

Lecture One & Two

At the end of those two lectures, you will be able to understand the following concepts:

- 1) Definition of managerial accounting.**
- 2) Characteristics of Managerial accounting.**
- 3) Types of Cost Classifications.**
- 4) Contribution Margin.**
- 5) Break-Even Point (Dollar & Units)**

Cost-Volume-Profit [CVP] analysis is an analytical tool for studying the relationship between volume, cost, prices, and profits. It is very much an extension, or even a part of marginal costing. It is an integral part of the profit planning process of the firm.

However, formal profit planning and control involves the use of budgets and other forecasts, and the CVP analysis provides only an overview of the profit planning process. Besides it helps to evaluate the purpose and reasonableness of such budgets and forecasts.

Generally, CVP analysis provides answers to questions such as:

- (a) What will be the effect of changes in prices, costs, and volume on profits?
- (b) What minimum sales volume need be made to avoid losses?
- (c) Which product is the most profitable one and which product or operation of a plant should be discontinued? Etc.

Main Characteristics of Managerial accounting

- 1) Planning - budgeting ---- market/ spending / costs
- 2) Decision making

3) Directing & motivating

4) Controlling for example firm \$50000 budget \$45,000 actual

Types of Cost Classifications:

Classification of Costs essentially means the grouping of costs according to their similar characteristics. It is the logical process of categorizing the different costs involved in a business process according to their nature, functions, traceability etc. Here we will be focusing on five classifications. Let us learn them in more detail.

Classification by behavior

- **Fixed Cost:** The cost which is hardly affected by the temporary change taking place in business activity is known as a fixed cost. It includes rent, [depreciation](#), lease, salary, etc.
- **Variable Cost:** The cost which changes proportionately with the change in production quantity or other business activity. Raw material, packaging, sales commissions, wages, etc. are variable costs.
- **Semi-Variable Cost:** The cost which is moderately influenced by the change in business activity. It includes power consumption, maintenance cost, management cost, supervision cost, etc.



- **Material Costs:** Material costs are the costs of any materials we use in the production of goods. For example, let's divide material costs into raw material costs, spare parts, costs of packaging material etc.
- **Labor Costs:** Labor costs consists of the salary and wages paid to permanent and temporary employees in the pursuit of the manufacturing of the goods
- **Expenses:** All other expenses associated with making and selling the goods or services.



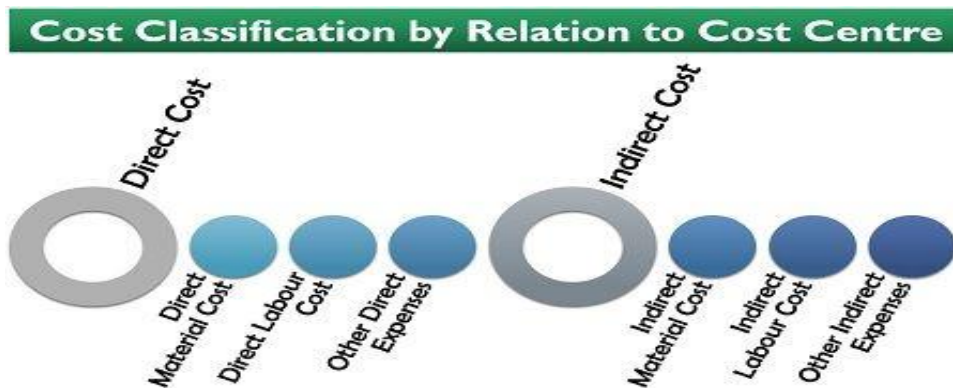
Classification by Functions

- **Production Costs:** All costs concerned with actual manufacturing or construction of the goods
- **Commercial Costs:** Total costs of the operation of an enterprise other than the manufacturing costs. It includes the admin costs, selling and distribution costs etc.



Classification by Traceability

- Direct Costs: So these are the costs which are easily identified with a specific cost unit or cost centers. Some of the most basic examples are the materials used in the manufacturing of a product or the labor involved with the production process.
- Indirect Costs: These costs are incurred for many purposes, i.e. between many cost centers or units. So we cannot easily identify them to one particular cost center. Take for example the rent of the building or the salary of the manager. We will not be able to accurately determine how to ascertain such costs to a particular cost unit.

