

Cost Behavior-Analysis and Use



Different elements of costs whether they are either manufacturing or administrative or selling behave differently with changes in the volume of activity. This behavior of costs may have impacts on the managerial decisions relating to volume of activity, selection of markets, selection of products, selection of machineries etc. The unit deals with types of cost Behavior, analysis of mixed costs, and the Contribution format of Income Statement.

School of Business

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Lesson 1: Types of Cost Behavior

Learning Objectives

After completing this lesson, you are expected to be able to:

- Define costs and other relevant concepts;
- Classify costs according to their behavior or responses to changes in the volume of activities; and
- Explain various types of fixed costs.

Introduction

Although the term "Cost" is defined in previous chapters, yet it would be better if this is repeated here.

Cost: [The Penguin Dictionary of Accounting]

"The amount of cash or cash equivalents paid or the fair value of the other consideration given to acquire an asset. Also included would be subsequent costs to bring the asset into its present condition and location."

Cost: [Kohler's Dictionary for Accountants]

"An expenditure or outlay of cash, other property, capital stock, or services or the incurring of a liability therefor, identified with goods or services acquired or with any loss incurred and measured by the amount of cash paid or payable or the market value of other property, capital stock, or services rendered in exchange or in other situations, any commonly accepted basis of valuation."

Cost Behavior: [The Penguin Dictionary of Accounting]

"The effects on total costs of changes in the level of activity within a business. Certain costs are "Fixed Costs"; others are "Variable Costs" and some are in between. The behavior of total costs can be studied in break-even analysis."

Activity

"The work, or one of several lines of work, carried on within any organization or organizational subdivision."

- Examples:
- Production activity (volume);
 - Sales activity (volume)

Cost Driver

"A factor within an organization that causes costs."

Cost Classification

This refers to splitting up of costs into different categories, such as Direct Cost versus Indirect Cost; Variable Cost versus Fixed Cost.

Functional Classification of costs includes splitting up of total costs into:

- manufacturing costs,
- selling and distribution costs and
- general and administrative costs.

Types of Cost Behavior Patterns

All functional costs whether manufacturing, selling or administrative behave differently with the changes in the volume of production and sale. On the basis of these differences in behavior, costs can be classified as follows:

- (i) Variable costs;
- (ii) Fixed costs, and
- (iii) Mixed costs:
 - (a) Semi-variable costs
 - (b) Semi-fixed costs / step-costs/step variable costs.

Variable Costs: [Eric L. Kohler]

A variable cost or expense is "an operating expense or operating expenses as a class, that vary directly, sometimes proportionately, with sales or production volume, facility, utilization, or other measures of activity." These type of costs may also be termed as "True Variable costs."

Exaples: { Materials consumed }
 { Direct labour } Direct Costs

{ Power Factory supplies }
{ Depreciation on production basis } Variable Production Overhead

Sales Commission [Selling Overhead (Variable)]

Variable Costs: [The Penguin Dictionary of Accounting]

Variable costs are costs that vary in proportion to the volume of production.

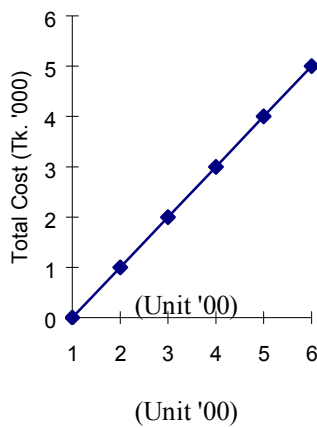
"Variable costs are costs that vary in proportion to the volume of production. Normally, raw materials and direct labor input will be variable costs. Some variable overhead costs that cannot be directly ascribed to particular units of production or processes may, nevertheless, still be variable with total production."

Example:

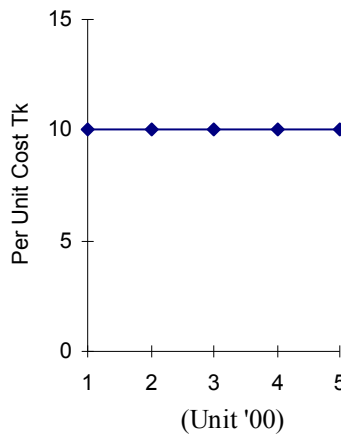
Level of Production	Total Direct Material Cost Taka	Per unit Direct Material Cost Taka
100 units	1,000	10.00
200 "	2,000	10.00
300 "	3,000	10.00
400 "	4,000	10.00
500 "	5,000	10.00

These two sets of data are shown in the following two graphs.

Graph # 1



Graph # 2



Graph # 1 shows that the total true variable costs will form a straightline starting from the zero point on the base upward. This means that total true variable cost will increase proportionately.

Graph # 2 shows that per unit true variable cost will remain constant at different levels of production and per unit true variable costs will form a straight line parallel to the base.

Fixed Costs: [The Penguin Dictionary]

“In cost accounting context, the term means those costs that do not vary with levels of output or sales in the short term.”

Example: Factory rent, staff on contract chief executives salary, interest on loan.

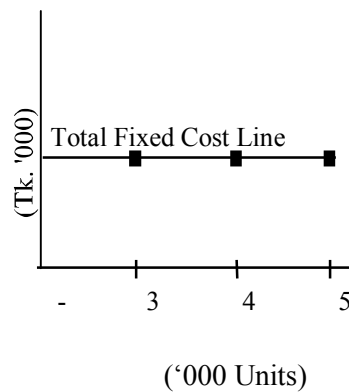
Fixed costs are considered as overheads that relate to several product lines or jobs.

