Learning Objective 4

Understand cost classifications used to predict cost behavior: variable costs, fixed costs, and mixed costs.

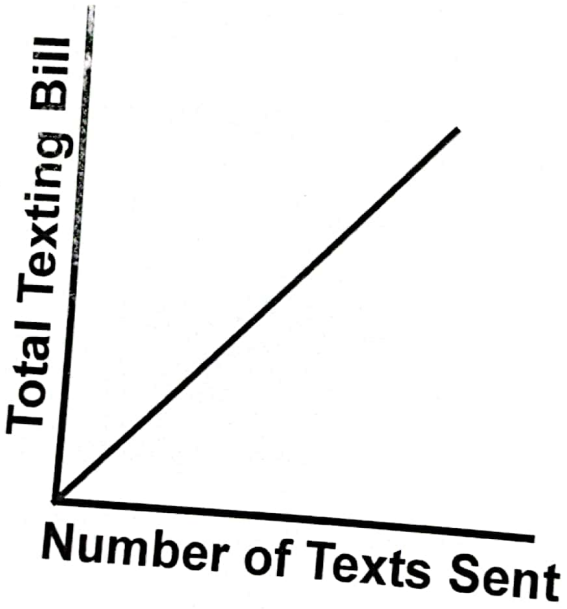
Cost Classifications for Predicting Cost Behavior

Cost behavior refers to how a cost will react to changes in the level of activity. The most common classifications are:

- **Variable costs.**
- **Fixed costs.**
- **Mixed costs.**

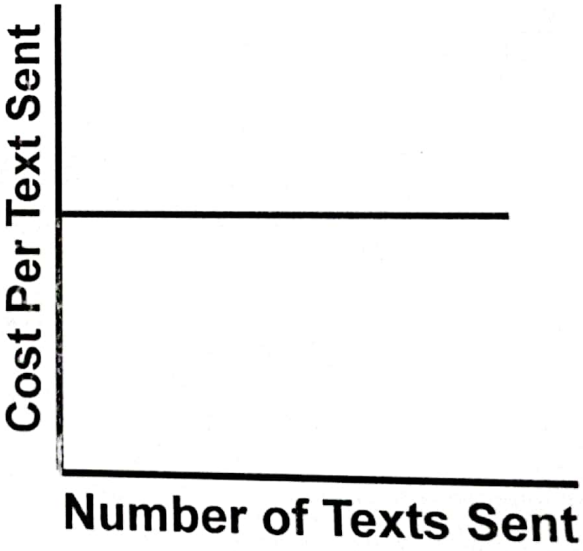
Variable Cost

A cost that varies, in total, in direct proportion to changes in the level of activity. Your **total texting bill** may be based on how many texts you send.