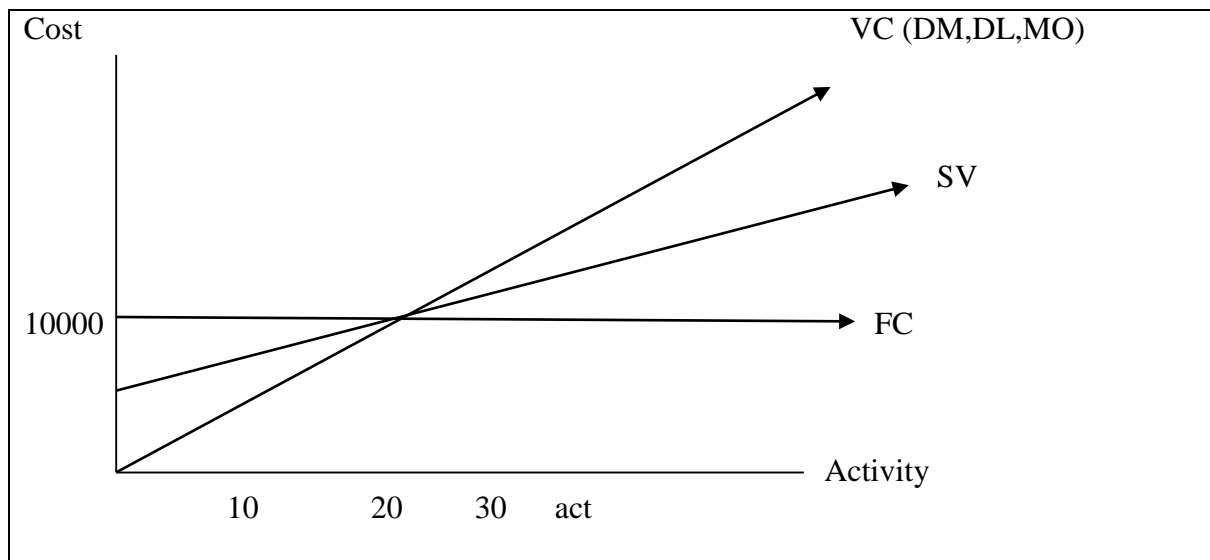


Classification by Normality

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- Normal Costs: This is a part of the cost of production and a part of the costing profit and loss. These are the costs that the firm incurs at the normal level of output in standard conditions.
- Abnormal Costs: These costs are not normally incurred at a given level of output in conditions in which normal levels of output occur. These costs are charged to the profit and loss account, they are not a part of the cost of production.



Types of Cost Classification by Controllability:

The degree of control depends on the level of management in the organization. Managers at higher levels in the organization have a greater degree of control over costs than do managers at lower levels in the organization. Classifying costs by controllability is an important part of assigning cost, responsibility, and evaluating a manager's cost control performance.

Types of Cost Classifications Classification by Relevance:

An opportunity cost is the potential benefit lost by choosing a specific action from two or more alternatives Example: If you were not attending college, you could be earning \$20,000 per year.

Your opportunity cost of attending college for one year is \$20,000. An opportunity cost is the potential benefit lost by choosing a specific action from two or more alternatives. Opportunity costs are always relevant to a selection decision. Example: If you were not attending college, you could be earning \$20,000 per year. Your opportunity cost of attending college for one year is \$20,000.

Types of Cost Classification by Function:

Direct Labor Direct Material Manufacturing Overhead Product Period costs are expenses not attached to the product. Administrative costs are non-manufacturing costs of staff support and administrative functions. Selling costs are incurred to obtain orders and to deliver finished goods to customers. Product costs are incurred to manufacture a product. Product costs are not expensed as they are incurred. Instead, they are assigned to inventory and do not become expenses until the product is sold. Inventory is reported at cost as an asset on the balance sheet. Period costs are expensed in the period incurred. Period costs are not assigned to inventory with the product. They are non-manufacturing costs usually grouped into two broad categories: selling and administrative. Selling costs are incurred to obtain customer orders and to deliver finished goods to customers. Examples are advertising and shipping costs. Administrative costs are non-manufacturing costs of staff support and administrative functions. Examples are accounting, data processing, personnel, and research and development.