Fixed costs are those costs that do not vary with levels of output or sales in the short term.

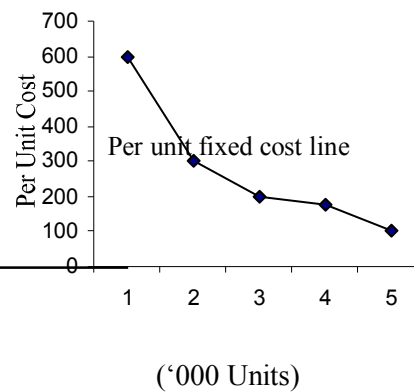
Example:

Production Level (Unit)	Production Managers Salary (Tk.'000)	Factory Rent (Tk.'000)	Supervisor's Salary (Tk.'000)	Total (Tk.'000)	Per unit Cost (Tk.)
100	25	20	15	60	600
200	25	20	15	60	300
300	25	20	15	60	200
400	25	20	15	60	150
500	25	20	15	60	100

Graph # 1



Graph # 2



Graph # 1 shows that over a short term, total fixed costs will not change and this will form a straight-line over different levels of activity. But, graph # 2 shows that the per unit fixed costs decreases in the short term as the volume of activity increases. Where the proportion of fixed costs is high in relation to variable costs management should try to increase production as much as possible to enjoy this benefit.

Types of Fixed Costs

Fixed costs are sometimes termed as capacity costs, because fixed costs are results from outlays made for buildings, equipment, skilled professional employees and other items needed to provide the basic capacity for sustained operations. Fixed costs may be either "committed" or "discretionary".

Committed fixed costs relate to the investment in facilities, equipment and the basic organization structure of the enterprise.

Committed Fixed Costs: Garrison & Noreen termed committed fixed costs as that relate to the investment in facilities, equipment and the basic organization structure of the enterprise.

Examples:

- Depreciation of building and equipment
- Taxes on real estate
- Insurance
- Salaries of top executives

Two key characteristics of committed fixed costs are (i) they are long term in nature and (ii) they can't be significantly reduced without seriously impairing the profitability or long term goal of the organization.

Discretionary Fixed Costs: Discretionary fixed costs (often referred as managed fixed costs) usually arise from annual decisions by management to spend in certain fixed cost areas.

Examples:

- Advertising Costs
- Research Costs
- Public Relation Costs
- Students Internship Program Costs
- Management Training Program Costs

Step Cost / Semi-fixed Cost / Step-variable Cost

The Penguin Dictionary of Accounting:

"A step cost (or step-function cost) is a cost that increases as volume in an organization increases but in discrete rather than continuous form. This would be caused whether particular resources come in large and indivisible units".

Eric L. Kohler:

"A cost such as semifixed cost that advances by steps with increased volume of activity."

Garrison & Noreen:

"A resource that is obtainable only in large chunk and whose costs increase or decrease only in response to fairly wide changes in activity is known as a step-variable cost."

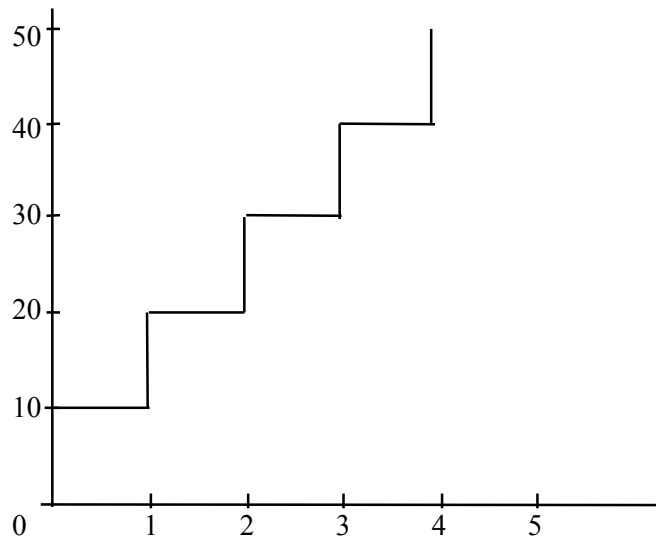
Semi fixed cost is cost that advances by steps with increased volume of activity.

Example:

Levels of Production (Units)	Number of Inspectors	Monthly Total Remuneration (Tk.)
1000	1	10,000
2000	2	20,000
3000	3	30,000
4000	4	40,000
5000	5	50,000

Production levels (Units)	Average unit cost (Taka)
500	20.00
1000	10.00
1500	13.33
2000	10.00
2500	12.00
3000	10.00
3500	11.43
4000	10.00
4500	11.11
5000	10.00

Graph : Step Cost



Semi-variable cost is "an item of cost containing both fixed and variable elements."

Mixed Costs: Mixed costs are also known as semi-variable costs. According to the Penguin Dictionary of Accounting, a semi-variable cost is "an item of cost containing both fixed and variable elements such as an organization's expense for using a utility that may contain an annual standing charge." It may also be termed as a semi-fixed cost.