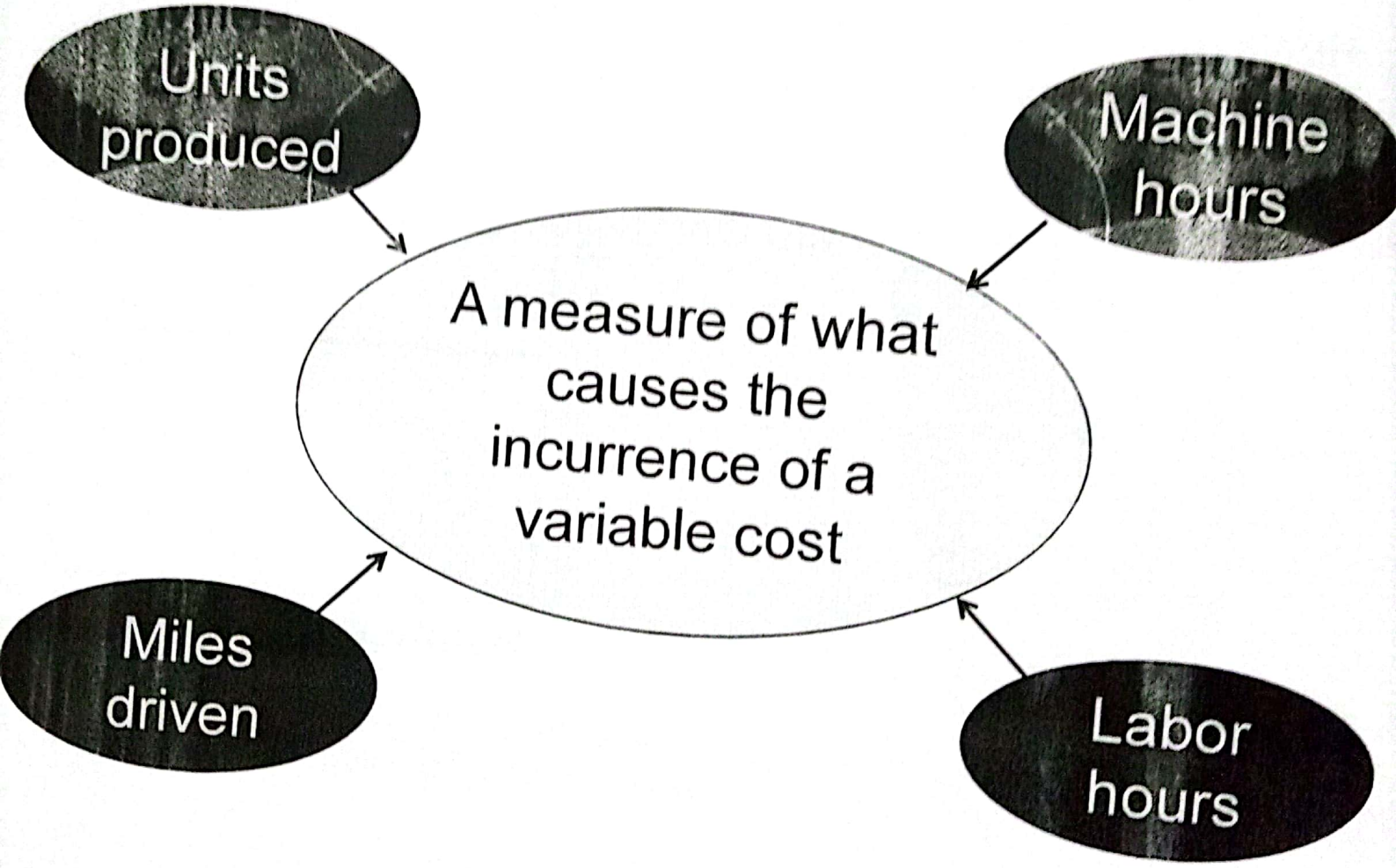


Variable Cost Per Unit

However, variable cost per unit is constant. The **cost per text** sent may be constant at 5 cents per text message.

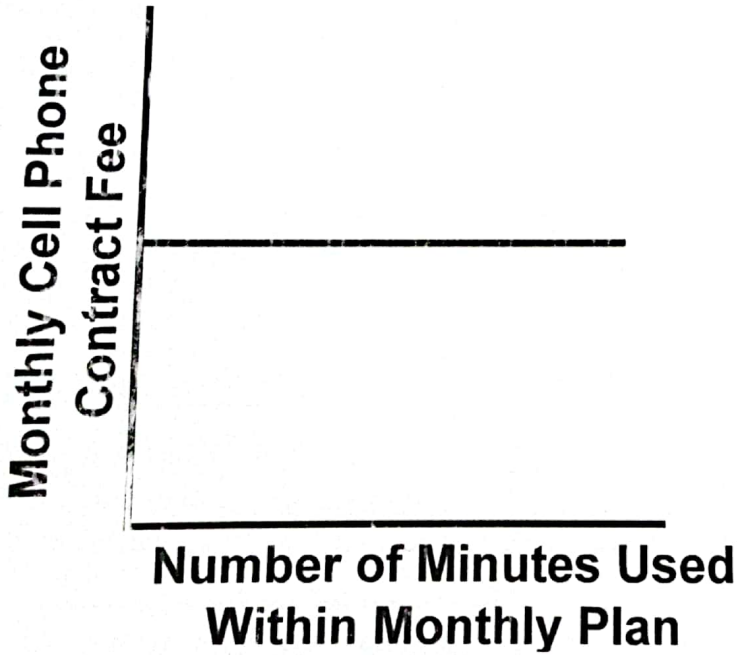


The Activity Base (Cost Driver)



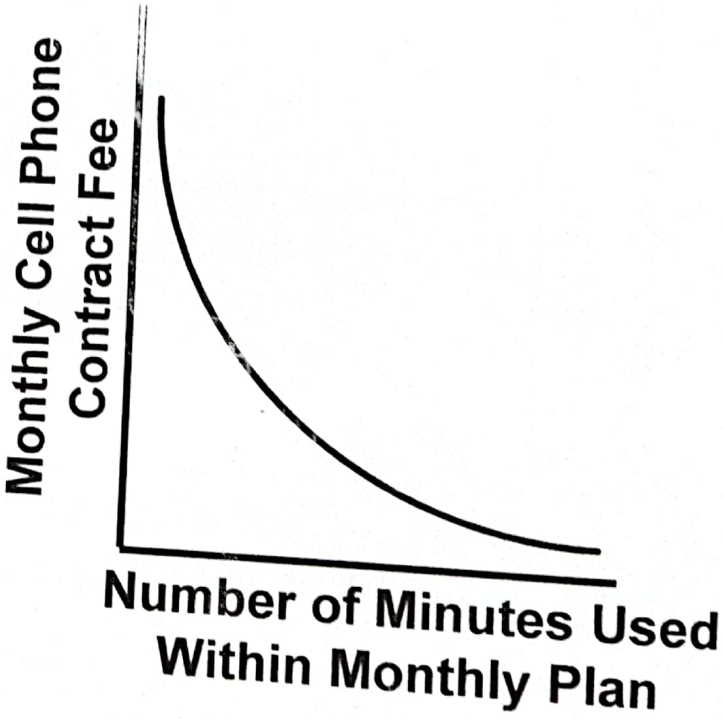
Fixed Cost

A cost that remains constant, in total, regardless of changes in the level of the activity. Your monthly contract fee for your cell phone may be fixed for the number of monthly minutes in your contract.