Definition of Contribution margin (CM):

The contribution margin (CM) is the difference between the selling price of a unit and variable cost per unit or the difference between a firm's revenue and its total variable costs. In other words, it's a proportion of revenue available to cover fixed costs of a firm.

Formula:

$$\text{CM} = \text{Sales} - \text{Total Variable Costs}$$

The contribution margin can be expressed in the following ways: **per unit, in total, and as a ratio.**

1) The per unit formula can be represented as follows:

$$\text{CM}_{\text{Per Unit}} = \text{Selling Price} - \text{V. C} \text{ or } (\text{CM} / \text{Numbers of units sold})$$

where P is the selling price of a unit, and VC is the variable cost per unit.

2) The total contribution margin (CM_{Total}) of a firm can be calculated as follows:

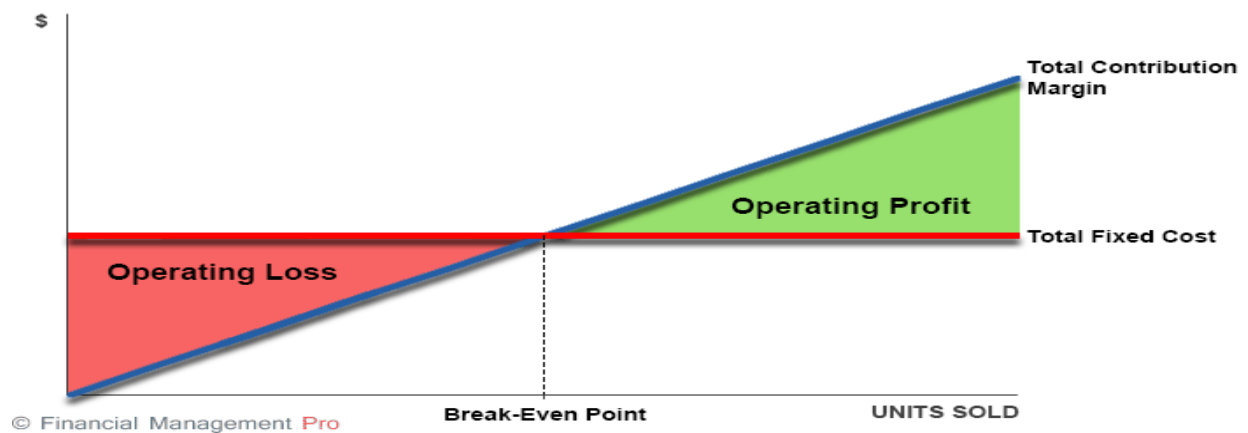
$$\text{CM}_{\text{Total}} = \text{Total Sales} - \text{Total Variable Costs}$$

3) The contribution margin ratio (**CM Ratio**) can be calculated as follows:

$$\text{CM Ratio} = \frac{\text{Contribution Margin per Unit}}{\text{Selling price of a unit}} = \frac{\text{Total Contribution Margin}}{\text{Total Sales}}$$

The goal of contribution margin analysis is:

Determining how the change in price affects the break-even point and operating profit or loss.



For example, a decrease in the selling price will lead to a lower total contribution margin and will shift the break-even point to a higher volume. The concept is also a useful tool in determining the operating profit or loss at various levels of selling prices and sales volumes.

Gross margin

Do not confuse contribution margin with gross margin!

The first appears in a statement of income if a firm applies variable costs. Such an approach implies two groups of cost: fixed costs and variable costs.

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In contrast, gross margin appears in a statement of income if a firm uses absorption cost. In such a case, all costs are classified into two groups: period costs and product costs. In turn, product costs include direct labor costs, direct materials, and overhead. So, gross margin is the difference between a firm's total sales and the cost of goods sold (COGS).