Example:

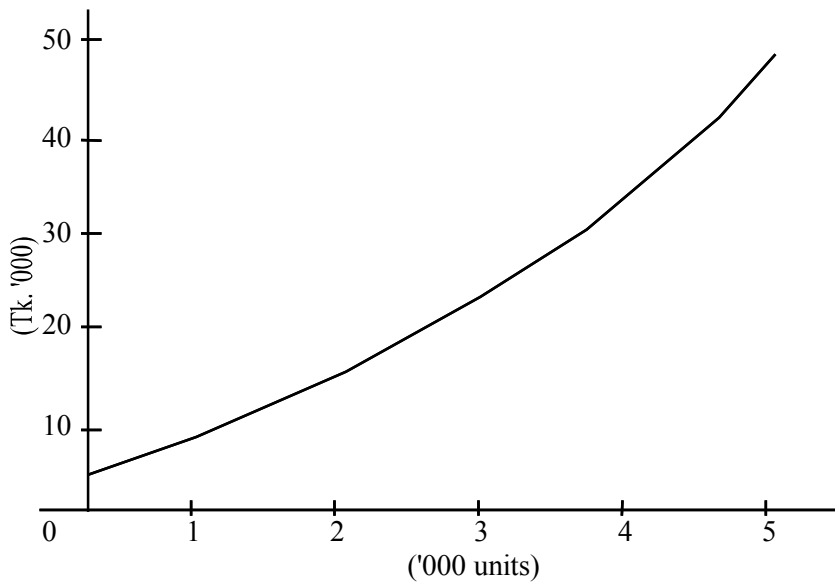
(a)

Production Volume (Units)	Total Costs (Taka)	Unit Cost (Taka)
1000	60,000.00	6.00
2000	13,000.00	6.50
3000	22,000.00	7.33
4000	33,000.00	8.25
5000	46,000.00	9.20

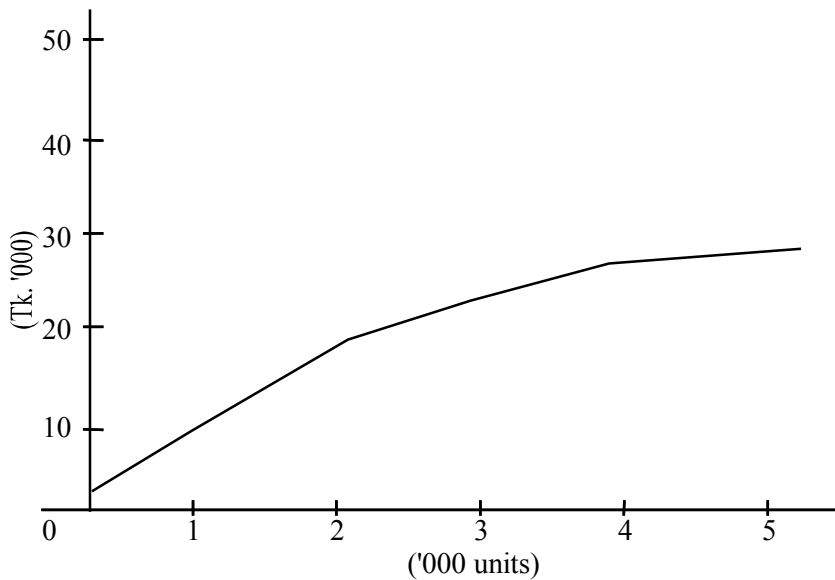
(b)

Production Volume (Units)	Total Costs (Taka)	Unit Cost (Taka)
1000	10,000.00	Tk.10.00
2000	17,000.00	8.50
3000	22,000.00	7.33
4000	25,000.00	6.25
5000	26,000.00	5.20

Graph: (Mixed Cost): Total cost increases at an increasing rate. (Convex shape)



Graph: (Mixed Costs): Total cost increases at a decreasing rate (concave shape)



Lesson 2: Analysis of Mixed Costs

Learning Objectives

After completing this lesson, you are expected to be able to:

- Explain the terms - "Mixed Costs" and "Analysis";
- Describe various methods of segregating fixed costs from variable costs including
 - Scatter Diagram
 - High-Low Method
 - Regression Method
 - Miscellaneous methods like
 - 'account analysis' and
 - 'engineering approach'

Analysis of Mixed Costs

As already mentioned, 'mixed costs' are cost items which have both fixed and variable elements. For helping management, these two components should be segregated. The process of segregation is termed as analysis.

Mixed Costs

Also known as semi-variable costs, a mixed cost is an item of cost containing both fixed and variable elements.

Analysis: [Chamber's Dictionary]

Analysis refers to separating of a thing into its elements or component parts.

Analysis: [B.N. Roy]

Analysis means breaking up a complex fact into its constituent factors. Complex facts are analysed or separated in order that we may understand which of them are essential and which merely accidental.

Analysis is a means of explanation which means that we show that a joint effect is due to several causes acting together.

