
A	1,57,000	2.40	3,76,800
B	38,000	4.20	1,59,600
C	36,000	1.10	39,600
	2,31,000		5,76,000

(i) Material cost variance = (SQ × SP) – (AQ × AP) = 6,00,000 – 5,76,000 = Rs. 24,000 (F)

(ii) Material price variance = AQ(SP – AP)

A	=	1,57,000 (2.50 – 2.40)	=	15,700 (F)
B	=	38,000 (4.00 – 4.20)	=	7,600 (A)
C	=	36,000 (1.00 – 1.10)	=	3,600 (A)
MPV	=			Rs. 4,500 (F)

(iii) Material usage variance = SP(SQ – AQ)

A	=	2.50 (1,60,000 – 1,57,000)	=	7,500 (F)
B	=	4.00 (40,000 – 38,000)	=	8,000 (F)
C	=	1.00 (40,000 – 36,000)	=	4,000 (F)
MUV	=			Rs. 19,500 (F)

MCV = MPV + MUV = 4,500 (F) + 19,500 (F) = Rs. 24,000 (F)

(iv) Material mix variance

MMV = SP (AQ in std. prop – Aq)

A	=	2.50 (1,54,000 – 1,57,000)	=	7,500 (A)
B	=	4.00 (38,500 – 38,000)	=	2,000 (F)
C	=	1.00 (38,500 – 36,000)	=	2,500 (F)
				Rs. 3,000 (A)

(v) Material yield variance $= \frac{SQ \times SQP}{Output} \times$ (Expected output from AQ – Actual output)

$$= \frac{6,00,000}{2,00,000} \times \left(\frac{2,00,000}{2,40,000} \times 2,31,000\right) - 2,00,000$$

= 3 (1,92,500 – 2,00,000) = Rs. 22,500 (F)

MUV = MMV + MYV = 3,000 (A) + 22,500 (F) = Rs. 19,500 (F)

AQ in Std. Proportion = A = 2,31,000 × 16/24 = 1,54,000;

B = 2,31,000 × 4/24 = 38,500; C = 2,31,000 × 4/24 = 38500

Example 19.2

From the following data, calculate the following variances:

(i) Material cost variance;
(ii) Material price variance;
(iii) Material quantity variance;
(iv) Material mix variance;
(v) Material yield variance.

Material	*Standard*		*Actual*	
	Qty.	*Unit Price*	*Qty.*	*Unit Price*
A	60%	Rs. 20	88	Rs. 30
B	40%	Rs. 10	132	Rs. 10

Standard Loss: 10%

Actual output: 180 units

(B.Com.(Hons), Delhi 2003, 2005)

Solution:

Comparative Statement of Costs

	Standard			*Actual*		
Article	*Qty.*	*Price Rs.*	*Cost Rs.*	*Qty. Rs.*	*Price Rs.*	*Cost Rs.*
A	120	20	2,400	88	30	2,640
B	80	10	800	132	10	1,320
	200		3,200	220		3,960
Less: Std. Loss	20			40		–
	180		3,200	180		3,960

Material cost variance = Std. cost – Actual cost

= 3,200 – 3,960 = Rs. 760 (A)

Material quantity variance

= (SQ – AQ) SP

A = (120 – 88) 20 = 640 (F)

B = (80 – 132) 10 = 520 (A)

Rs. 120 (F)

Material price variance = (SP – AP) × AQ

A = (20 – 30) 88 = 880 (A)

B = (10 – 10) 132 = Nil

Rs. 880 A

Material mix variance

$$A = \left(\frac{120}{200} \times 220 - 88\right) 20 = 880 \text{ (F)}$$

$$B = \left(\frac{80}{200} \times 220 - 132\right) 10 = 440 \text{ A}$$

Rs. 440 (F)

Material yield variance

$$= \left(\frac{180}{200} \times 220 - 180\right) \frac{3200}{180}$$

$$= (198 - 180) \frac{3200}{180}$$

= Rs. 320 (A)

Working Notes:

(i) *Standard quantity of materials A and B*

Standard quantity = 60 + 40 = 100

Less: Standard loss 10

Standard output 90

When standard output is 90, quantity of material A is 60

When output is 180, material A quantity will be $\frac{180 \times 60}{90} = 120$

Similarly quantity of material B will be $\frac{180 \times 40}{90} = 80$

(ii) *Standard output for the actual input*

Actual input = 88 + 132 = 220

When standard input is 100, standard output is 90

When actual input is 220, standard output will be $\frac{220 \times 90}{100} = 198$

(iii) *Revised standard quantity for actual input*

Material A = $\frac{120}{200} \times 220$

Material B = $\frac{80}{200} \times 220$

Example 19.3

Pragati Company manufactures a product P by mixing three raw materials. For every 100 kg of output 125 kg of raw material input are used. In April 1997, there was an output of 5600 kg. of product P. The standard and actual particulars of April, 1997 are as follows:

Raw Material	*Standard*		*Actual*	
	Mix	*Price per kg*	*Mix*	*Price per kg*
I	50%	Rs. 40	60%	Rs. 42
II	30%	Rs. 20	20%	Rs. 16
III	20%	Rs. 10	20%	Rs. 12

Calculate all material variances. The actual quantity of material used was 7000 kg.

(B. Com. (Hons.) Delhi 1997)

Solution:

Raw Material	*Standard for output of 5600 kg.*			*Actual for output of 5600 kg*		
	Qty kg.	*Rate Rs.*	*Amt. Rs.*	*Qty kg.*	*Rate Rs.*	*Amt. Rs.*
I	3500	40	1,40,000	4200	42	1,76,400
II	2100	20	42,000	1400	16	22,400
III	1400	10	14,000	1400	12	16,800
Total	7000*		1,96,000	7000		2,15,600

$$\frac{*5,600}{100} \times 125$$

DMCV = Std. Cost for Actual Output – Actual Cost

= 1,96,000 – 2,15,600 = Rs. 19,600 (A)

DMPV = Actual Qty. × (SR – AR)

I = 4,200 × (40 – 42) = 8,400 (A)

II = 1,400 × (20 – 16) = 5,600 (F)

III = 1,400 × (10 – 12) = 2,800 (A)

5,600 (A)

DMUV = SR × (Std. qty. for actual output – Actual qty.)

I = 40 × (3,500 – 4,200) = 28,000 (A)

II = 20 × (2,100 – 1,400) = 14,000 (F)

III = 10 × (1,400 – 1,400) = Nil

14,000 (A)

DMMV= SR × (SRQ – AQ)

Since total Std. Mix and Actual Mix are the same, the RSQ will be the same as Std. qty.

I = 40 × (3,500 – 4,200)= 28,000 (A)

II = 20 × (2,100 – 1,400)= 14,000 (F)

III = 10 × (1,400 – 1,400)= 0

14,000 (A)

The Direct Material Yield Variance will be *Nil.*

Example 19.4

AB Ltd. has established the following standard mix for producing gallons of product A.

	Rs.
5 gallons of material X at Rs. 7 per gallon	= 35
3 gallons of material Y at Rs. 5 per gallon	= 15
2 gallons of material Z at Rs. 2 per gallon	= 4
	Rs. 54

A standard loss of 10% of output is expected to occur. Actual input was as under:

53000 gallons of material X at Rs. 7 per gallon.

28000 gallons of material Y at Rs. 5.30 per gallon

19000 gallons of material Z at Rs. 2.20 per gallon.

Actual output for a period was 92700 gallons of product A.

Compute:

(i) Material Mix Variance

(ii) Material Yield Variance *(B. Com. (Hons.) Delhi 1999)*

Solution:

Material	*Standard*			*Actual*		
	Quantity	*Rate Rs.*	*Amount Rs.*	*Quantity*	*Rate Rs.*	*Amount Rs.*
X	50000	7	3,50,000	53000	7.00	3,71,000
Y	30000	5	1,50,000	28000	5.30	1,48,400
Z	20000	2	40,000	19000	2.20	41,800
	100000		5,40,000	100000		5,61,200

(i) Material Mix Variance = SR × (Revised Std. Quantity* – Actual Quantity)

* Since Total Actual Mix and Total Std. Mix is the same, hence Standard Quantity is equal to Revised Standard Quantity

X = Rs. 7 × (50000 – 53,000) = 21,000 (A)
Y = Rs. 5 × (30000 – 28,000) = 10,000 (F)
Z = Rs. 2 × (20000 – 19,000) = 2,000 (F)
9,000 (A)

(ii) $$\text{Material yield Variance} = \text{Standard Cost Per unit} \times \begin{pmatrix}\text{Standard Output for Actual Mix} - \text{Actual output}\end{pmatrix}$$

= 6 × (90,000 – 92,700)
= Rs. 16,200 (F)

Verification:

$$\text{Direct Material Usage Variance} = \text{Standard Rate} \times \begin{pmatrix}\text{Std. Qty for actual output} - \text{Actual}\end{pmatrix}$$

X = 7 × (51500 – 53,000) = 10,500 (A)
Y = 5 × (30900 – 28,000) = 14,500 (F))
Z = 2 × (20600 – 19,000) = 3,200 (F)
7,200 (F)

Direct Material Usage Variance = Direct Material Mix Variance + Direct Material Yield Variance
= 9,000 (A) + 16,200 (F)
= 7,200 (F)

Example 19.5

Vinak Ltd. produces an article by blending two raw materials. It operates a standard costing system and the following standards have been set for raw materials:

Material	*Standard mix*	*Standard price per kg*
A	40%	Rs. 4.00
B	60%	Rs. 3.00

The standard loss in processing is 15%.