Example 1:

Let's assume Company ABC is currently producing and selling just one product at a selling price of \$150 per unit. Variable costs per unit are \$90, and annual fixed costs are \$750,000. During the financial year, Company ABC sold 14,750 units.

Solution:

$$CM_{\text{Per Unit}} = \$150 - \$90 = \$60$$

The total CM will be \$885,000.

$$CM_{\text{Total}} = (14,750 \times \$150) - (14,750 \times \$90) = \$885,000$$

The CM ratio of Company A will be 40%.

$$CM \text{ Ratio} = \frac{\$60}{\$150} = \frac{\$885,000}{14,750 \times \$150} = 40\%$$

The total contribution margin of \$885,000 allows Company A to cover all fixed costs of \$750,000 and have an operating profit of \$135,000.

The income statement, when presented in contribution margin format, looks like this:

Sales	\$ xx.xx
Less: Total Variable Costs	xx.xx
Contribution Margin	xx.xx
Less: Total Fixed Costs	<u>xx.xx</u>
Operating Income	xx.xx

The contribution margin ratio can be computed as: 1 minus the variable cost ratio. For example, if variable cost is 60% of sales, then the contribution margin would be 40% of sales.

Example:

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To illustrate the concepts of contribution margin, consider the following example.

	Per unit	Total	Ratio
Sales (2,000 units)	\$20	\$40,000	100%
Less: Variable Costs	9	18,000	45%
Contribution Margin	\$11	\$22,000	55%
Less: Fixed Costs		10,000	
Operating Income		\$12,000	

CM per unit. The unit CM is \$11 (\$20 minus \$9). Alternatively, it can be computed as \$22,000 contribution margin divided by 2,000 units.

CM ratio. The CMR is 55% (contribution margin of \$22,000 divided by sales of 40,000). It can also be computed as: CM per unit of \$11 divided by selling price of \$20. Also, the variable cost ratio is 45%; hence, the CMR can be computed as $1 \text{ minus } 45\% = 55\%$.

Example 2:

Puma is a sports footwear startup which currently sells just one shoe brand. The sales price is \$80, variable costs per unit is \$50 and fixed costs are \$2,400,000 per annum. During financial year 2018, the company sold units for \$16,000,000.

Required: Calculate the company's contribution margin for the period and calculate its breakeven point in both units and dollars.

Solution:

	Per unit	Total	Ratio
Sales (200,000 units)	\$ 80	\$16,000,000	100%
Less: Variable Costs	50	10,000,000	62.5%

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Contribution Margin	\$30	\$6,000,000	37.5%
Less: Fixed Costs		<u>2,400,000</u>	
Operating Income		\$3,600,000	