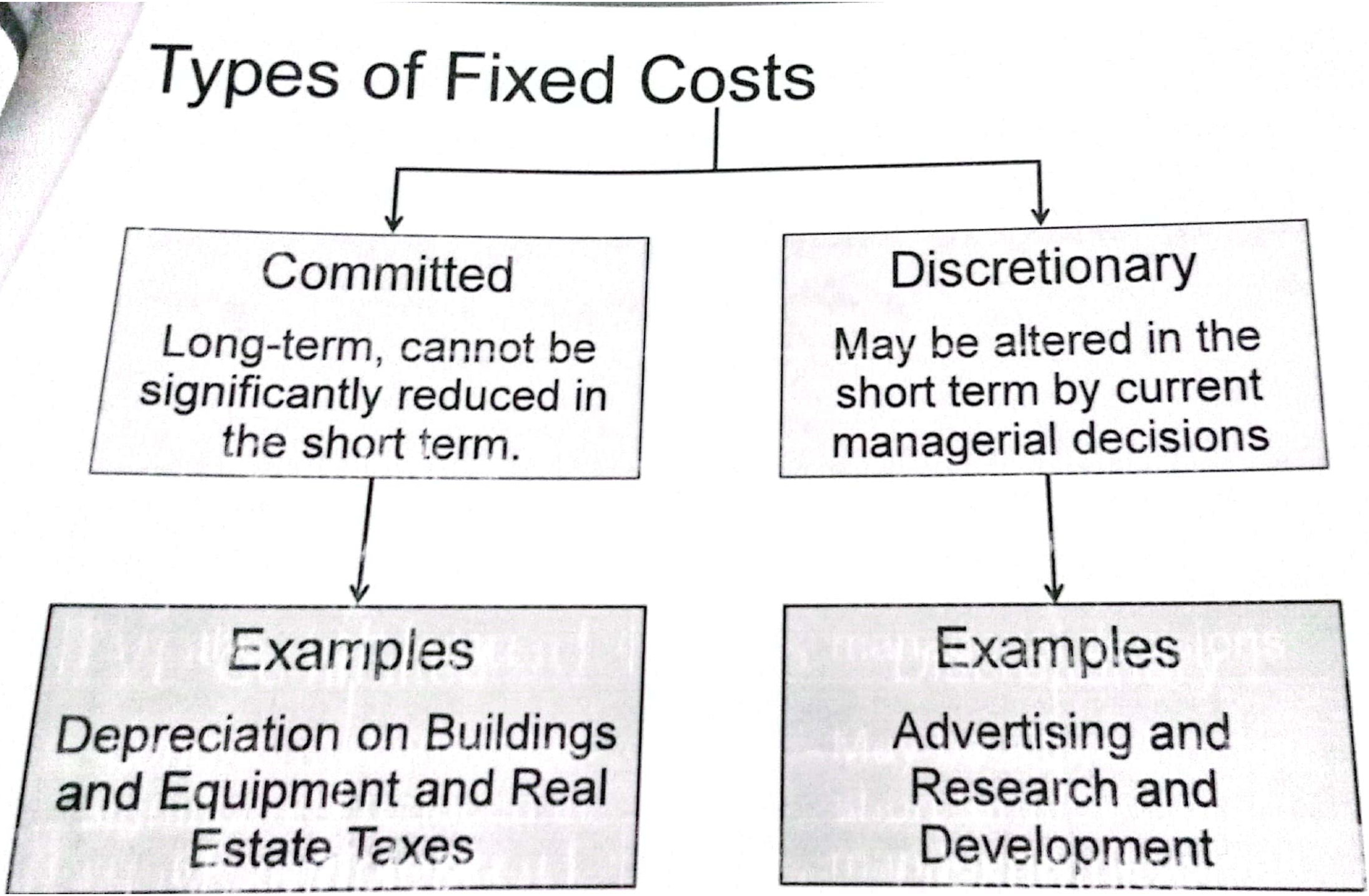


Fixed Cost Per Unit

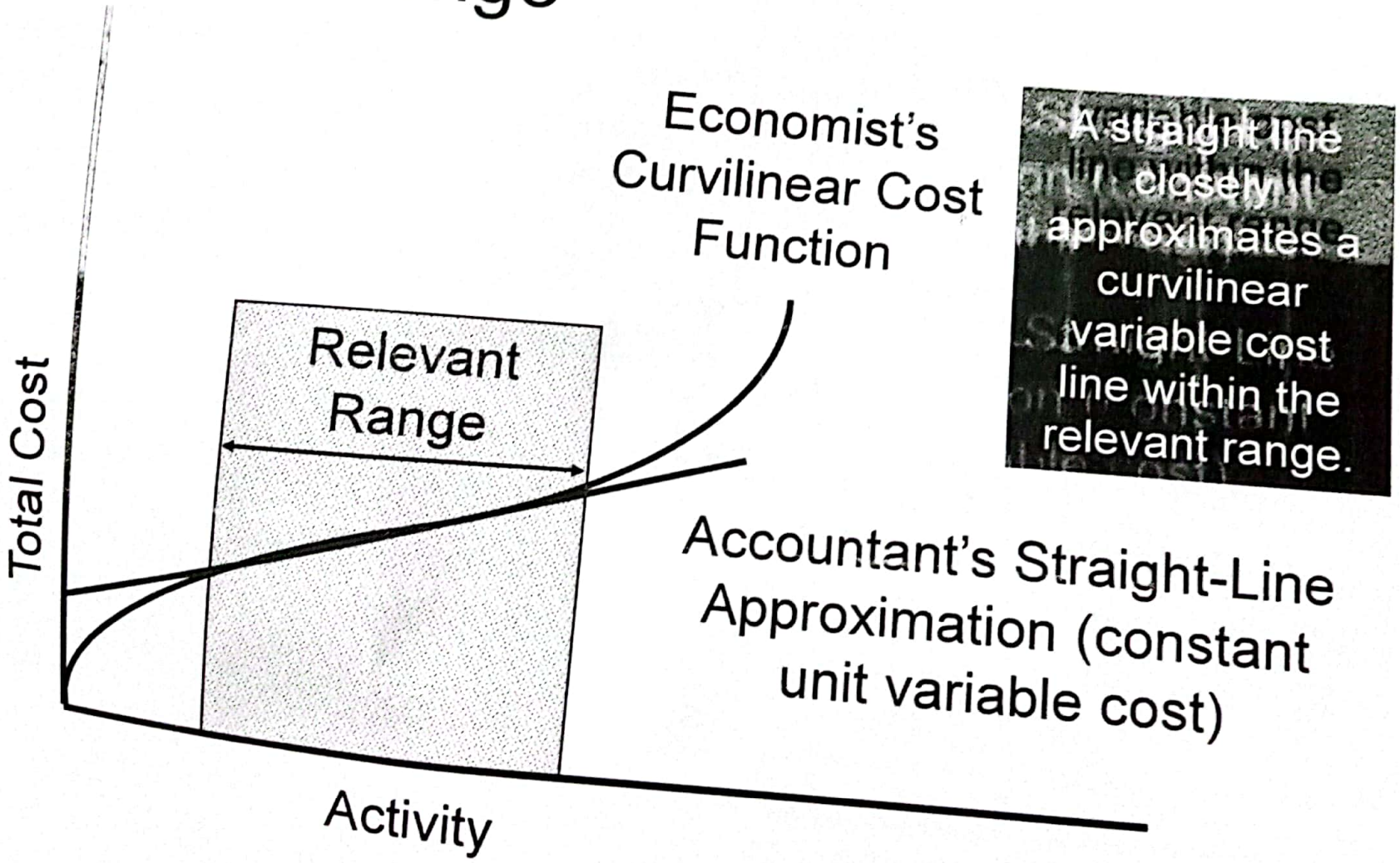
However, if expressed on a per unit basis, the average fixed cost per unit varies inversely with changes in activity. The average fixed cost **per cell phone call made** decreases as more calls are made.



Types of Fixed Costs



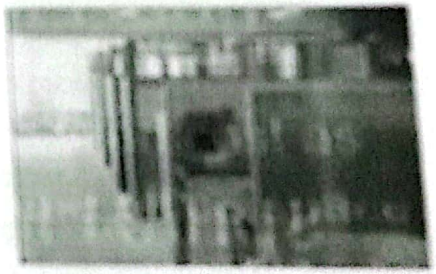
The Linearity Assumption and the Relevant Range