During April 2001 the company produced 1700 kg of finished output. The position of stocks and purchases for the month of April 2001 is as under:

Material	Stock on 1.4.01 (kg)	Stock on 30.4.01 (kg)	Purchasing during April 2001	
			(kg)	Cost (Rs.)
A	35	5	800	3,400
B	40	50	1200	3,000

Calculate the following variances:

(i) Materials price variance
(ii) Materials usage variance
(iii) Materials yield variance
(iv) Materials mix variance
(v) Total materials cost variance.

(CA Inter, B. Com. (Hons), Delhi)

Solution:

Standard cost of standard mix:

Type of material	Standard quantity of material required Rs.	Standard price per kg Rs.	Standard quantity
A	800	4	3200
B	1,200	3	3600
Total	2,000		6800

Note: 1. The loss being 15% to produce 85 kg of an article, the standard quantity of material required is 100 kg. Therefore, to produce 1700 kg of the article the standard quantity of material required is $\frac{100}{85} \times 1700$ kg or 2000 kg

2. Out of 2000 kg of material used, 40% is type A and 60% is type B, that is, 800 kg of A and 1,200 kg of B are the standard quantities.

Actual costs

Type of material	*Actual quantity of material used kg*	*Actual price per kg Rs*	*Actual quantity X actual price Rs*
A	830	4.25	3,518.75
B	1190	2.50	2,995.00
Total	2020		6,513.75

* Actual quantity of material A is 830 kg, out of this 35 kg is available at the standard price of Rs 4 per kg and remaining 795 kg at Rs 4.25 per kg.

Actual quantity of material B used is 1190 kg; out of this 40 kg is available at the standard price Rs. 3 per kg and the remaining 1150 kg at Rs. 2.50.

(i) Materials price variance = Actual quantity × (Actual price – Standard price)

A. Standard price of 830 units @ 4		3,320.00
Actual price of 35 units @ Rs. 4	140.00	
795 units @ Rs. 4.25	3,378.75	3,518.75
		198.75 (A)

B. Standard price of 1190 units @ Rs. 3		3,570.00
Actual price of 40 units @ Rs. 3	120,00	
1150 units @ Rs. 2.50	2,875.00	2,995.00
		575.00 (F)
	Total	376.75 (F)

(ii) Materials (total) usage variance = Standard price × (Actual quantity – Standard quantity)

	Rs.
A : 4 × (830 – 800)	120.00 (A)
B : 3 × (1,190 – 1,200)	30.00 (F)
	90.00 (A)

(iii) Materials yield variance = Standard rate × (Actual yield – Standard yield)

$$\text{Standard rate} = \frac{\text{Total standard cost}}{\text{Standard yield}} = \text{Rs.}\ \frac{6{,}700}{1{,}700} = \text{Rs 4 per kg}$$

Yield variance = 4 (1,700 – 1,717*) or Rs. 68 (A)

*By using 2000 kg of material, standard yield is 1700 kg. Therefore, the standard yield by using 2020 kg of material will be (1700/2000 × 2020 or 1717 kg)

(iv) Material mix variance = Actual quantity × (Per unit standard cost of standard mix – per unit standard cost of actual mix)

$$= 2020\left(\frac{6{,}800}{2000} - \frac{6{,}890}{2020}\right)$$

= 2020 (3.4 – 3.410) or Rs. 22 (A)

(v) Materials cost variance = (Actual cost – Standard cost)

= Rs. 6,513.75 – 6,800

= Rs. 286.25 (F)

Example 19.6

A company is manufacturing a chemical product making use of 4 different types of raw materials as follows:

Raw material	Share of total input (%)	Cost of raw materials (Rs./kg)
A	40	50
B	30	80
C	20	90
D	10	100

There is an inevitable normal loss of 10% during the processing.

For April 2007, the management furnished the following information:

Raw material consumed	Quantity Consumed (kg.)	Cost of material (Rs./kg)
A	42000	48
B	31000	80
C	18000	92
D	9000	110

Output obtained for the month was 92000 kg.

Calculate:

(a) Material cost variance,
(b) Material price variance,
(c) Material mix variance,
(d) Material yield variance,
(e) Material usage variance. *(ICWA, Inter, Stage 1, June 2007)*

Solution:

Standard cost of the Finished product is worked out as follows:

Input	Quantity (kg)	Standard Price/kg (Rs.)	Standard Cost (Rs.)
A	40	50	2,000
B	30	80	2,400
C	20	90	1,800
D	10	100	1,000
	100	7,200	7,200
Processing loss	10	–	–
Output	90		7,200
Standard Cost per Unit (7200 ÷ 90)			Rs. 80

Computation of variances:

(a) *Material cost variance* = Standard Cost of actual Finished Output – Actual cost of Output

$$= 92000 \times 80 - \begin{bmatrix} A = 42000 \times 48 = 20,16,000 \\ B = 31000 \times 80 = 24,80,000 \\ C = 18000 \times 92 = 16,56,000 \\ D = 9000 \times 110 = 9,90,000 \end{bmatrix}$$

71,42,000

= 73,60,000 – 71,42,000 = Rs. 2,18,000 (F)

(b) *Material price variance* = (Standard Price – Actual Price) Actual Quantity Consumed

A = (50 – 48) 42,000 = Rs. 84,000 (F)
B = (80 – 80) 31,000 = –
C = (90 – 92) 18,000 = Rs. 36,000 (A)
D = (100 – 110) 9,000 = Rs. 90,000 (A)
Rs. 42,000 (A)

(c) *Material mix variance* = (Actual input in standard proportion – Actual input) × Standard price

A = (40,000 – 42,000) Rs. 50 = Rs. 1,00,000 (A)
B = (30,000 – 31,000) Rs. 80 = Rs. 80,000 (A)
C = (20,000 – 18,000) Rs. 90 = Rs. 1,80,000 (F)
D = (10,000 – 9,000) Rs. 100 = Rs. 1,00,000 (F)
Rs. 1,00,000 (F)

(d) *Material yield variance* = (Standard yield of Actual input – Actual yield) × Standard Rate of Finished Product

= (1,00,000 × 90 – 92,000) × Rs. 80
= Rs. 1,60,000 (F)

(e) *Material usage variance* =Standard Cost of Actual Finished Output – Stand Cost (input) of Actual Input.

$$\text{Rs. } 73,60,000 - \begin{Bmatrix} A = 42000 \times 50 = 21,00,000 \\ B = 31000 \times 80 = 24,80,000 \\ C = 18000 \times 90 = 16,20,000 \\ D = 9000 \times 100 = \ 9,00,000 \end{Bmatrix}$$

$$= 73,60,000 - 71,00,000$$

$$= \text{Rs. } 2,60,000 \text{ (F)}$$

(i) Check: Material usage variance = (Mix Variance + Yield Variance)
= (1,00,000 (F) + 1,60,000 (F)) = Rs. 2,60,000 (F)

(ii) Material cost variance = Material price variance + Material usage variance
2,18,000 (F) = 42,000 (A) + 2,60,000 (F)

Example 19.7

In a manufacturing process the following standards apply:
Standard prices : Raw material A Rs. 10 per kg., B Rs. 50 per kg.
Standard mix : 75% A and 25% B (by weight)
Standard output (weight of product as a percentage of weight of raw material) – 90%
In a particular period actual costs, usages and output were as follows:
4400 kg of A costing Rs. 46,500
1600 kg of B costing Rs. 78,500
Output 5670 kg of product.
The budgeted output for the period was 7200 kg.
Compute the material cost variances. *(ICWA, Stage 2, June 2005)*

Solution:

Standard yield from 6000 kg (4400 kg + 1600 kg) of input is

			Rs.
Material A (75%)	4500 kg @ Rs. 10	=	45,000
Material B (25%)	1500 kg @ Rs. 50	=	75,000
	6000 kg		1,20,000
Less:			
Normal loss @ 10%	600 kg		
Std. Output	5400 kg		

Std. Cost of actual output of 5670 kg = $\frac{1,20,000}{5400} \times 5670$

= Rs. 1,26,000

Actual cost of actual output of 5670 kg

			Rs.
	4400 kg × Rs. 10.568	=	46,500
	1600 kg × Rs. 49.063	=	78,500
	6000 kg		1,25,000
Less actual loss	330 kg		
Actual output	5670 kg		

(i) Material cost variance = 1,26,000 – 1,25,000 = Rs. 1000 (F)

(ii) Material price variance:

A (10 – 10.568) × 4400	= 2,499.20 (A)
B (50 – 49.063) × 1600	= 1,499.20 (F)
	1,000.0 (A)

(iii) Material usage variance:

		Rs.
A	$\left(\frac{4500}{5400} \times 5670 - 4400\right) \times 10$	= 3250 (F)
B	$\left(\frac{1500}{5400} \times 5670 - 1600\right) \times 50$	= 1250 (A) / 2000 (F)

(iv) Material Mix variance:

A (4500 – 4400) × 10	= 1000 (F)
B (1500 – 1600) × 50	= 5000 (A)
	4000 (A)

(v) Yield variance = (5400 – 5670) $\times \frac{1200000}{5400}$ = 6000 (F)

Example 19.8

A factory manufactures a chemical product with three ingredient chemicals A, B and C as per standard data given below:

Chemical	*Percentage of total input*	*Standard Cost per kg. (Rs.)*
A	50%	40
B	30%	60
C	20%	95

There is a process loss of 5% during the course of manufacure.

The Management gives the following details for a certain week:

Chemical Consumed	Quantity purchased and issued	Actual Cost (Rs.)
A	5200 kg.	2,34,000
B	3600 kg.	2,19,600
C	1700 kg.	1,58,100

Output of finished product: 10200 kg.

Calculate all the relevant variances. *(ICWA, Inter, Stage 1, Dec. 2005)*

Solution:

Standard Cost of a Chemical Product

Chemical	*Percentage of Input*	*Quantity (kg)*	*Standard cost per kg (Rs.)*	*Total cost Rs.*
A	50%	0.50	40	20
B	30%	0.30	60	18
C	20%	0.20	95	19

(Contd.)

Total input	1.00	57
Less: Loss on processing (5%)	0.05	57
Output	0.95	

Standard Cost of a chemical product = $\frac{\text{Rs. } 57}{0.95}$ = Rs. 60

Computation of variances:

(1) *Total Material Cost Variances:*
Standard cost of actual production (output) – Actual material cost for production
= 10200 × Rs. 60 – Rs. (234000 + 219600 + 158100)
= Rs. 612000 – Rs. 611700 = Rs. 300 (FAV).

(2) *Material Price Variance:*
(Std. Price – Actual Price) × Actual qty. consumed.

A: [40 – (234000 / 5200)] × 5200	Rs. 26,000 (A)
B: [60 – (219600 / 3600)] × 3600	Rs. 3,600 (A)
C: [95 – (158100 / 1700)] × 1700	Rs. 3,400 (F)
	Rs. 26,200 (A)

(3) *Material Mix Variance:*
= (Actual input in std. proportion – Actual input) × Std. Cost of input/kg.

A: (0.50 × 10500 – 5200) × Rs. 40	Rs. 2,000 (F)
B: (0.30 × 10500 – 3600) × Rs. 60	Rs. 27,000 (A)
C: (0.20 × 10500 – 1700) × Rs. 95	Rs. 38,000 (F)
	Rs. 13,000 (F)

(4) *Yield Variance*
(Std. yield from actual input – Actual Output) × Std. cost of finished product
= (10,500 × 0.95 – 10,200) × Rs. 60 = Rs. 13,500 (F)

(5) *Usage Variance:*
Std. cost (output) of Actual output – Std cost of Actual Qty Consumed.
= 10,200 × Rs. 60 – $\begin{bmatrix} 5{,}200 \times \text{Rs. } 40 \\ 3{,}600 \times \text{Rs. } 60 \\ 1{,}700 \times \text{Rs. } 95 \end{bmatrix}$ = Rs.6,12,000 – Rs. 5,85,500
= Rs. 26,500 (F)
Usage Variance: Mix Variance + Yield Variance
= Rs. 13,000 (FAV) + Rs. 13,500 (FAV) = Rs. 26,500 (F)
Total Material Cost Variance:
Material Price Variance + Material Usage Variance
= Rs. 26,200 (ADV) + Rs. 26,500 (F)
= Rs. 300 (F)

Example 19.9

A product is manufactured by mixing and processing three raw materials X, Y and Z as per standard data given below:

Raw material	*Percentage of input*	*Cost per (kg)*
X	40%	Rs. 40
Y	40%	Rs. 60
Z	20%	Rs. 85

Loss during processing is 5% of input and this has no realisable value. During a certain period 580,000 kg of finished product was obtained from inputs as per details given below:

Raw material	*Quantity consumed*	*Cost/kg*
X	240000 kg	Rs. 38
Y	250000 kg	Rs. 59
Z	110000 kg	Rs. 88

Calculate the total material cost variance with details of sub-variances relating to Price, Mix Yield and Usage. *(ICWA, Inter, Stage 1, Dec. 2004)*

Solution:

Standard Cost of the Finished Product

Raw material	*Percentage of Input*	*Quantity (kg)*	*Cost per kg. (Rs.)*	*Total (Rs.)*
X	40%	40	40	1,600
Y	40%	40	60	2,400
Z	20%	20	85	1,700
	Total input	100		5,700
	Less: Loss in processing	5		
	Output	95		5,700

$$\text{Standard cost per kg } \frac{5,700}{95} = \text{Rs. } 60$$

Computation of Variances

(i) *Total material cost variance:*

= standard cost of actual product – Actual material cost for production

$$= 5,80,000 \times \text{Rs. } 60 - \begin{bmatrix} 2,40,000 \times \text{Rs. } 38 \\ 2,50,000 \times \text{Rs. } 59 \\ 1,10,000 \times \text{Rs. } 88 \end{bmatrix}$$

= 3,48,00,000 – 3,35,50,000

= Rs. 12,50,000 (F)

(ii) *Material Price Variance:* (Std Price – Actual Price) × Actual Qty consumed

X: (40 – 38) × 24000 = 4,80,000 (F)

Y: (60 – 59) × 250000 = 2,50,000 (F)

Z: (85 – 88) × 110000 = 3,30,000 (A)

4,00,000 (F)

(iii) *Material Mix Variance:* (Input in Std proportion – Actual input) × Std Cost of input/kg

X (240000 – 240000) × Rs. 40 = Nil

Y (240000 – 250000) × Rs. 60 = Rs. 600000 (ADV)

Z (120000 – 110000) × Rs. 85 = Rs. 850000 (FAV)

600000 600000 Rs. 250000 (FAV)

(iv) *Yield variance:* = (Std yield from actual input – Actual input) × Std Cost of finished product

$$= \left(600000 \times \frac{95}{100} - 580000\right) \times \text{Rs. } 60$$

= 10000 × Rs. 60 = Rs. 6,00,000

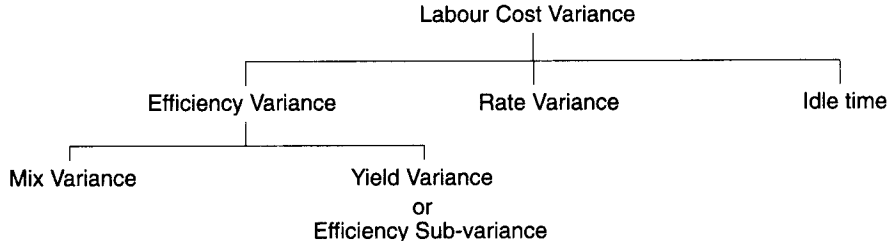
(v) Usage Variance: Standard cost (Output) of Actual production/(Output) – Standard Cost of Actual quantity Consumed

580000 × 60 – X : 2,40,000 × 40
Y : 2,50,000 × 60
Z : 1,10,000 × 85
= Rs. 3,48,00,000 – Rs. 3,39,50,000 = Rs. 8,50,000 (FAV)

Mix Variance + Yield Variance
Rs. 2,50,000 (FAV) + Rs. 6,00,000 (FAV)
= Rs. 8,50,000 (FAV)

LABOUR VARIANCES

Direct labour variances arise when actual labour costs are different from standard labour costs. Labour variances constitute the following:



Labour Cost Variance

Labour cost variance denotes the difference between the actual direct wages paid and the standard direct wages specified for the output achieved. This variance is calculated by using the following formula:

Labour cost variance = (AH × AR – SH × SR)

where AH = Actual hours

AR = Actual rate

SH = Standard hours

SR = Standard rate

Labour Efficiency Variance

The calculation of labour efficiency or usage variance follows the same pattern as the computation of materials usage variance. If actual direct labour hours required to complete a job differ from the number of standard hours specified, a labour efficiency variance results; it is the difference between actual hours expended and standard labour hours specified multiplied by the standard labour rate per hour. The formula is:

Labour efficiency variance = (Actual hours – Standard hours for the actual output) × Std. rate per hour.