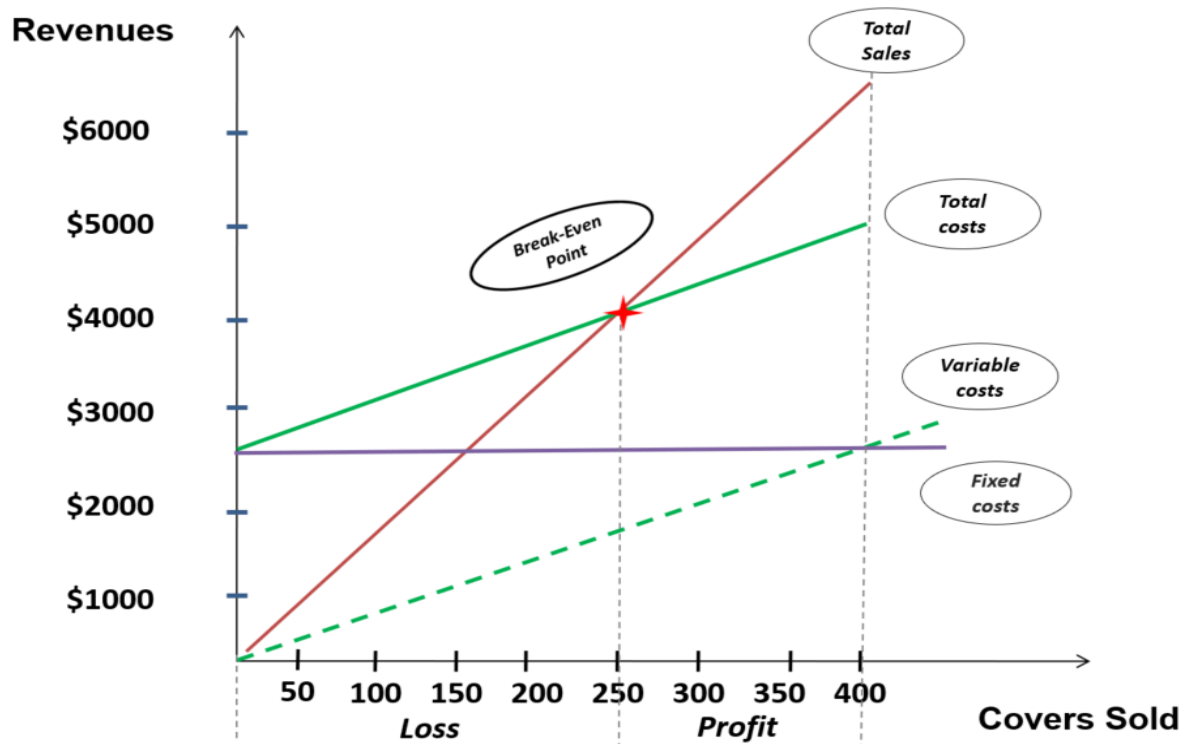
CM per unit. The unit CM is \$30 (\$80 minus \$50). Alternatively, it can be computed as \$6,000,000 contribution margin divided by 200,000 units.

CM ratio. The CMR is 37.5% (contribution margin of \$6,000,000 divided by sales of \$16,000,000). It can also be computed as: CM per unit of \$30 divided by selling price of \$80.

Contribution margin is an important input in calculation of breakeven point, i.e. the sales level (in units and/or dollars) at which a company makes zero profit. Breakeven point

(in units) equals total fixed costs divided by contribution margin per unit and breakeven point (in dollars) equals total fixed costs divided by contribution margin ratio.

2- Break-even Point: The break-even point is reached when total costs and total revenues are equal, generating no gain or loss (Operating Income of \$0). Business operators use it to determine how many product units they need to sell at a given price point to break even or to produce the first dollar of profit.



$$\text{Break Even point in units} = \frac{\text{Fixed Costs}}{\text{Contribution Margin Per unit}}$$

$$\text{Breakeven point in dollars} = \frac{\text{Fixed Costs Dollar}}{\text{Contribution Margin in \%}}$$

Or

$$\text{Breakeven point in units} * \text{Selling Price}$$

Example:

The selling price per grilled chicken for Ali's BBQ Restaurant is \$16. The restaurant averages 85 chickens sold a day or 2,550 chickens per month. The restaurant currently loses money as indicated in the following statement:

Statement Item	Dollar Amount	Percent of Income
Sales (2,550 units * \$16)	\$40800	100%
Deduction Variable costs \$11.52	(\$29,376)	(72%)
Contribution Margin \$4.48	\$11,424	28%
Deduction Fixed Costs	(\$13,464)	
Total Operation Income	(\$2,040)	

Required/ The owner wants to know the sales volume required in terms of both dollars (\$) and the number of covers for the restaurant to break even considering its current expense structure.

Solution/

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Break Even point in units = $\frac{\$13,464}{\$4.48}$ 3005.36 units per month or 100 units per day

Breakeven point in dollars $\frac{\text{Fixed Costs Dollar } 13464}{\text{Contribution Margin in } 28\%}$ \$48,086

Or

$3005.35 * 16 = \$48,086$

Verification

Ali's BBQ / Income statement

Statement Item	Dollar Amount	Percent of Income
Sales (3005.35*\$16)	\$48086	100%
Deduction Variable costs 11.52	34622	82%
Contribution Margin	13,464	28%
Deduction Fixed Costs	13,464	
Total Operation Income	\$100	

= Fixed costs/Contribution margin per unit = $\$2,400,000/\$30 = 80,000$ units

Breakeven point in dollars

= Breakeven point in units \times Sales price = $80,000 \times \$80 = \$6,400,000$