Methods of Analysing Mixed Costs

The following are the methods used to separate fixed and variable parts of mixed costs:

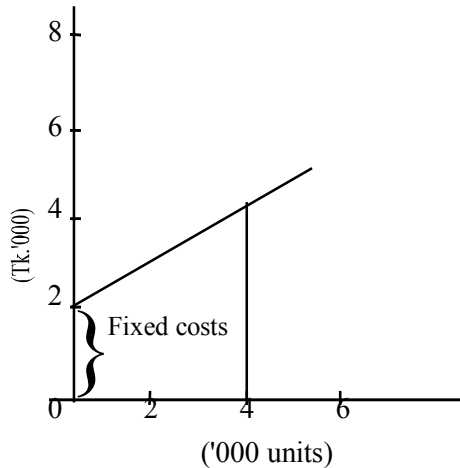
- (a) Scatter Diagram
- (b) High-Low Method
- (c) Regression Method
- (d) Miscellaneous methods: account analysis and engineering approach

Scatter Diagrams: Scatter diagrams are merely graphs showing, in two-dimensional space, the pairs of values (x_i, y_i) . This is a statistical technique of identifying the form of functional relationship between x_i , the independent variable and y_i , the dependent variable. This technique can be used to segregate mixed costs into fixed and variable components.

Example:

Levels of Production (x_i)	Total Costs (y_i)
1000 units	Tk.3,000
2000 "	4,000
3000 "	5,000
4000 "	6,000
5000 "	7,000

Graph: Scatter Diagram



From the diagram:

Fixed Costs: Tk.2,000

$$\begin{aligned} \text{Variable Cost Rate} &= \frac{\text{Tk.10,000}}{10,000 \text{ Units}} \\ &= \text{Tk.1 per unit} \end{aligned}$$

$$\text{Slope / rate} = \frac{\text{Perpendicular}}{\text{Base}}$$

Cost function:

$$y = 2,000 + 1x$$

Where, y = Total Costs

x = Units of production

Tk.2000 = Fixed Costs

The scatter diagram shows a perfectly positive relationship between volume of production and total costs.

High-Low Method: If a scatter diagram confirms that the relationship is approximately linear, attempts must be made to segregate fixed and variable costs. This can be done by using the "high-low method".

Example:

<u>Production level</u>	<u>Maintenance Costs</u>
2,000 units	Tk.13,000.00
5,000 "	28,000.00
6,000 "	35,000.00
4,000 "	25,000.00
8,000 "	40,000.00
10,000 "	45,000.00

In the above example,

Lowest point : 2,000 units Cost : Tk.13,000.00
Highest point : 10,000 " 45,000.00

Variable cost Tk.45,000-Tk.13,000 Tk.32,000
per unit : $\frac{\text{Tk.45,000-Tk.13,000}}{10,000 - 2,000}$ = $\frac{\text{Tk.32,000}}{8,000}$ = Tk.4 / unit

Fixed Cost : Tk.13,000 - (Tk.4×2,000) = Tk.5,000

Cost Function:

$$\text{Total costs } y = \text{Tk.5,000} + \text{Tk.4}x$$

The High-Low method is based on the rise-over-run formula for the slope of a straight-line.

$$\text{Variable cost} = \text{Slope of the line} = \frac{\text{Rise}}{\text{Run}} = \frac{y_2 - y_1}{x_2 - x_1}$$

This method has a limitation that it considers only two points in the cost data which are not enough to produce accurate result. At the time of using the method one should be aware of its limitations.

The Least Square Regression Method: The High-Low method of separating fixed and variable costs in mixed cost is limited for its consideration of two points instead of all data. The least square regression is a method of separating a mixed cost into its fixed and variable components that uses all of the data.

A regression line of the form $y = a + bx$ is fitted to the data, where a represents the total fixed cost and 'b' represents the variable cost per unit of the activity.

Calculation of 'a' and 'b'

In a regression analysis, two unknown a & b can be found using the normal equations:

$$\Sigma y = na + b \Sigma x$$
$$\Sigma xy = a \Sigma x + b \Sigma x^2$$

Now,

$$b = \frac{\Sigma xy}{\Sigma x^2} \quad \text{Where, } x = x - \bar{x}$$

$$y = y - \bar{y}$$
$$x^2 = (x - \bar{x})^2$$

$$a = \bar{y} - b(\bar{x})$$

Example:

Calculation of variation and covariation

x	$x - \bar{x}$	$(x - \bar{x})^2$	y	$y - \bar{y}$	$(y - \bar{y})^2$	$(x - \bar{x})(y - \bar{y})$
7	0	0	10	1	1	0
9	2	4	12	3	9	6
5	-2	4	6	-3	9	6
8	1	1	9	0	0	0
6	-1	1	8	-1	1	1
9	2	4	11	2	4	4
7	0	0	10	1	1	0
4	-3	9	5	-4	16	12
8	1	1	10	1	1	1
7	0	0	9	0	0	0
		24			42	30

Variation in x = $\Sigma(x - \bar{x})^2 = 24$ Variation in y = $\Sigma(y - \bar{y})^2 = 42$ Covariation of x and y = 30

$$b = \frac{\text{Covariation}}{\text{Variation in x}} = \frac{30}{24} = 1.25$$

$$\begin{aligned} a &= \bar{y} - b(\bar{x}) \\ &= 9 - 1.25(7) \\ &= 9 - 8.75 \\ &= .25 \end{aligned}$$

Therefore the cost function will be:

$$y = 0.25 + 1.25x$$

Where, y = Total costs

Fixed costs = 0.25

Variable cost per unit = 1.25

x = Units

The same result can be arrived by solving the two normal equations mentioned above.

Multiple regression analysis may be used in situations where number of independent variable is more than one.