It may be noted that the standard labour hour rate and not the actual rate is used in computing labour efficiency variance. If quantity variances are calculated, changes in prices/rates are excluded, and when price variances are calculated, standard quantities are ignored.

Labour Rate Variance

Labour rate variance is computed in the same manner as materials price variance. When actual direct labour hour rates differ from standard rates, the result is a labour rate variance. It is that portion of the direct wages variance which is due to the difference between the actual rate paid and standard rate of pay specified. The formula for its calculation is:

Labour rate variance = (Actual rate – Standard rate) × Actual hours

Favourable rate variance arise whenever actual rates are less than standard rates; unfavourable variances occur when actual rates exceed standard rates.

Labour Mix Variance

Labour mix variance is computed in the same manner as materials mix variance. Manufacturing or completing a job requires different types or grades of workers and production will be completed if labour is mixed according to standard proportions. Standard labour mix may not be adhered to under some circumstances and substitution will have to be made. There may be changes in the wage rates of some workers; there may be a need to use more skilled or expensive types of labour, for example, employment of men instead of women; sometimes workers and operators maybe absent. These lead to the emergence of a labour mix variance which is calculated by using the following formula:

Labour mix variance = (Actual labour mix—Revised standard labour mix in terms of actual total hours) × Standard rate per hour

To take an example, suppose the following were the standard labour cost data per unit in a factory:

Class	*Proportion*			*Cost*
	%			*Rs.*
A	50	3 hours @	Rs. 4.00	12
B	50	3 hours @	Rs. 2.00	6
	100	6 hours	Rs 3.00	18

In a period, many class B workers were absent and it was necessary to substitute class B workers. Since the class A workers were less experienced with the job, more labour hours were used. The recorded costs of a unit were:

Class	*Proportions*		*Cost*	
	%		*Rs.*	
A	75	6 hours @	Rs. 4.00	24.00
B	25	2 hours @	Rs. 2.00	4.00
	100	8 hours	Rs 3.50	28.00

Labour mix variance will be calculated as follows:

Labour mix variance = (Actual proportion – Revised standard proportion of actual total hours) × Standard rate per hour

Revised standard proportion:

$$\text{Class A} = \frac{3}{6} \times 8 = 4 \text{ hours}$$

$$\text{Class B} = \frac{3}{6} \times 8 = 4 \text{ hours}$$

Applying the formula:

Class A = (6 – 4) × Rs. 4 = 8 (Unfavourable)

Class B = (2 – 4) × Rs. 2 = 4 (Favourable)

Total labour mix variance = Rs. 4 (Unfavourable)

Labour Yield Variance

The final product cost contains not only material cost but also labour cost. Therefore, higher or lower output than the standard output should take into account labour yield variance also. A lower output simply means that final output does not correspond with the production units that should have been produced from the hours expended on the inputs. It can be computed by applying the following formula:

Labour yield variance = (Actual output – Standard output based on actual hours) × Average standard labour rate per unit of output

or

Labour yield variance = (Actual loss – Standard loss on actual hours) × Average standard labour rate per unit of output

Labour yield variance is also known as labour efficiency sub-variance which is computed in terms of inputs, i.e. standard labour hours and revised labour hours mix (in terms of actual hours). Labour efficiency sub-variance is computed by using the following formula:

Labour efficiency sub-variance = (Revised standard mix – Standard mix) × Standard labour rate

Substitution Variance This type of variance arises in the case of labour, due to the substitution of labour, that is when one grade of labour is substituted by another. This variance in fact represents the difference between the actual hours at standard rate of standard worker and the actual hours at standard rate of actual worker.

The formula for computation is:

Substitution variance = (Standard hours × Standard rate for standard worker) – (Standard hours × Standard rate of actual worker)

Idle Time Variance

Idle time variance occurs when workers are not able to do the work due to some reason during the hours for which they are paid. Idle time can be divided according to causes responsible for creating idle time, for example, idle time due to breakdown, lack of materials or power failures. Idle time variance will be equivalent to the standard labour cost of the hours during which no work has been done, but for which workers have been paid for unproductive time. Suppose, in a factory 2000 workers were idle because of a power failure. As a result of this a loss of production of 4000 units of product A and 8000 units of product B occurred. Each employee was paid his normal wage (a rate of Rs. 20 per hour). A single standard hour is needed to manufacture four units of product A and eight units of product B. Idle time variance will be computed in the following manner:

Standard hours lost:

$$\text{Product A} = \frac{4000}{4} = 1000 \text{ hr}$$

$$\text{Product B} = \frac{8000}{8} = 1000 \text{ hr}$$

Total hours lost = 2000 hr

Idle time variance (power failure)

2000 hours @ Rs. 20 per hour = Rs. 40,000 (Adverse)

Example 19.10

Calculate labour variances from the following information:

Actual hours	5,800
Actual direct wages	Rs. 1,800
Standard rate per hour	Re. 0.35
Standard hours	6,000

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

Solution:

Actual Rate (AR)	=	Rs. 1,800 / 5800	=	Re. 0.3103448	
Total standard wage	=	6000 × 0.35	=	Rs. 2,100	
Labour cost variances	=	Std. Wage – Actual Wage	=	2100 – 1800	= Rs. 300 (F)
Labour rate variance	=	AH (SR – AR)	=	5800 (0.35 – 0.3103448)	= Rs. 230 (F)
Labour efficiency variance	=	SR (SH – AH)	=	0.35 (6000 – 5800)	= Rs. 70 (F)
Labour cost variance	=	LRV + LEV	=	230(F) + 70(F)	= Rs. 300 (F)

Example 19.11

Standard labour cost of producing 40 units of a product is 30 hours work by skilled workers at a standard rate of Rs. 60 per hour and 90 hours work by unskilled workers at the standard rate of Rs. 20 per hour. 40 units of the product were produced for which skilled workers were paid for 20 hours at Rs. 55 per hour and unskilled workers were paid for 130 hours at Rs. 24 per hour. Due to a machine break-down both skilled and unskilled workers lost 9 hours each. They were paid even for this time.

Calculate:

(i) Labour cost variance
(ii) Labour rate variance
(iii) Labour efficiency variance unadjusted
(iv) Labour mix variance
(v) Labour yield variance
(vi) Idle time variance

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

Solution:

Standard Labour Cost of 40 Units of Product				*Actual labour Cost of 40 Units of Product*					
	SH	SR	SH × SR		AH Paid for	Idle Hours	AH Worked	AR Rs.	AH Paid × AR Rs.
Skilled	30	60	1,800	Skilled	20	9	11	55	1,100
Unskilled	90	20	1,800	Unskilled	130	9	121	24	3,120
	120		Rs. 3,600		150	18	132		4,220

(i) *Labour Cost Variance* = Standard Labour Cost – Actual Total Labour Cost
= (SH × SR) – (AH Paid × AR) = Rs. 3,600 – Rs. 4,220 = Rs. 620 (A)

Idle Time Variance	= Idle Hours × SR	
Skilled	= 9 × 60	= Rs. 540 (A)
Unskilled	= 9 × 20	= Rs. 180 (A)
Idle Time Variance		= Rs. 720 (A)

(ii) *Labour Rate Var (LRV)* = [(AH Paid (SR – AR)]

Skilled	= 20 (60 – 55)	= Rs. 100 (F)
Unskilled	= 130 (20 – 24)	= Rs. 520 (A)
Labour Rate Variance		= Rs. 420 (A)

Note: Labour Rate Variance is calculated with reference to actual time for which payment has been made including idle time paid for.

(iii) *Total Labour Efficiency Var.* (including impact of idle time) = [SR (SH – AH paid for)]

Skilled	= 60 (30 – 20)	= Rs. 600 (F)
Unskilled	= 20 (90 – 130)	= Rs. 800 (A)
Total LEV (including Idle Time)		= Rs. 200 (A)

For true measure of labour efficiency it is desirable that the impact of idle time (which is due to abnormal factors) is excluded and only Actual Hours worked are taken for calculating Labour Efficiency Variance.