Homework

- 1- XYZ wishes to make an annual profit of \$100,000 from the sale of appliances. Details of manufacturing and annual capacity are as follows:

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Production Capacity	10,000 units
Variable Cost per unit	\$30
Fixed Cost	\$30,000

Required:

- a) How much is the Price per unit?
 - b) Break-Even Per Unit (how many units the company has to sell to make ZERO profits?)
- 2- ABC firm has entered into a business of making Electrical fans. The management of company is interested in knowing the breakeven point at which there will be **NO profit/loss**. Below are the details of the cost incurred:

Total Sales Revenues (\$300 per fan)	\$300,000
Variable Cost per unit	\$240,000
Fixed Cost	\$60,000

Calculate (1) The Contribution Margin (CM) Per unit and (2) the **Breakeven Per unit?**

Lecture Three

High-Low Method

At the end of those two lectures, you will be able to understand the following concepts:

- 1- High-Low Method concepts
- 2- High-Low Method practices

In cost accounting classification, there is 3 types of cost: Fixed Cost, Variable Cost and Mixed Cost (mix of fixed and variable). So, in a very simple language, the high low method is a method which is used to separate fixed and variable cost from the total cost. It compares the highest level of activity and the lowest level of activity and then compares cost at each level. This is a very important concept in cost accounting and is very is useful in determining fixed and variable costs related to the product, machinery, and also used in budgeting activities.

Formula for High Low Method:

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In the high low method, we start with determining variable cost first. The formula for variable cost in this method is given by:

$$\text{Variable cost per unit} = \frac{\text{Highest activity cost} - \text{Lowest activity cost}}{\text{Highest activity units} - \text{Lowest activity units}}$$

Fixed cost = Highest activity cost – (Variable cost per unit x Highest activity units)

Or

Fixed cost = Lowest activity cost – (Variable cost per unit x Lowest activity units)

High Low Method – Example #1

Let us consider an example to understand the calculation better using this method.

The below table represents the total cost for a company for different production levels in the first six months of a year.

Units	Total Cost
3000	\$59,000
2720	\$55,000
2500	\$52,500
2150	\$50,500
1950	\$47,500
1250	\$38,000

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To calculate the fixed and variable cost, we first need to calculate the variable cost per unit using the formula above. Here x2 will be 3000, and y2 will be \$59,000, while x1 will be 1250, and y1 will be \$38,000.

Putting the values in the formula: $(\$59,000 - \$38,000) \div (3,000 - 1,250)$, we get variable cost as \$12 per unit.

Let us now calculate the fixed cost. Putting the value in the formula:

Fixed cost will be = $\$59,000 - (\$12 \times 3,000)$ or $\$38,000 - (\$12 \times 1,250)$. Hence, the fixed cost is \$23,000.

Now that we have both fixed and variable costs, we can frame the cost volume function. It will be: $y = \$23,000 + (12 \times 3000) = 59000$

Or = $23,000 + (12 \times 1250) = 38000$

High Low Method – Example #2

Let say you have a small business and you sell burgers. For the last 12 months, you have noted down what was the monthly cost and what was the number of burgers sold in the corresponding month.

Month	Number of Burgers Sold	Total Cost (\$)
Jan	122	\$5,123
Feb	154	\$4,356
Mar	113	\$3,670
Apr	190	\$5,800
May	98	\$4,000
Jun	90	\$3,200
Jul	123	\$3,456
Aug	111	\$2,145
Sept	161	\$5,468
Oct	78	\$3,210
Nov	118	\$4,125
Dec	132	\$4,100

Determine the highest and lowest activity point. So the highest activity happened in the month of April and the lowest is in the month of October.