Coefficient of Correlation = r; Coefficient of Determination = r^2

$$r^2 = \frac{\text{Explained variation}}{\text{Total Variation}} = \frac{6 \Sigma (x - \bar{x}) (y - \bar{y})}{\Sigma (y - \bar{y})^2}$$

Miscellaneous Methods: In practice, the following methods are very much popular:

- (i) Account analysis
- (ii) Engineering analysis

Account Analysis: Each account under consideration is classified as either fixed or variable based on the analyst's prior knowledge of how the figures of the account behave with the changes in the volume of activity.

Example:

Variable	Fixed
Direct Material	Supervisors' Salaries
Direct Labor	Depreciation
Indirect Material	Lease Instalments
Electricity	Production Engineer's benefits
Power	

The Engineering Approach: This type of analysis involves a detailed analysis of what cost behavior should be, based on an individual industrial engineer's evaluation of the production methods to be used, material specifications, labor requirement equipment usages, efficiency of production, power consumption and so on.

Lesson 3: The contribution Format of Income Statement

Learning Objectives

After completing this lesson, you are expected to be able to:

- Explain the process of preparation of income statement according to traditional approach;
- Explain the process of preparation of income statement according to contribution format;
- Explain the reasons for the differences between income figures under the two methods of preparing income statements;
- Identify the situations where contribution figure can help management in decision making; and
- To identify argument against contribution format income statement.

'Income Statement' is U.S. term for Profit and Loss Account. Income statements are prepared to ascertain the amount of profit income earned or loss incurred by an enterprise during a particular accounting period. There are two accepted formats of income statements:- (1) Traditional Format of Income Statement and (2) Contribution Format of Income Statement for internal reporting.

Traditional Format of Income Statement

Under this approach, revenues are recorded as and when earned and costs are classified on the basis of functions irrespective of their behavior in relation to the volume of production and sale. Thus costs are classified as follows:

- (i) Manufacturing Costs: Both fixed and variable
- (ii) General and Administrative Costs: Both fixed and variable
- (iii) Selling and Distribution Costs: Both fixed and variable

Under traditional approach, all operating expenses i.e. general and administrative costs and selling and distribution costs are treated as periodic charges, whereas, manufacturing costs are matched to periodic sale to find out gross profit. More specifically it can be said that fixed manufacturing overheads are treated as product costs and included in the valuation of inventory. From "Gross Profit/Gross Margin", total operating expenses both fixed and variable are deducted to find out periodic net operating income.

Under traditional approach, all operating expenses whereas, manufacturing costs are matched to periodic sale to find out gross profit.

Example: Production unit = Sale Units

Sales	:	Tk.12,000
Cost of Production	:	Variable Tk.2,000
		Fixed <u>Tk.4,000</u> Tk.6,000

Administrative Costs: Variable Tk.400
Fixed Tk.1,500 Tk.1,900

Selling Costs : Variable Tk.600
Fixed Tk.2,500 Tk.3,100

Income Statement
For the Period
[Under Traditional Approach]

Sales		Tk.12,000
Less Cost of Goods sold		<u>6,000</u>
Gross Profit / Margin		6,000
Less Operating Expenses:		
Administrative Costs	Tk.1,900	
Selling Costs	<u>3,100</u>	<u>5,000</u>
Net Operating Income:		<u>1,000</u>

Under absorption costing method, fixed manufacturing overheads are treated as product costs and included in inventory valuation.

This method is also known as Income Statement under absorption costing system. Under absorption costing method, fixed manufacturing overheads are treated as product costs and included in inventory valuation.

The Contribution Approach: Contribution Format of Income Statement: [Variable Costing Income Statement]

Although an income statement prepared in the functional format under traditional approach may be useful for external reporting, it has serious limitations when used for internal purposes. Internally, management needs data for planning, control and decision making. More useful data can be generated if income statements can be prepared basing on behavioral classification of costs. Therefore, income statements prepared according to contribution format are more useful to managers.

The excess of sales over the variable costs (manufacturing, administrative and selling) is known as contribution margin. This is the contribution toward fixed costs and net income. Income Statement under

Contribution Format: [Previous Example]

Income Statement
For the Period
[Contribution Format]

Sales		Tk.12,000
Less Variable Costs:		
Manufacturing	Tk.2,000	
Administrative	600	
Selling	<u>400</u>	<u>3,000</u>
Contribution Margin		Tk.9,000
Less Fixed costs:		
Manufacturing	4,000	

Administrative	2,500	
Selling	<u>1,500</u>	<u>8,000</u>
Net Operating Income		<u>1,000</u>

It is claimed that this approach furnishes data for internal planning and decision making. More specifically, these data can be used for the following purposes:

- (i) Cost-volume-profit analysis
- (ii) Appraising management performance
- (iii) Segment reporting of profit data
- (iv) Budgeting
- (v) Product line profitability analysis
- (vi) Special pricing
- (vii) Use of scarce resources
- (viii) Make or buy decisions

Extended Example

A firm sells its products at a price of Tk.10 per unit. Standard variable cost is Tk.3 per unit. Normal volume is 30,000 units, and budgeted fixed cost is Tk.60,000 per quarter; hence, the fixed overhead rate is Tk.2 per unit. The standard cost is Tk.5 per unit. Variable operating expense (selling expenses and general and administrative expenses) is Tk.1 per unit. Fixed operating expenses are Tk.10,000 per quarter. Sales and production during each quarter were as follows:

	Qtr.1	Qtr.2	Qtr.3	Qtr.4
Sales (Units)	20,000	20,000	40,000	50,000
Production (Units)	30,000	40,000	40,000	20,000