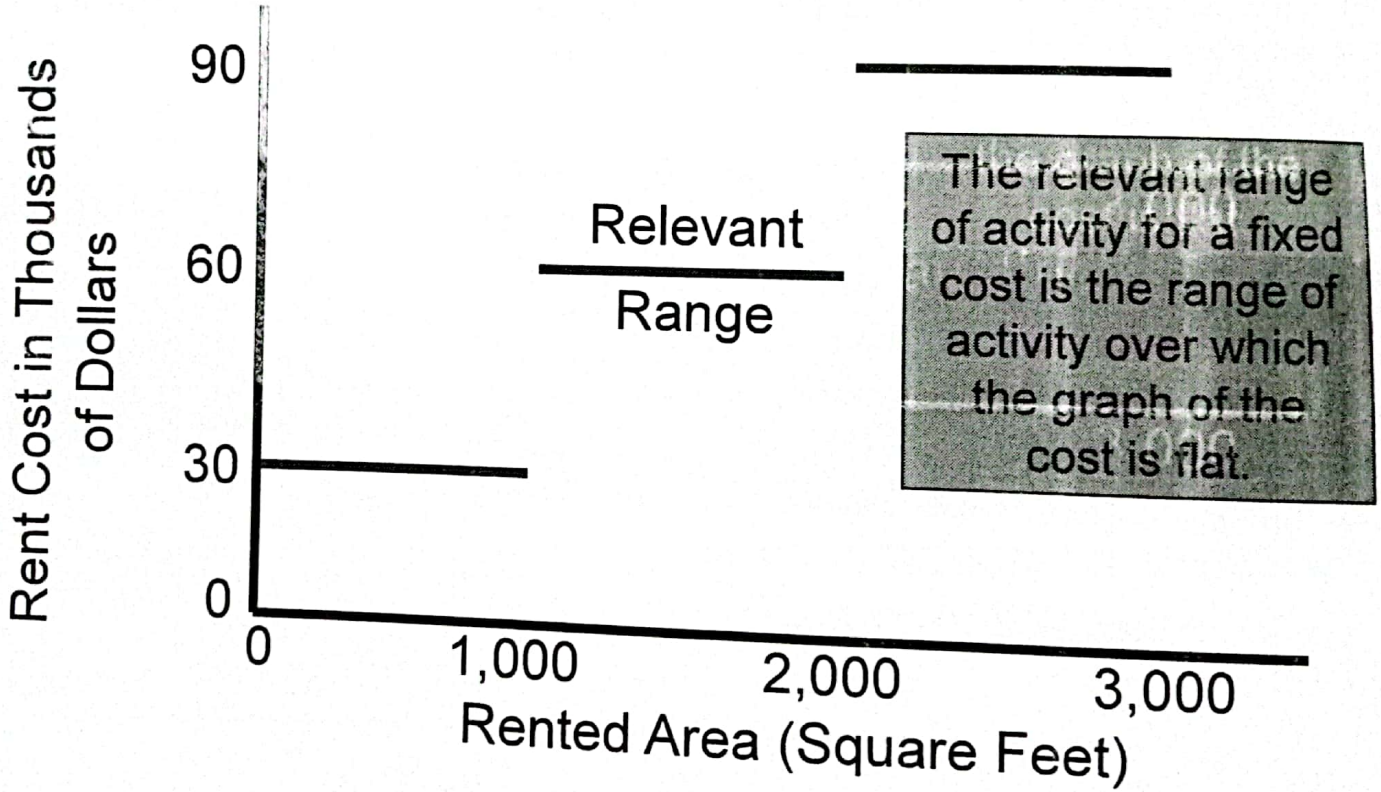
Fixed Costs and the Relevant Range

The relevant range of activity pertains to fixed cost as well as variable costs. For example, assume office space is available at a rental rate of $30,000 per year in increments of 1,000 square feet.

Fixed costs would increase in a step fashion at a rate of $30,000 for each additional 1,000 square feet.



Fixed Costs and the Relevant Range



Cost Classifications for Predicting Cost Behavior

Behavior of Cost (within the relevant range)		
Cost	**In Total**	**Per Unit**
Variable	**Total variable cost increase and decrease in proportion to changes in the activity level.**	**Variable cost per unit remains constant.**
Fixed	**Total fixed cost is not affected by changes in the activity level within the relevant range.**	**Fixed cost per unit decreases as the activity level rises and increases as the activity level falls.**

Quick Check ✓

Which of the following costs would be variable with respect to the number of cones sold at a Baskins & Robbins shop? (There may be more than one correct answer.)

A. The cost of lighting the store.

B. The wages of the store manager.

C. The cost of ice cream.

D. The cost of napkins for customers.

Quick Check ✓

Which of the following costs would be variable with respect to the number of cones sold at a Baskins & Robbins shop? (There may be more than one correct answer.)