Labour Efficiency Variance = [SR (SH – AH worked)]

Excluding idle time

Skilled	= 60 (30 – 11)	= Rs. 1,140 (F)
Unskilled	= 20 (90 – 121)	= Rs. 620 (A)
LEV (Excl. Idle Time)		= Rs. 520 (F)

Lab. Mix Var. (LMV) = SR AH worked in standard proportion – AH worked

AH Worked in standard proportion:

Skilled	= 132 × 30/120	= 33
Unskilled	= 132 × 90/120	= 99
LMV Skilled	= 60 (33 – 11)	= Rs. 1,320 (F)
Unskilled	= 20 (99 – 121)	= Rs. 440 (A)
Labour Mix Variance		= Rs. 880 (F)

$$\textit{Labour Yield Variance (LYV)} = \textit{Standard Labour Cost per unit of output} \left(\begin{matrix}\textit{Expected total output} \\ \textit{from total hrs worked}\end{matrix} - \textit{Actual output}\right)$$

$$= \frac{(SH \times SR)}{\text{Output}} \text{ that is } \frac{\text{Rs. } 3{,}600}{40 \text{ units}} \left(\frac{40 \text{ units}}{120 \text{ hrs}} \times 132 \text{ hrs.} - 40 \text{ units}\right)$$

= Rs. 90 (44 units – 40 units) = Rs. 360 (A)

Example 19.12

The standard labour cost for producing 200 metres of cloth was predetermined as 20 skilled labour hours @ Rs. 15 per hour and 30 unskilled labour hours @ Rs. 10 per hour. 300 metres of cloth was produced with the help of 30 skilled labour hours paid @ Rs. 17 per hour and 30 unskilled labour hours paid @ Rs. 12 per hour. Calculate:

(i) Labour mix variance and

(ii) Labour yield variance.

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

Solution:

Labours Mix Variance:

$$A = \left(\frac{30}{75} \times 60 - 30\right) 15 = 90 \text{ (A)}$$

$$B = \left(\frac{45}{75} \times 60 - 30\right) 10 = 60 \text{ (F)}$$

Rs. 30 (A)

Labour yield variance

$$A = \left(\frac{300}{75} \times 60 - 300\right) \frac{900}{300} = \text{Rs. } 180 \text{ (F)}$$

Example 19.13

The standard cost on 'Material' and 'Labour' for the making of a unit of a certain product is estimated a under –

Material 80 kg at Rs. 1.50 per kg.
Labour 18 hrs. at Rs. 1.25 per hr.

On completion of the production of a unit, it was found that 75 kg of material costing Rs. 1.75 per kg ha been consumed and that the time taken was 16 hours, the wage rate being Rs. 1.50 per hour.

You are required to analyse material and labour variances. *(B.Com.(Hons), Delhi, 200*

Solution:

Material Cost Variance:
St. Cost of Material – Actual Cost of Material
80 kg × Rs. 1.50 – 75 kg × Rs. 1.75
= Rs. 120 – Rs. 131.25 = Rs. 11.25 Adverse
Material cost variance is analyzed as follows:

(a) Material Price Variance:
Actual usage (St. Price – Actual Price)
75 kg (Rs. 1.50 – Rs. 1.75) = Rs. 18.75 Adverse

(b) Material Usage Variance:
St. Price (St. usage – Actual Usage)
Rs. 1.50 (80 kg – 75 kg) = Rs. 7.50 Favourable

Labour Cost Variance:
St. cost of labour – Actual cost of labour
18 hrs × Rs. 1.25 – 16 hrs × Rs. 1.50
= Rs. 22.50 – Rs. 24 = Rs. 1.50 (A)
Labour cost variance is analyzed as follows:

(a) Labour Rate Variance:
Actual Time (St. Rate – Actual Rate)
16 hrs (Rs. 1.25 – Rs. 1.50) = Rs. 4(A)

(b) Labour Efficiency Variance:
St. Rate (St. Time – Actual Time)
Rs. 1.25 (18 hrs – 16 hrs) = Rs. 2.50 (F)

Example 19.14

The following standard and actual data in respect of Chemical X is made available to you from the records of Naulakha Chemicals Ltd.

Standard Data:		*Total*
Materials:	*Rs.*	*Rs.*
450 kg of material A @ Rs. 20 per kg	9,000	
360 kg of material B @ Rs. 10 per kg	3,600	12,600
810		
Labour: @ per hour	Rs.	
2400 skilled hours Rs. 2		4,800
1200 unskilled hours Re. 1		1,200
90 kg Normal loss	–	–
720 kg		18,600
Actual Data:		Total
Materials:	Rs.	Rs.
450 kg of material A @ Rs. 19 per kg	8,550	
360 kg of material B @ Rs. 11 per kg	3,960	12,510
810		
Labour: @ per hour		
2,400 skilled hours Rs. 2.25		5,400
1,200 unskilled hours Rs. 1.25		1,500
50 kg Actual loss		19,410
760		

You are required to compute:

(a) Material cost variance;
(b) Material price variance;
(c) Material yield variance;
(d) Labour cost variance;
(e) Labour rate variance;
(f) Labour yield variance. *(B.Com.(Hons), Delhi 2002)*

Solution

(a) Material Cost Variance:

$$(RSQ \times SP) - (AQ \times AP)$$

RSQ of Material A $= \frac{760}{720} \times 450 = 475$ kg

RSQ of Material B $= \frac{760}{720} \times 360 = 380$ kg

Material A $= (475 \times 20) - (450 \times 19)$
$= 9{,}500 - 8{,}550 = 950$ (F)

Materials B $= (380 \times 10) - (360 \times 11)$
$= 3{,}800 - 3{,}960 = \frac{160\ (A)}{790\ (F)}$

(b) Material Price Variance:

(SP – AP) AQ	Rs.
Material A = (20 – 19) × 450 kg.	450 (F)
Material B = (10 – 11) × 360 kg.	360 (A)
Total	90 (F)

(c) Material Yield Variance:

Std. Price (Std. loss – Actual loss)

$$\text{Rs. } \frac{12,600}{720} (90 \text{ kg} - 50 \text{ kg})$$

$$= \frac{12,600}{720} \times 40 = \text{Rs. } 700 \text{ (F)}$$

(d) Labour Cost Variance:

(SH × SR) – (AH × AR)

Skilled (2,400 × 2) – (2,400 × 2.25)

4.800 – 5.400 = Rs. 600 (A)

Unskilled = (1,200 × 1) – (1,200 × 1.25)

1,200 – 1,500 = Rs. 300 (A)

Total 900 (A)

(e) Rate Variance:

(SR – AR) AH

Skilled (Rs. 2 – Rs. 2.25) × 2,400 = Rs. 600 (A)

Unskilled (Rs. 1 – Rs. 1.25) × 1,200 = Rs. 300 (A)

Total 900 (A)

(f) Labour Yield Variance – NIL

Example 19.15

The standard output of production 'EXE' is 25 units per hour in manufacturing department of a company employing 100 workers. The standard wage rate per labour hour is Rs. 6.

In a 42 hour week, the department produced 1040 units of 'EXE' despite 5% of the time paid was lost due to an abnormal reason. The hourly wage rate actually paid were Rs 6.20, Rs 6 and Rs 5.70 respectively to 10, 30 and 60 of the workers.

Compute relevant variances. *(CA Inter, May 1997)*

Solution:

Basic Calculations

1. *Standard man hours per unit:*
   25 units is the standard output when 100 workers work for 1 hour. Hence, standard man hours per unit are 100/25 = 4.