Income Statement
For the Year
[Traditional Approach]

Items	Quarter				Total
	1	2	3	4	
Sales	Tk. 200,000	Tk. 200,000	Tk. 400,000	Tk. 5,00,000	Tk. 13,00,000
Less Cost of Goods Sold:					
Beginning Inventory	—	50,000	150,000	150,000	—
Cost of Goods Manufactured	1,50,000	200,000	200,000	100,000	6,50,000
Cost of goods available for sale	1,50,000	250,000	350,000	250,000	6,50,000
Less Ending Inventory	50,000	150,000	150,000	—	—
Cost of Goods Sold	1,00,000	100,000	200,000	250,000	6,50,000
Gross Profit	1,00,000	100,000	200,000	250,000	6,50,000
Less: Operating Expenses					
Variable	20,000	20,000	40,000	50,000	1,30,000

Fixed	10,000	10,000	10,000	10,000	40,000
Volume Variance	-	(20,000)	(20,000)	20,000	(20,000)
Net Income	70,000	90,000	170,000	170,000	5,00,000

Income Statement
For the Year
[Contribution Approach]

Items	Quarter				Total
	1	2	3	4	
	Tk.	Tk.	Tk.	Tk.	Tk.
Sales:	2,00,000	2,00,000	4,00,000	5,00,000	13,00,000
Less Variable Expenses					
Variable Cost of Goods sold					
Beginning Inventory	-	30,000	90,000	900,000	-
Cost of goods produced	90,000	1,20,000	1,20,000	60,000	3,90,000
Goods available for sale	90,000	1,50,000	2,10,000	1,50,000	3,90,000
Less Ending Inventory	30,000	90,000	90,000	-	-
Variable Cost of goods sold	60,000	60,000	1,20,000	1,50,000	3,90,000
Variable Selling and Administrative Expenses	20,000	20,000	40,000	50,000	130,000
Contribution	1,20,000	1,20,000	2,40,000	3,00,000	7,80,000
Less Fixed Costs: Manufacturing + Administrative	70,000	70,000	70,000	70,000	2,80,000
Net Income	50,000	50,000	1,70,000	2,30,000	5,00,000

Reconciliation of Net Income differences under two approaches

Quarter	Net Income		Difference in Income	Difference Inventory Value		Difference
	Traditional	Contribution		Beginning	Ending	
1	Tk. 70,000	Tk. 50,000	Tk. 20,000	0	20,000	Tk. 20,000
2	90,000	50,000	40,000	20,000	60,000	40,000
3	170,000	170,000	0	60,000	60,000	0
4	170,000	230,000	-60,000	60,000	0	-60,000
Year Total	500,000	500,000	0	0	0	0

Differences between incomes are the differences between inventory values under two approaches.

There are differences between quarterly incomes under two approaches but yearly incomes are the same. What is the cause of the differences between incomes under two approaches? Differences between incomes are the differences between inventory values under two approaches.

Arguments against contribution format Income Statement:

- (a) Valuation of inventories fails to meet requirements of "good" accounting theory. [Fails cost attachment]
- (b) Variable costing may omit certain incremental costs.

PRACTICE TEST

A. Self-Assessment Questions (SAQs)

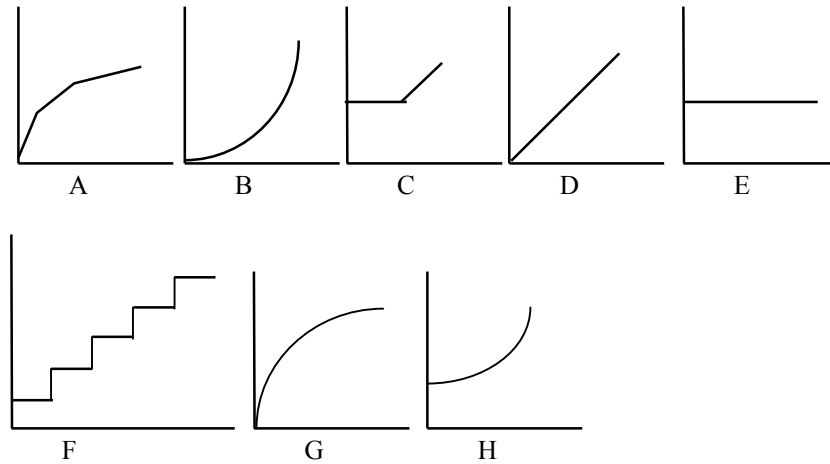
True – False

1. Indicate which one is true and which one is false.
 - (a) Total Fixed costs do not change with the changes in the volume of production.
 - (b) Total true variable costs increase proportionately with the increase in the volume of production.
 - (c) Per unit fixed cost increases with the increase in the volume of production.
 - (d) Per unit variable cost remains constant what ever may be the volume of production.
 - (e) With the changes in the volume of production per unit variable cost changes but per unit fixed cost remains fixed.
 - (f) Total variable costs changes with the volume of production, but the per unit variable cost remains constant.