A. The cost of lighting the store.

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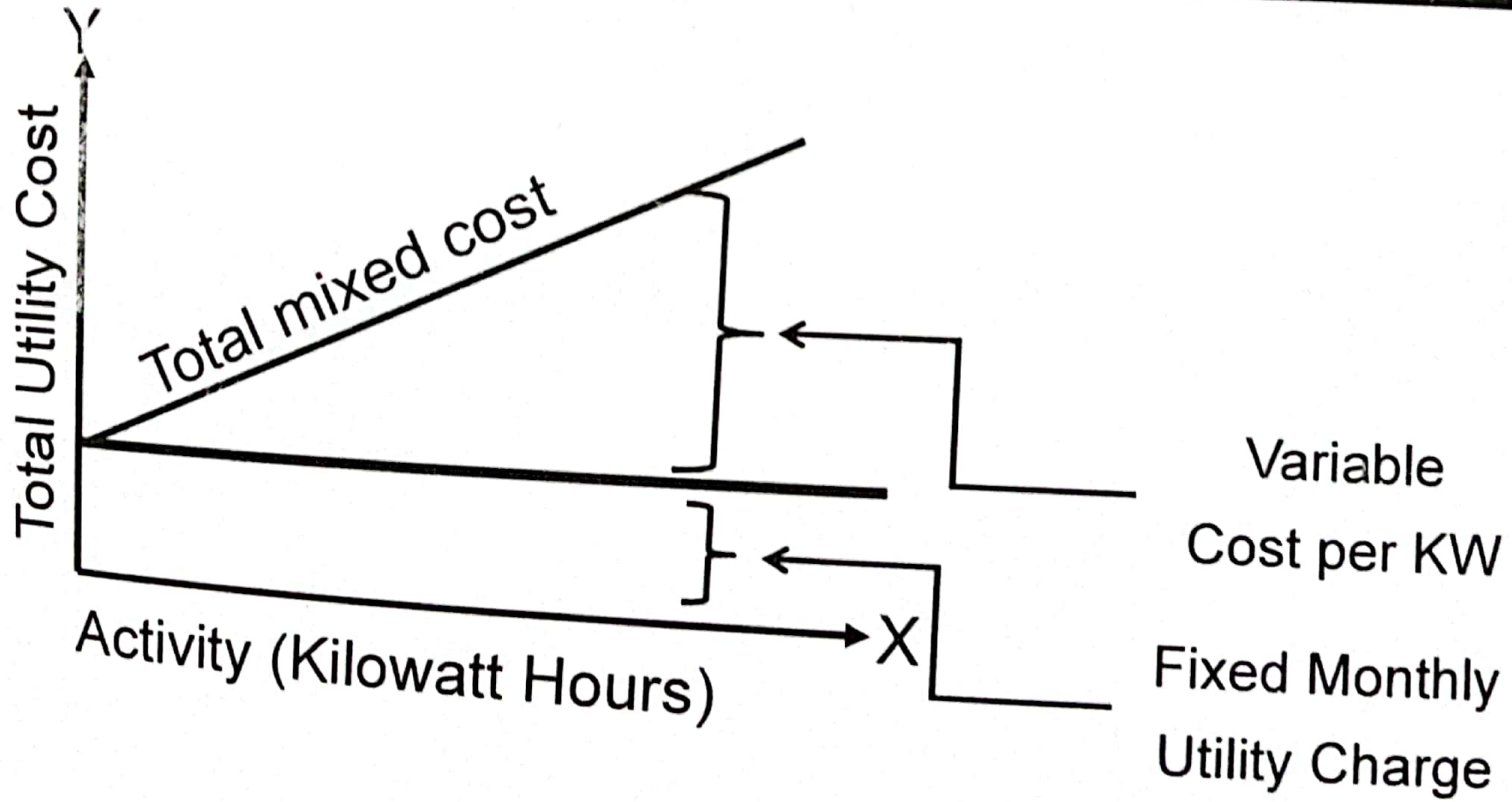
C. The cost of ice cream.

D. The cost of napkins for customers.

Mixed Costs

A mixed cost contains both variable and fixed elements. Consider the example of utility cost.