2. Standard Output: 1,040 units			*Actual Output: 1,040 units*				
Man hours for actual output	*Rate per hr.*	*Amount* Rs.	*Actual hours paid* for Rs.	*Idle time hrs.*	*Prod. hrs.*	*Rate per hour* Rs.	*Amount paid for production* Rs.
4,160	6	24,960	420	21	399	6.20	2,604
(1,040 units × 4 hrs.)			1,260	63	1,197	6.00	7,560
			2,520	126	2,394	5.70	14,364
		24,960	4,200	210	3,990		24,528

Computations of Variances

Labour Cost Variance:

= Standard Labour Cost – Actual Labour Cost

= Rs. 24,960 – Rs. 24,528 = Rs. 432 (F)

Labour Rate Variance:

= Actual Time paid for × (Standard Rate – Actual Rate)

(i)	410 × (6 – 6.20)	=	84 (A)
(ii)	1,260 × (6 – 6)	=	—
(iii)	2,520 × (6 – 5.70)	=	756 (F)
			672 (F)

Labour Efficiency Variance (after segregating Idle Time Variance);

= Standard Rate × (Standard Time for actual output – Actual Time worked)

= Rs. 6 × (4,160 hrs. – 3,990 hrs.) = Rs. 1,020 (F)

Labour Idle Time Variance:

= Idle Time hrs. × Standard Rate

= 210 hrs. × Rs. 6 = Rs. 1,260 (A)

Example 19.16

From the following records of Apollo Bolt Nut Manufacturing Company, you are required to compute material and labour variances:

An input of 100 kg of material yields to standard output of 10000 units.
Standard price per kg of material = Rs. 20
Actual quantity of material issued and used by production department 10000 kg.
Actual price per kg of material = Rs. 21 per kg.
Actual output = 900,000 units
Number of employees = 200
Standard wage rate per employee per day = Rs. 40
Standard daily output per employee = 100 units
Total number of days worked = 50 days
(Idle time paid for and included in the above half day for each employee)
Actual wage rate per day = Rs. 45 *(B. Com. (Hons), Delhi 1998)*

Solution:

Direct Material Variances

DMCV = Standard Cost for Actual output – Actual Cost

= 9000 × 20 – 10000 × 21

= 1,80,000 – 2,10,000

= Rs. 30,000 (A)

Direct Material Cost Variance (DMCV) can be segregated into Direct Material Price Variance (DMPV) and Direct Material Usage Variance (DMUV) as shown below:

DMPV = Actual Quantity × (Standard Rate – Actual Rate)

= 10000 kg × (20 – 21)

= Rs. 10000 (A)

DMUV = Standard Rate × (Standard Quantity for Actual Output – Actual Quantity)

= 20 × (9000 – 10000)

= Rs. 20,000 (A)

Direct Labour Variances

DLCV= Standard Labour Cost for Actual Output – Actual Labour Cost
= 900,000 × .40 – 50 × 200 × 45
= 3,60,000 – 4,50,000
= Rs. 90,000 (A)

Direct Labour Cost Variance (DLCV) may be segregated into Direct Labour Rate Variance (DLRV), Direct Labour Idle Time Variance (DLITV) and Direct Labour Revised Efficiency Variance (DLREV).

DLRV = Actual Time paid for × (SR – AR)
= 50 × 200 × (40 – 45)
= Rs. 50,000 (A)

DLITV = Idle Hours × Std. Rate
= 25 × 200 × 40
= Rs. 2,00,000 (A)

DLREV = Standard Rate × (Std. Time for Actual Output – Actual Time Worked)
= 40 × (9,000 – 5,000)
= 40 × 4,000 = Rs. 1,60,000 (F)

Verification:

DLCV = DLRV + ITV + DLREV
Rs. 90,000 (A) = Rs. 50,000 (A) + Rs. 2,00,000 (A) + Rs. 1,60,000 (F)

Example 19.17

A building can be constructed by engaging a gang of workers as per details given below, for 100 working days of eight hours each.

Standard data:

	Skilled	Semi-skilled	Unskilled
No. of workers in the gang	6	8	6
Standard rate of wages/hr	Rs. 25	Rs. 20	Rs. 16

Actual completion of the work however took 104 days of eight hours each. This includes 16 hours of stoppages due to heavy rains. The actual number of workers engaged and the actual rates paid are given below:

	Skilled	Semi-skilled	Unskilled
Number engaged	8	6	6
Actual rate/hr.	Rs. 30	Rs. 24	Rs. 16

Calculate the following variances:

(a) Labour cost variances
(b) Labour rate variance
(c) Labour efficiency variance
(d) Labour mix variance
(e) Idle time variance *(ICWA, Inter, Stage 1, Dec. 2006)*

(i) Standard labour cost:

			Days hrs.		
Skilled workers	=	6 Nos. @ Rs. 25 for	100 × 8	=	Rs. 1,20,000
Semi skilled workers	=	8 Nos. @ Rs. 20 for	100 × 8	=	Rs. 1,28,000
Unskilled workers	=	6 Nos. @ Rs. 16 for	100 × 8	=	Rs. 76,800
					Rs. 3,24,800

Standard gang time	=	800 hours.								
Standard gang rate/hr.	=	Rs. 3,24,800 ÷ 800							=	Rs. 406/hr.

(ii) Actual labour cost:

		No.		Days		hr.day		Rate	=	Rs.
Skilled workers	=	8	×	104	×	8	×	Rs. 30	=	Rs. 1,99,680
Semi skilled workers	=	6	×	104	×	8	×	Rs. 24	=	Rs. 1,19,808
Unskilled workers	=	6	×	104	×	8	×	Rs. 16	=	Rs. 79,872
										Rs. 3,99,360

(iii) Standard labour cost for actual hours of actual gang:

			Days hrs.		
Skilled workers	=	8 Nos. @ Rs. 25 for	104 × 8	=	Rs. 1,66,400
Semi skilled workers	=	6 Nos. @ Rs. 20 for	104 × 8	=	Rs. 99,840
Unskilled workers	=	6 Nos. @ Rs. 16 for	104 × 8	=	Rs. 79,872
					Rs. 3,46,112

(iv) Standard labour cost for actual hours of standard gang:

			Days hrs.		
Skilled workers	=	6 Nos. @ Rs. 25 for	104 × 8	=	Rs. 1,24,800
Semi skilled workers	=	8 Nos. @ Rs. 20 for	104 × 8	=	Rs. 1,33,120
Unskilled workers	=	6 Nos. @ Rs. 16 for	104 × 8	=	Rs. 79,872
					Rs. 3,37,792

(v) Standard labour cost for actual hours utilised for completion of the work.

$(104 \times 8 - 16) \times$ Rs. 406 = Rs. 3,31,296

Calculation of Variances:

(a) *Labour Cost Variance:*
(Actual labour cost – Std. Cost of Actual hours utilised for completion of the Work):
(3,99,360 – 3,31,296) = Rs. 68,064 (Adv.)

(b) *Labour Rate Variance:*
(Actual labour cost – Std. L. Cost for Actual hours of Actual gang):
(3,99,360 – 3,46,112) = Rs. 53,248 (Adv.)

(c) *Labour Efficiency Variance:* (Std L. Cost of Actual hrs – Std Labour Cost of Actual hrs. utilised for Completion of the Work):
= (3,46,112 – 3,31,269) = Rs. 14,816 (Adv.)

(d) *Labour Mix Variance:* (Std L Cost of Actual hours – Std Lab. Cost of Actual hrs in Std Mix)
= (3,46,112 – 3,37,792) = Rs. 8,320 (Adv.)

(e) *Idle time Variance* = Idle time × Std Rate = 16 × 406 = Rs. 6,496 (Adv)
Alternatively: Labour Cost variance: (Labour rate variance + Labour efficiency variance)
= [53,248 (A) + 14,816 (A)]
= Rs. 68,064 (Adv.)
Labour Efficiency Variance = (L. Mix V + Idle time V.)
= [8,320 (A) + 6,496 (A)]
= Rs. 14,816 (Adv.)

Example 19.18

The following cost data are available for the year 2005:

	Budgeted		*Actual*
Fixed overhead	96,000	(yearly)	8,500 (monthly)
Working days	300	(yearly)	–
Production (units)	24,000	(yearly)	2,100 (monthly)
Working hours in a day	8		–
Idle time (hrs.)	–		4

Find out idle time variance *(ICWA, Stage 2, Dec. 2006)*

Solution:

Let FO_2 stand for Budgeted fixed overhead for one month = Rs. 96,000/12 = Rs. 8,000
Let FO_3 stand for Standard fixed overhead for hours available during the period at standard rate.

$$= \frac{\text{Fixed overhead for one month}}{\text{Budgeted hours} \times \text{Hours available in a month}}$$

$$= \frac{\text{Rs. 8,000}}{\frac{\text{Budgeted hours available in a year}}{12}} \times \text{Hours available in a year}$$