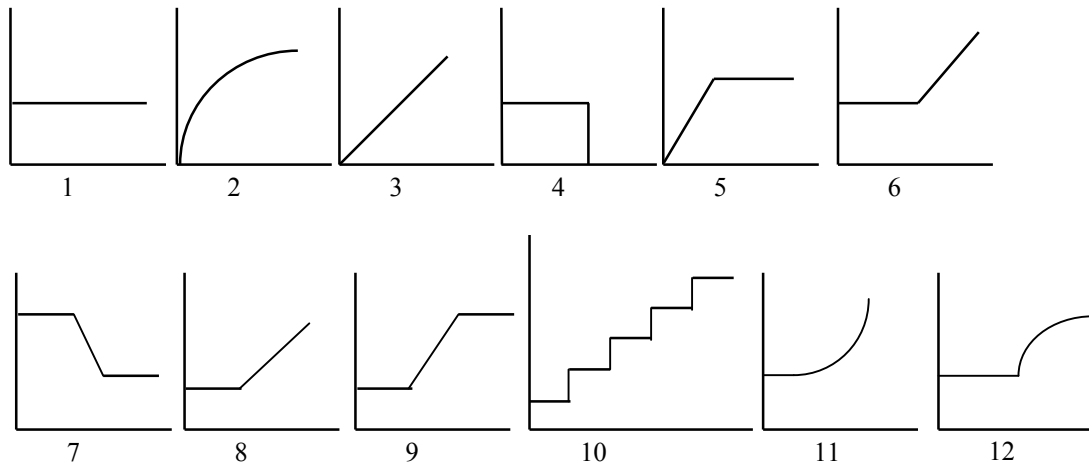
B. Matching

2. Choose from the accompanying graphs. A Through H the one that matches the following numbered items.
 - (i) Cost of machining labour that tends to decrease as workers gain experience.
 - (ii) Price of an increasingly scarce raw material as the quantity used increases.
 - (iii) Guaranteed annual wage plan, whereby workers get paid for 40 hours of work per week even at zero or low level of production that require working only a few hours weekly.
 - (iv) Water bill, which entails a flat fee for the first 10,000 gallons used and then an increasing unit cost for every additional 10,000 gallons used.
 - (v) Availability of quantity discounts where the cost per unit falls as each price break is reached.
 - (vi) Depreciation of office equipment.
 - (vii) Cost of steel for a manufacturer of firm implements.
 - (viii) Salaries of supervisors, where one supervisor is added for every 12 phone solicitors.
 - (ix) Natural gas bill consisting of a fixed component, plus a constant variable cost per thousand cubic feet after a specified number of cubic feet are used.

The vertical axis of a graph represents taka of cost incurred and the horizontal axis represents levels of cost-driver activity during a particular time period. The graphs may be used more than once.



3. A number of graphs displaying cost behavior patterns that might be found in a company's cost structure are shown below. The vertical axis on each graph represents total cost and the horizontal axis represents the level of activity (volume).



Required:

- (a) For each of the following situations, identify the graph that illustrates the cost pattern involved. Any graph may be used more than once.
- (i) Electricity bill - a flat fixed charge plus a variable cost after a certain number of kilowatt-hours used.
 - (ii) City water bill, which is computed as follows:

First	10,00,000 gallons or less	Tk.1,000 flat fee
Next	10,000 gallons	0.003 per gallon used
Next	10,000 gallons	0.006 per gallon used
Next	10,000 gallons	0.009 per gallon used
ETC		ETC

- (iii) Depreciation of equipment where the amount is computed by the straight-line method: When the depreciation rate is established, it was anticipated that the obsolescent factor would be greater than wear and tear factor.
 - (iv) Rent on a factory building donated by the city, where the agreement calls for a fixed fee payment unless 200,000 labour-hours or more are worked, in which case no rent need be paid.
 - (v) Cost of raw materials, where the cost starts at Tk.7.50 per unit and then decreases by 5 paise per unit for each of the first 100 units purchased, after which it remains constant at Tk.2.50 per unit.
 - (vi) Salaries of maintenance workers, where one maintenance worker is needed for every 1,000 hours of machine-hours or less (that is 0 to 1000 hours requires one maintenance worker, 1001 to 2000 hours requires two maintenance workers, etc).
 - (vii) Cost of raw materials used.
 - (viii) Rent on a factory building donated by the municipality, where the agreement calls for rent of Tk.1,00,000 less Tk.1 for each direct-hour worked in excess of 2,00,000 hours, but a minimum rental payment of Tk.2,000 must be paid.
 - (ix) Use of a machine under lease, where a minimum charge of Tk.1000 is paid for up to 400 hours of machine time. After 400 hours of machine time, an additional charge of Tk.2 per hour is paid up to a maximum charge of Tk.2000 per period.
- (b) How would a knowledge of cost behavior patterns such as those above of help to a manager in analyzing the cost structure of his or her firm?

C. Descriptive Questions

4. Explain briefly, but as analytically as you can, why is the following statement is correct:

"Profit under traditional approach reflects the effect of changes in sales and production, whereas profit under contribution format reflects only changes in sales."