Highest Activity Cost of April	5,800\$
Highest Activity Units of April	190
lowest Activity Cost of October	\$3,210
lowest Activity Units of October	78

$$\text{Variable cost per unit} = \frac{\text{Highest activity cost} - \text{Lowest activity cost}}{\text{Highest activity units} - \text{Lowest activity units}}$$

$$\text{Variable cost per unit} = \frac{\$5800 - 3120}{190 - 78}$$

Variable cost per unit = \$23.125

For the Highest Activity

Fixed Cost is calculated using the formula given below

Fixed Cost = Highest Activity Cost – (Variable Cost Per Units * Highest Activity Units)

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$$= \$5800 - (\$23.125 * 190)$$

$$\text{Fixed costs} = \$1,406.25$$

For the Lowest Activity

Fixed Cost is calculated using the formula given below

$$\text{Fixed Cost} = \text{Lowest Activity Cost} - (\text{Variable Cost Per Units} * \text{Lowest Activity Units})$$

$$3,210 - (23.125 * 87) = \text{Fixed Cost}$$

$$= \$1,406.25$$

High Low Method – Example #3

The manager of a hotel would like to develop a cost model to predict the future costs of running the hotel. Unfortunately, the only available data is the level of activity (number of guests) in a given month and the total costs incurred in each month. Being a new hire at the company, the manager assigns you the task of anticipating the costs that would be incurred in the following month (September).

He anticipates that the number of guests in September will be 3,000. Given the dataset below, develop a cost model and predict the costs that will be incurred in September.

Month	Number of Guests	Total Costs
January	1,500	\$143,000.00
February	2,300	\$203,100.00
March	1,000	\$105,450.00
April	4,323	\$454,225.00
May	4,545	\$371,225.00
June	3,541	\$296,225.00
July	4,312	\$353,945.00
August	2,143	\$191,237.00
September	3,000	?

Using the high-low method:

$$\text{Variable cost per unit} = \frac{\$371,225 - \$105,450}{4,545 - 1,000} = \$74.97 \text{ per number of guests}$$

Note: It is important to choose the high-low values from the units (i.e., number of guests) and not the total costs. The number of units drives the total costs. For example, notice that the highest total cost is \$454,255, which corresponds to an activity level of 4,323. However, the correct high-low values are from the independent variable (the variable that predicts the costs). In such a case, the high and low will be 4,545 number of guests in May (total costs: \$371,225) and 1,500 number of guests in January (total costs: \$143,000).

Given the variable cost per number of guests, we can now determine our fixed costs.

Using the high activity cost:

$$\text{Fixed cost} = \$371,225 - (\$74.97 \times 4,545) = \$30,486.35$$

Using the low activity cost:

$$\text{Fixed cost} = \$105,450 - (\$74.97 \times 1,000) = \$30,480$$

Using either the high or low activity cost should yield approximately the same fixed cost value. Note that our fixed cost differs by \$6.35 depending on whether we use the high or low activity cost. It is a nominal difference, and choosing either fixed cost for our cost model will suffice.

Cost model for hotel = \$30,480 + \$74.97 x No. of guests Therefore, the anticipated costs for September would be:

$$\text{September costs} = \$30,480 + \$74.97 \times 3,000 = \$255,390$$

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High Low Method – Example #2

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Let say you are a manager of a hotel and you are really concerned about the cost of which hotel is incurring and you want to derive a model to predict future cost, based on historical cost. You have collected data for the last 10 months and wants to see the cost for the next 2 months.

Data Table:

Month	Number of Guests	Total Cost (in \$)
Jan	1500	\$1,289,000
Feb	1342	\$1,018,000
Mar	990	\$960,000
Apr	2347	\$2,114,000
May	3427	\$2,989,000
Jun	4210	\$3,769,000
Jul	2133	\$1,690,000
Aug	1908	\$1,235,000
Sept	3140	\$2,899,000
Oct	2234	\$1,008,000
Nov	4200	
Dec	3290	

Determine the highest and lowest activity point. So the highest activity happened in the month of **Jun** and the lowest is in the month of **March**.