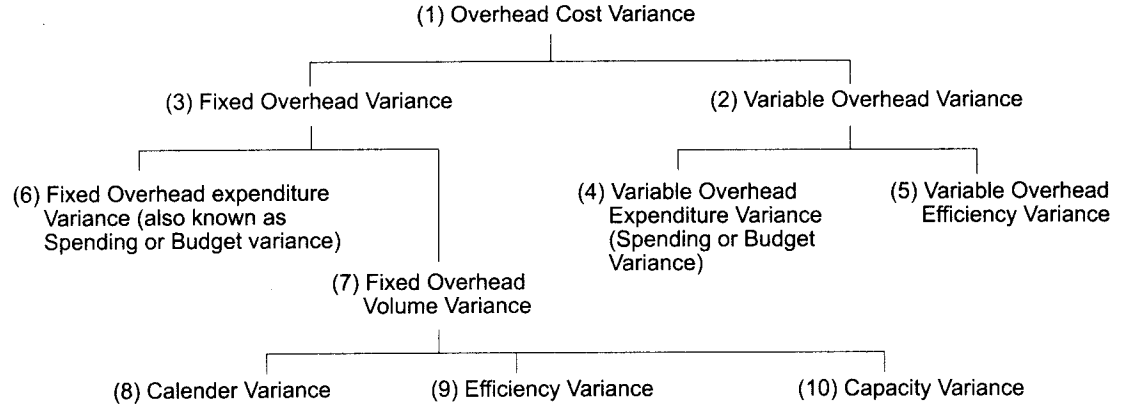
$$= \frac{\text{Rs. 8,000}}{\frac{\text{300 days} \times \text{8 hours}}{12}} \text{ (Budgeted hrs. for a month – Idle hrs)}$$

$$= \frac{\text{Rs. 8,000}}{\text{200 hrs}} \text{ (200 hrs – 4)} = \frac{\text{Rs. 8,000}}{200} \text{ 196 or Rs. 7,840}$$

Idle Time Variance = $FO_2 - FO_3$
= Rs. 8,000 – Rs. 7,840 = Rs. 160 (A)

OVERHEAD VARIANCES

The analysis of factory overhead variances is more complex than variance analysis for direct materials and direct labour. Generally, overhead variances constitute the following variances:



1. Total Overhead Cost Variance

This overall overhead variance is the difference between the actual overhead cost incurred and the standard cost of overhead for the output achieved. This can be computed by applying the following formula:

(Actual overhead incurred – Standard hours for the actual output × Standard overhead rate per hour)

or

Actual overhead incurred – (Actual output × Standard overhead rate per unit)

To illustrate the overall overhead variance, assume that the actual overhead for a department amounts to Rs. 10,00,000 for the month of January, 2002 and standard (or allowed) hours for work performed total 4500 hours, while actual hours used are 5000. If overhead rate is Rs 200 per hour, the overall overhead variance will be the following:

Actual department overhead	Rs. 10,00,000
Overhead charged to production (4500 hr × Rs. 200)	Rs. 9,00,000
Overall or net overhead variance (Unfavourable)	Rs. 1,00,000

2. Variable Overhead Variance

It is the difference between actual variable overhead cost and standard variable overhead allowed for the actual output achieved. The formula for computing this variance is as follows:

Actual overhead cost – (Actual output × Variable overhead rate per unit)

or

Actual overhead cost – (Standard hours for actual output × Standard variable overhead rate per hour)

3. Fixed Overhead Variance

This variance indicates the difference between the actual fixed overhead cost and standard fixed overhead cost allowed for the actual output. This variance is found by using the following formula.

Fixed overhead variance = Actual overhead cost – Fixed overhead absorbed

or

Actual overhead cost – (Standard hours for actual output × Standard fixed overhead rate per hour).

4. Variable Overhead Expenditure (Spending or Budget) Variance

This variance indicates the difference between actual variable overhead and budgeted variable overhead based on actual hours worked. This variance is found by using the following formula:

(Actual variable overhead – Budgeted variable overhead)

5. Variable Overhead Efficiency Variance

This variance is like labour efficiency variance and arises when actual hours worked differ from standard hours required for good units produced. The actual quantity produced and standard quantity fixed might be different because of higher or lower efficiency of workers employed in the manufacturing of goods. This variance is found by using the following formula:

(Actual hours – Standard hours for actual output) × Standard variable overhead rate per hour

6. Fixed Overhead Expenditure (Spending or Budget) Variance

This variance indicates the difference between actual fixed overhead and budgeted fixed overhead. The formula for computing this variance is as follows:

(Actual fixed overhead – Budgeted fixed overhead)

If actual fixed overhead costs are greater than budgeted fixed costs, an unfavourable variance results because actual costs exceed the budget. Actual overhead costs seldom equal budgeted costs because property tax rates may change, insurance premiums may increase or equipment charges may affect depreciation rates. As an illustration, assume that a company completed 36000 units (equal to 18000 standard productive hours) in 18500 hours at the recorded fixed cost of Rs 75,100. The standard fixed cost rate per hour is Rs 4. Therefore,

Expenditure variance = (Actual overhead costs – Budgeted overhead costs)
That is = (75,100 – 18,500 × 4)
= (75,100 – 74,000)
= Rs 1,100 (unfavourable)

The expenditure or budget variance provides management with information which helps in controlling costs. The budget variance is usually prepared on a departmental basis and the factors that cause the budget variance are, therefore, controllable by departmental managers.

7. Fixed Overhead Volume Variance

Volume variance relates to only fixed overhead. This variance arises due to the difference between the standard fixed overhead cost allowed (absorbed) for the actual output and the budgeted fixed overhead based on standard hours allowed for actual output achieved during the period. The variance shows the over- or under-absorption of fixed overheads during a particular period. If the actual output is more than the standard output, there is over-absorption and variance is favourable. If actual output is less than the standard output, the volume variance is unfavourable. The formula for computing this variance is as follows:

(Budgeted overhead applied to actual output – Budgeted fixed overhead based on standard hours allowed for actual output)

or

(Actual production – Budgeted production) × Standard fixed overhead rate per unit

Volume variance is further sub-divided into three variances.

8. Fixed Overhead Calendar Variance

It is that portion of volume variance which is due to the difference between the number of actual working days in the period to which the budget is applicable and budgeted number of days in the budget period.

If actual working days is more than the budgeted working days, the variance is favourable as work has been done on days more than budgeted or allowed and vice-versa. The formula is as follows:

(No. of actual working days – No. of budgeted working days) × Standard fixed overhead rate per day

Calendar variance can be computed based on hours or output. Then the formulae are:

Hours Basis:

Calendar variance = (Revised budget capacity hours – Budgeted hours) × Standard fixed overhead rate per hour

If revised budgeted capacity hours are more than the budgeted hours, the variance will be favourable. In the reverse situation, the variance will be unfavourable.

Output Basis

Calendar variance = (Revised budgeted quantity in terms of actual number of days worked – Budgeted quantity) × Standard fixed overhead rate per unit

If revised budgeted quantity is more than the budgeted quantity the variance is favourable; if revised budgeted quantity is less, the variance will be unfavourable.

9. Fixed Overhead Efficiency Variance

It is that portion of volume variance which arises when actual hours of production used for actual output differ from the standard hours specified for that output. If actual hours worked are less than the standard hours, the variance is favourable and when actual hours are more than the standard hours, the variance is unfavourable. The formula is:

Fixed overhead efficiency variance = (Actual hours – Standard hours for actual production) × Standard fixed overhead rate per hour

or

Fixed overhead efficiency variance = (Actual production – Standard production as per actual time available) × Standard fixed overhead rate per unit)

10. Fixed Overhead Capacity Variance

It is that part of fixed overhead volume variance which is due to the difference between the actual capacity (in hours) worked during a given period and the budgeted capacity (expressed in hours). The formula is:

Capacity variance = (Actual capacity hours – Budgeted capacity hours) × Standard fixed overhead rate per hour

This variance represents idle time also. If actual capacity hours are more than the budgeted capacity hours, the variance is favourable and if actual capacity hours are less than the budgeted capacity hours, the variance will be unfavourable.

In case actual number of days and budgeted number of days are also given, then budgeted capacity hours will be calculated in terms of actual number of days and it will be known as revised budgeted capacity hours, that is, budgeted hours for actual days worked. In this situation, the formula for calculating capacity variance will be as follows:

Capacity variance = (Actual capacity hours – Revised budgeted capacity hours) × Standard fixed overhead rate per hour

In the above formula, the variance will be favourable if actual capacity hours are more than the revised budgeted hours. However, if actual capacity hours are lesser than the revised budgeted hours, the variance will be adverse as lesser hours means that lesser actual hours have been worked taking the actual days utilised into account.

Two-way, Three-way and Four-way Variance Analysis

The above overhead variances are also classified as Two-way, Three-way and Four-way variance. The different variances under these categories are listed below. The formulae for computing these variances are similar to as explained in the preceding section.