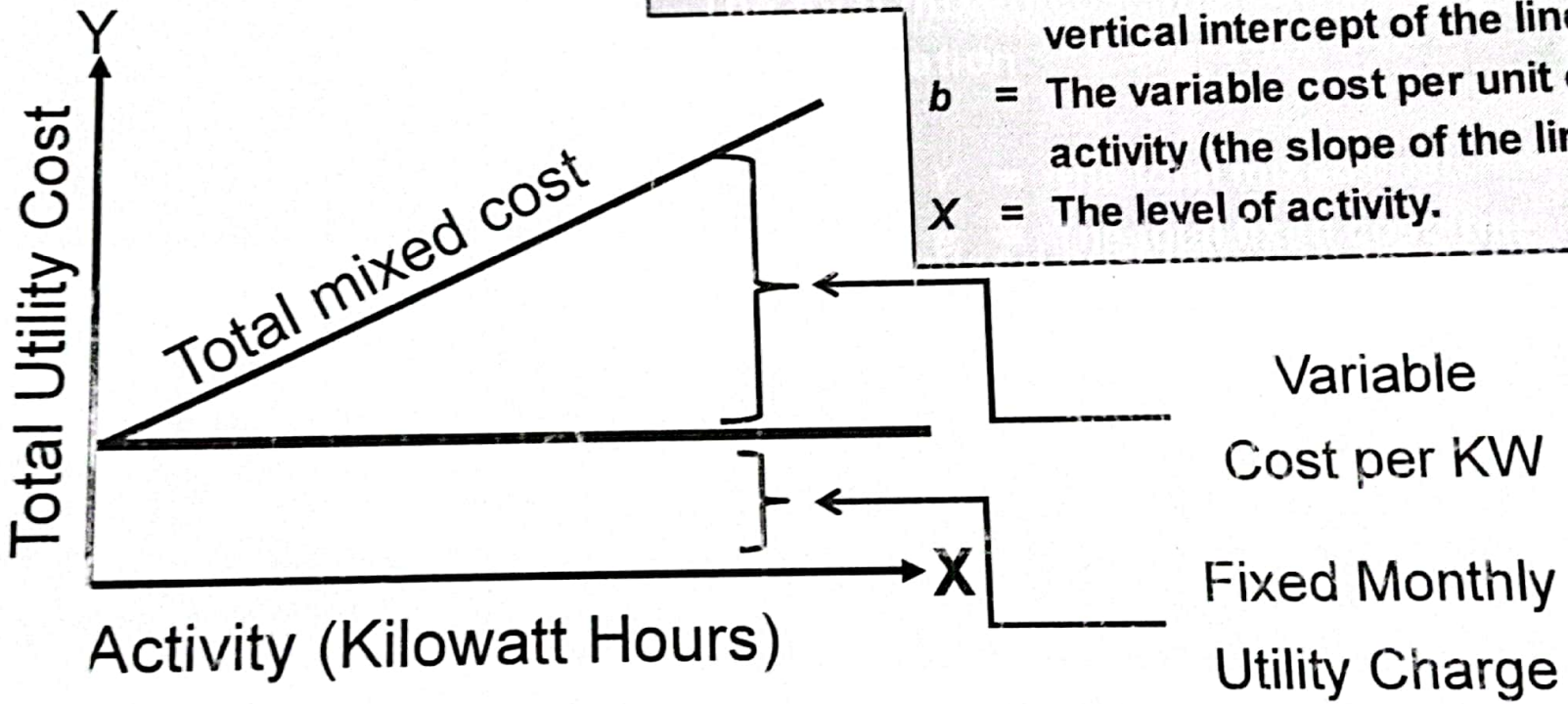


Mixed Costs

The total mixed cost line can be expressed as an equation: $Y = a + bX$

Where:

- Y = The total mixed cost.
- a = The total fixed cost (the vertical intercept of the line).
- b = The variable cost per unit of activity (the slope of the line).
- X = The level of activity.



Mixed Costs – An Example

If your fixed monthly utility charge is $40, your variable cost is $0.03 per kilowatt hour, and your monthly activity level is 2,000 kilowatt hours, what is the amount of your utility bill?

$$Y = a + bX$$

$$Y = \$40 + (\$0.03 \times 2{,}000)$$

$$Y = \$100$$

Analysis of Mixed Costs

Account Analysis and the Engineering Approach

In **account analysis**, each account is classified as either variable or fixed based on the analyst's knowledge of how the account behaves.

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Learning Objective 5

Analyze a mixed cost using a scattergraph plot and the high-low method.