5. "Aside from any advantages to management or external parties," the chief cost account argued, 'adoption of contribution format will save us a great deal of time and, therefore, money.' What did he have in mind?
6. Why do profit figures differ under "Traditional Format" and "Contribution Format"?
7. "Step cost can be fixed or variable depending on your perspective". Explain.
8. Explain how mixed costs are related to both fixed and variable costs.
9. Why are fixed costs also called capacity costs?
10. How do committed fixed costs differ from discretionary fixed costs?
11. Why are committed fixed costs the most difficult to change?
12. How can a company's choice of technology affect its costs?
13. Describe the methods for measuring cost functions using past cost data.
14. Explain the strengths and weaknesses of the High-Low method.
15. What is the difference between the contribution approach to income statement and the Traditional Approach to income statement?
16. What is the contribution margin?
17. What is the difference between ordinary least squares regression analysis and multiple regression analysis?
18. Distinguish between (i) a variable cost (ii) a mixed cost and (iii) a step cost.
19. Define cost behavior.
20. Classify the following fixed costs as normally being either committed or discretionary:
 - (a) Depreciation on building, (b) Advertising
 - (c) Research (d) Long-term equipment lease
 - (e) Pension Payments to the firm's retirees.
 - (f) Management development and training.

21. On November 15, 2006, Sheila, a newly hired cost analysts at L. Company was asked to predict overhead costs for the company's operations in 2007, when 510 units are expected to be produced. She collected the following quarterly data:

<u>Quarter</u>	<u>Production in units</u>	<u>Overhead costs</u>
1/2003	76	Tk.730
2/2003	79	720
3/2003	72	655
4/2003	136	1,331
1/2004	125	1,001
2/2004	128	1,111
3/2004	125	1,119
4/2004	133	1,042
1/2005	124	997
2/2005	129	1,066
3/2005	115	996
4/2005	84	957
1/2006	84	835
2/2006	122	1,050
3/2006	90	991

Required:

- (i) Using the high-low method to estimate costs, prepare a predication of overhead costs for 2007.
- (ii) Sheila ran a regression analysis using the data she collected. The result was
- $$Y = \text{Tk.}337 + \text{Tk.}5.75 x$$
- Using this cost function, predict costs for 2007.
- (iii) Which prediction to you prefer? Why?

22. Limand Company, a manufacture of fine china and stoneware is troubled by fluctuations in productivity and wants to compute how manufacturing support costs are related to the various sizes of batches of output. The following data show the results of a random sample of 10 batches of one pattern of stoneware:

<u>Sample</u>	<u>Batch Size (x)</u>	<u>Support Costs, Y</u>
1	15	Tk.180
2	12	140
3	20	230

<u>Sample</u>	<u>Batch Size (x)</u>	<u>Support Costs, Y</u>
4	17	190
5	12	160
6	25	300
7	22	270
8	9	110
9	18	240
10	30	320

Required:

- (i) Draw a scatter graph.
 - (ii) Using regression analysis, measure the cost function of support costs and batch size.
 - (iii) Predict the support costs for a batch size of 22.
 - (iv) Using the high-low method, repeat requirements (ii) and (iii). Should the manager use the high-low a regression method? Explain.
23. The number of X-Rays taken and X-rays' costs over the last nine months in Beverly Hospital are given below:

<u>Months</u>	<u>X-Rays taken</u>	<u>X-Ray Costs</u>
January	6,250	Tk.28,000
February	7,000	29,000
March	5,000	23,000
April	4,250	20,000
May	4,500	22,000
June	3,000	17,000
July	3,750	18,000
August	5,500	24,000
September	5,750	26,000

Required:

- (i) Using the high-low method estimate the cost formula for X-ray costs.
- (ii) Using the cost formula you derived above what X-ray costs would you expect to be incurred during a month in which 4,600 X-rays are taken?

24. Alden Company has decided to use the contribution approach to the income statement internally for planning purposes. The company has analyzed its expenses and developed the following cost formulas:

<u>Cost</u>	<u>Cost Formula</u>
Cost of goods sold	Tk.20 per unit sold
Advertising expenses	Tk.170,000 per quarter
Sales Commissions	5% of sales
Administrative salaries	Tk.80,000 per quarter
Shipping expenses	?
Depreciation expense	Tk.50,000 per quarter

Management has concluded that shipping expenses is a mixed cost, containing both variable and fixed cost elements. Units sold and the related shipping expenses over the last eight quarters are given below:

<u>Quarters</u>	<u>Units Sold ('000)</u>	<u>Shipping Expense</u>
Year-1		
First	16	Tk.1,60,000
Second	18	1,75,000
Third	23	2,10,000
Fourth	19	1,80,000
Year-2		
First	17	1,70,000
Second	20	1,90,000
Third	25	2,30,000
Fourth	22	2,05,000

Management would like a cost formula derived for shipping expenses so that a budgeted income statement using the contribution approach can be prepared for the next quarter.

Required:

- (i) Using the least square regression method, estimate a cost formula for shipping expenses.
- (ii) In the first quarter of year 3, the company plans to sell 21,000 units at a selling price of Tk.50 per unit. Prepare an income statement for the quarter using the contribution format.

25. House of Organs, Inc. purchases organs from a well-known manufacturer and sells them at the retail level. The organs sold, on average, for Tk.150,000 each. The average cost of an organ from the manufacturer is Tk.90,000.

House of Organs, Inc. has always kept careful records of its costs. The costs that the company incurs in a typical month are presented below:

<u>Cost Items</u>	<u>Cost Formula</u>
Selling:	
Advertising	Tk.57,000 per month
Delivery of organs	Tk.3,600 per organ sold
Sales salaries & Commissions	Tk.288,000 per month

During November, the company sold and delivered 60 organs.

Required:

- (i) Prepare an income statement for November using the traditional format with costs classified by functions.
- (ii) Repeat requirement (i) using contribution format.