A. Two-way Variance Analysis

1. Controllable variance (Budget variance)
2. Volume variance (Uncontrollable variance)

B. Three-way Variance Analysis

1. Expenditure variance (Spending variance)
2. Capacity variance
3. Efficiency variance

C. Four-way Variance Analysis

1. Expenditure variance (Spending variance)
2. Variable overhead efficiency variance
3. Fixed overhead efficiency variance
4. Capacity variance

Example 19.19

A company using standard costing system has the following information for the budget period:
Budgeted variable overheads = Rs. 8,00,000
Budgeted fixed overheads = Rs. 5,00,000
Overheads are recovered on the basis of standard machine hours. The company had budgeted for 100,000 machine hours for the year.
During the budge period the company used 1,10,000 machine hours while it should have used 95,000 machine hours for actual output.
Actual variable overheads Rs. 8,00,000
Actual fixed overheads Rs. 4,70,000
Calculate the following variances:

(i) Variable overhead cost variance;
(ii) Variable overhead spending variance;
(iii) Variable overhead efficiency variance;
(iv) Fixed overhead cost variance;
(v) Fixed overhead expenditure variance;
(vi) Fixed overhead volume variance;
(vii) Fixed overhead efficiency variance;
(viii) Fixed overhead capacity variance. *(B.Com.(Hons), Delhi, 2007)*

Solution:

$$\text{Budgeted fixed overheads per standard hour} = \frac{\text{Budgeted Fixed Overheads}}{\text{Budgeted Std. Hours}} = \frac{\text{Rs. 5,00,000}}{100{,}000} = \text{Rs. 5}$$

$$\text{Budgeted variable overheads per standard hour} = \frac{\text{Budgeted Variable Overheads}}{\text{Budgeted Std. Hours}} = \frac{\text{Rs. 8,00,000}}{1{,}00{,}000} = \text{Rs. 8}$$

(i) $$\text{Variable overhead cost variance} = \frac{\text{Budgeted variable overheads}}{\text{for actual output}} - \frac{\text{Actual variable overheads}}{\text{for actual output}}$$

= (Budgeted variable overheads per standard hour × Actual output in Std. hrs) – Actual variable over heads
= (8 × 95,000) – Rs. 8,00,000 = Rs. 7,60,000 – Rs. 8.00,000 = Rs. 40,000 (A)

(ii) Variable overhead spending variance = Budgeted variable overheads – Actual variable overheads
= Rs. 8,00,000 – Rs. 8,00,000 = Nil

(iii) $$\text{Variable overheads efficiency variance} = \text{Budgeted variable overheads per standard hour} \left(\text{Budgeted output in standard hours} - \text{Actual output in standard hours} \right)$$

$$= 8(1,00,000 - 95,000) = \text{Rs. } 40,000 \text{ (A)}$$

$$\text{Variable overhead cost variance} = \text{Rs. } 40,000 \text{ (A)} = \left(\text{Variable overheads spanding variance} - \text{Variable overhead efficiency variance} \right)$$

$$= \text{Nil} + \text{Rs. } 40,000 \text{ (A)} = \text{Rs. } 40,000 \text{ (A)}$$

(iv) $$\text{Fixed overheads cost variance} = \text{Budgeted fixed overheads for actual output} - \text{Actual fixed overheads for actual output}$$

= (Budgeted fixed overheads per standard hour × Actual output in standard hours) – Actual fixed overheads

= Rs. 5 × 95,000 – Rs. 4,70,000 = Rs. 4,75,000 – Rs. 4,70,000 = Rs. 5,000 (F)

(v) Fixed Overheads Expenditure Variance = Budgeted Fixed Overheads – Actual Fixed Overhead

= Rs. 5,00,000 – Rs. 4,70,000 = Rs. 30,000 (F)

(vi) $$\text{Fixed overheads volume variance} = \text{Budgeted fixed overheads per standard hour} \left(\text{Budgeted output in standard hours} - \text{Actual output in standard hours} \right)$$

$$= 5(1,00,000 - 95,000) = \text{Rs. } 25,000 \text{ (A)}$$

Fixed overhead variance = Rs. 5,000 (F) = Fixed overheads expenditure var. + Fixed overheads volume variance

= Rs. 30,000 (F) + Rs. 25,000 (A) = Rs. 5,000 (F)

(vii) $$\text{Fixed overheads efficiency variance} = \text{Budgeted fixed overheads per standard hour} \left(\text{Budgeted hours for actual output} - \text{Actual hours worked for actual output} \right)$$

$$= \text{Rs. } 5\ (95,000 - 1,10,000) = \text{Rs. } 75,000 \text{ (A)}$$

(viii) $$\text{Fixed overheads capacity variance} = \text{Budgeted fixed overheads per standard hour} \text{ (Budgeted Hours – Actual hours woked)}$$

$$= \text{Rs. } 5\ (1,00,000 - 1,10,000) = \text{Rs. } 50,000 \text{ (F)}$$

Fixed overhead volume var. = Rs. 25,000 (A) = Fixed overhead efficiency variance + Fixed overhead capacity var.

= Rs. 75,000 (A) + Rs. 50,000 (F) = Rs. 25,000 (A).

Example 19.20

Details of fixed overheads, production hours and production for a period are:

Budgeted hours	10000 hours
Standard fixed overheads per hour	Rs. 10
Standard hours per unit of output	5 hours
Actual production	1920 units
Actual fixed overheads	Rs. 94,000

Calculate:

(i) Fixed overhead cost variance;
(ii) Fixed overhead expenditure variance; and
(iii) Fixed overhead volume variance. *(B.Com.(Hons), Delhi, 2005)*

Solution:

FOCV = Std. F/O for Actual output – Actual F/O for Actual output
= 1920 × 50 – 94000 = 2000 (F)

FO. Expenditure Variance = Budgeted Exp. – Actual Exp
= 1,00,000 – 94000 = 6000 (F)

$$\text{Fixed Overhead Volume Variance} = \begin{pmatrix}\text{Budgeted}\\ \text{overhead}\end{pmatrix} - \begin{pmatrix}\text{Actual}\\ \text{overhead}\end{pmatrix} \times \text{Budgeted Rate}$$

= (2000 – 1920) 50 = 4,000 (A)

Workings:

$$\text{Budgeted output} = \frac{\text{Budgeted Hours}}{\text{Budgeted Rate}} = \frac{10000}{5} = 2000 \text{ units}$$

Budgeted Expenditure = Budgeted Hours × Std. F/O per hour.
= 10000 × Rs. 10 = Rs. 1,00,000

Budgeted Rate per unit of output.

$$\text{Rs.} = \frac{1,00,000}{2000} = \text{Rs. 50 per unit}$$

Example 19.21

A company has a normal capacity of 120 machines working hours per day of 25 days in a month. The fixed overheads are budgeted Rs. 1,44,000 per month. The standard time required to manufacture one unit of production is 4 hours.

In April 1998, the company worked 24 days of 840 machine hours and produced 5305 units of output. The actual fixed overheads are Rs. 1,42,000.

Compute:

(i) Efficiency variance;
(ii) Capacity variance;
(iii) Calendar variance; *(B.Com.(Hons), Delhi 2005)*

Solution:

(i) *Calendar Variance:*

Budgeted output for Budgeted Hours of Budgeted days — Budgeted output for Budgeted Hours of Actual Days.

$$= \left(\frac{1}{4} \times 24,000 - \frac{1}{4} \times 23,040\right) 24$$

= (6,000 – 5,760) 24 = 5,760 (A)

Workings:

Budgeted Hours for Budgeted days = (8 × 120) × 25
= 24000 Hours.
Budgeted Hours for actual days = (8 × 120) × 24
= 23040 Hours

(ii) *Capacity Variance:*

Budgeted output for Budgeted Hours of actual days − Budgeted output for actual hours of actual days

$$= \left(23,040 \times \frac{1}{4} - 20160 \times \frac{1}{4}\right)24$$

= (5760 – 5040) 24 = 17,280 (A)

(iii) *Efficiency Variance:*

Budgeted output for actual Hours for actual days − Budgeted output for actual hours of actual days

= (5040 – 5305) 24 = 6360 (F)

Example 19.22

The following information is available from the cost records of a company for December, 2003:

	Rs.
Materials purchased 20000 pieces	88,000
Materials consumed 19000 pieces	
Actual wages paid for 4950 hours	24,750
Fixed factory overheads budgeted	40,000
Fixed factory overheads incurred	44,000

Units produced – 1800
Standard rates and prices are:
Direct material rate – Rs. 4 per piece.
Standard output – 10 pieces per unit
Direct labour rate – Rs. 4 per hour
Standard hours required to produce a unit – 2.5 hours
Overheads – Rs. 8 per labour hour

Compute the following variances:

(a) Material price and usage;
(b) Labour rate and efficiency;
(c) Fixed overheads expenditure variance;
(d) Fixed overheads volume variance. *(B.Com.(Hons), Delhi 2004)*