	A	B
18		
19	Highest Activity Cost	\$3,769,000
20	Highest Activity Units	4210
21	Lowest Activity Cost	\$960,000
22	Lowest Activity Units	990
23		

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Variable Cost Per Unit is calculated using the formula given below

Variable Cost Per Unit = (Highest Activity Cost – Lowest Activity Cost) / (Highest Activity Units – Lowest Activity Units)

	A	B	C	D
18				
19	Highest Activity Cost	\$3,769,000		
20	Highest Activity Units	4210		
21	Lowest Activity Cost	\$960,000		
22	Lowest Activity Units	990		
23				
24	Variable Cost Per Unit is calculated using the formula given below			
25	Variable Cost Per Unit = (Highest Activity Cost - Lowest Activity Cost)			
26	/ (Highest Activity Units - Lowest Activity Units)			
27				
28	Formula	=(B19-B21)/(B20-B22)		
29	Variable Cost Per Unit	\$872.36		
30				

- Variable Cost Per Unit = $(\$3,769,000 - \$960,000) / (4210 - 990)$
- Variable Cost Per Unit = **\$872.36 per unit**

For the Highest Activity

Fixed Cost is calculated using the formula given below

Fixed Cost = Highest Activity Cost – (Variable Cost Per Units * Highest Activity Units)

- Fixed Cost = $\$3,769,000 - (\$872.36 * 4210)$
- Fixed Cost = **\$96,363.35**

For the Lowest Activity: Fixed Cost is calculated using the formula given below

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Fixed Cost = Lowest Activity Cost – (Variable Cost Per Units * Lowest Activity Units)

- Fixed cost = \$960,000 – (\$872.36 * 990)
- Fixed Cost = **\$96,363.35**

Calculation of Total Cost

Total Cost = (Variable Cost Per Unit * x) + Fixed Cost

Where x is the number of guests in a particular month.

So, For Nov Month Total Cost is calculated as:

	A	B	C
4			
5	Month	Number of Guests	Total Cost (in \$)
6	Jan	1500	\$1,289,000
7	Feb	1342	\$1,018,000
8	Mar	990	\$960,000
9	Apr	2347	\$2,114,000
10	May	3427	\$2,989,000
11	Jun	4210	\$3,769,000
12	Jul	2133	\$1,690,000
13	Aug	1908	\$1,235,000
14	Sept	3140	\$2,899,000
15	Oct	2234	\$1,008,000
16	Nov	4200	=(B28*B16)+B35
17	Dec	3290	
27			
28	Variable Cost Per Unit	\$872.36	
34			
35	Fixed Cost	\$96,363.35	
36			

The result will be as given below.

C16 : X ✓ fx =(B28*B16)+B35			
	A	B	C
4			
5	Month	Number of Guests	Total Cost (in \$)
6	Jan	1500	\$1,289,000
7	Feb	1342	\$1,018,000
8	Mar	990	\$960,000
9	Apr	2347	\$2,114,000
10	May	3427	\$2,989,000
11	Jun	4210	\$3,769,000
12	Jul	2133	\$1,690,000
13	Aug	1908	\$1,235,000
14	Sept	3140	\$2,899,000
15	Oct	2234	\$1,008,000
16	Nov	4200	\$3,760,276
17	Dec	3290	
27			
28	Variable Cost Per Unit	\$872.36	
34			
35	Fixed Cost	\$96,363.35	
36			

- Total Cost = $(\$872.36 * 4200) + \$96,363.35$
- Total Cost = **\$3,760,276**

Similarly For Dec Month Total Cost is calculated as:

C17 : X ✓ fx =(B28*B17)+B35			
	A	B	C
4			
5	Month	Number of Guests	Total Cost (in \$)
6	Jan	1500	\$1,289,000
7	Feb	1342	\$1,018,000
8	Mar	990	\$960,000
9	Apr	2347	\$2,114,000
10	May	3427	\$2,989,000
11	Jun	4210	\$3,769,000
12	Jul	2133	\$1,690,000
13	Aug	1908	\$1,235,000
14	Sept	3140	\$2,899,000
15	Oct	2234	\$1,008,000
16	Nov	4200	\$3,760,276
17	Dec	3290	\$2,966,429
27			
28	Variable Cost Per Unit	\$872.36	
34			
35	Fixed Cost	\$96,363.35	
36			

- Total Cost = $(\$872.36 * 3290) + \$96,363.35$
- Total Cost = **\$2,966,429**