Scattergraph Plots – An Example

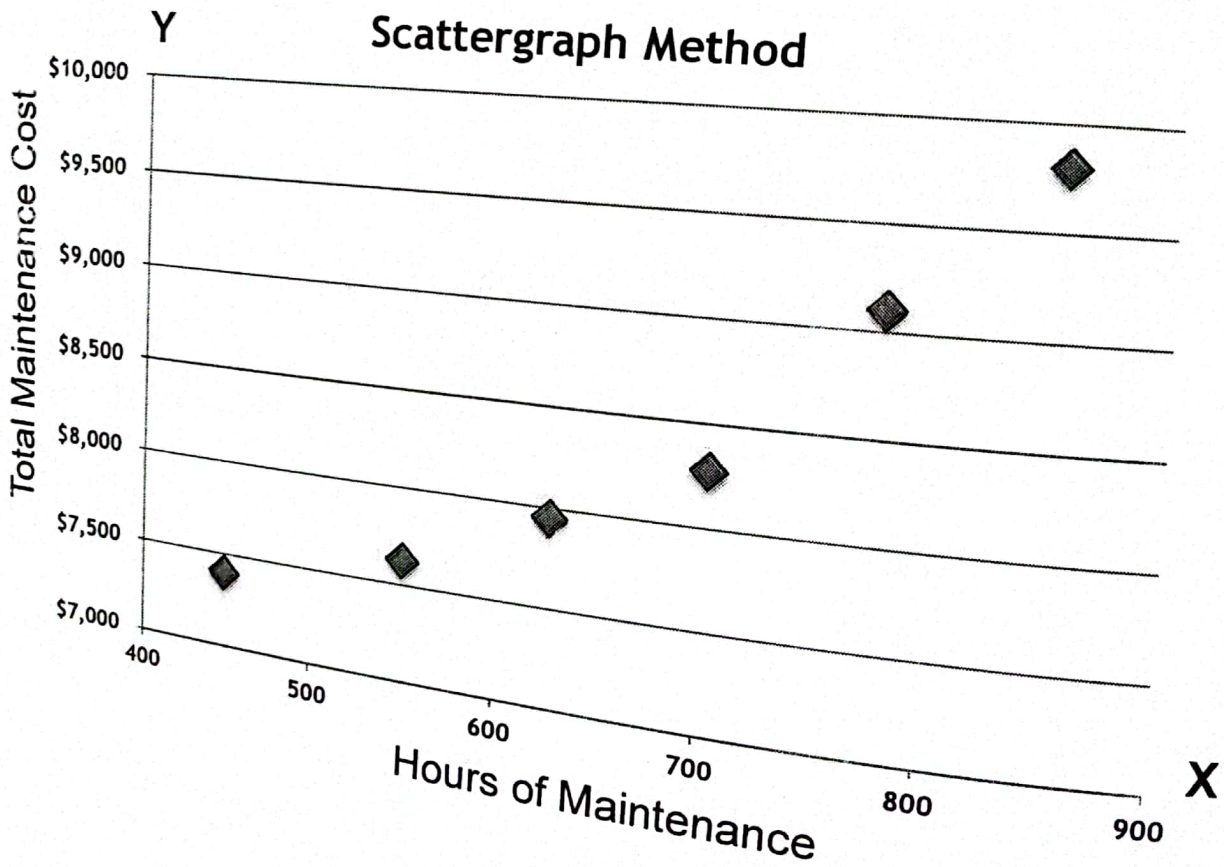
Assume the following hours of maintenance work and the total maintenance costs for six months.

High Low Method.xlsx

	A	B	C	D	E	F	G
1		Month		Hours of Maintenance		Total Maintenance Cost	
2		January		625		$ 7,950	
3		February		450		7,400	
4		March		700		8,275	
5		April		550		7,625	
6		May		775		9,100	
7		June		850		9,800	

The Scattergraph Method

Plot the data points on a graph (Total Cost ***Y*** "dependent variable" vs. Activity ***X*** *"independent variable"*).



The High-Low Method – An Example

High Low Method.xlsx

	A	B	C	D	E	F	G
1		Month		Hours of Maintenance		Total Maintenance Cost	
2		January		625		$ 7,950	
3		February		450		7,400	
4		March		700		8,275	
5		April		550		7,625	
6		May		775		9,100	
7		June		850		9,800	
8		High		850		$ 9,800	
9		Low		450		7,400	
10		Change		400		$ 2,400	
11							

The *variable cost per hour* of maintenance is equal to the change in cost divided by the change in hours.

$$\frac{\$2,400}{400} = \$6.00/\text{hour}$$

The High-Low Method – An Example

High Low Method.xlsx

	A	B	C	D	E	F	G
1		Month		Hours of Maintenance		Total Maintenance Cost	
8		High		850		$ 9,800	
9		Low		450		7,400	
10		Change		400		$ 2,400	
11							

Total Fixed Cost = Total Cost – Total Variable Cost

Total Fixed Cost = $9,800 – ($6/hour × 850 hours)

Total Fixed Cost = $9,800 – $5,100

Total Fixed Cost = $4,700

The High-Low Method – An Example

High Low Method.xlsx

	A	B	C	D	E	F	G
1		Month		Hours of Maintenance		Total Maintenance Cost	
8		High		850		$ 9,800	
9		Low		450		7,400	
10		Change		400		$ 2,400	
11							

The Cost Equation for Maintenance

$$Y = \$4{,}700 + \$6.00X$$

Quick Check ✓

Sales salaries and commissions are $10,000 when 80,000 units are sold, and $14,000 when 120,000 units are sold. Using the high-low method, what is the variable portion of sales salaries and commission?

a. $0.08 per unit
b. $0.10 per unit
c. $0.12 per unit
d. $0.125 per unit

Quick Check ✓

Sales salaries and commissions are $10,000 when 80,000 units are sold, and $14,000 when 120,000 units are sold. Using the high-low method, what is the variable portion of sales salaries and commission?

b. $0.10 per unit

	Units	Cost
High level	120,000	$ 14,000
Low level	80,000	10,000
Change	40,000	$ 4,000

$4,000 ÷ 40,000 units
= $0.10 per unit

Quick Check ✓

Sales salaries and commissions are $10,000 when 80,000 units are sold, and $14,000 when 120,000 units are sold. Using the high-low method, what is the fixed portion of sales salaries and commissions?

a. $ 2,000
b. $ 4,000
c. $10,000
d. $12,000

Quick Check ✓

Sales salaries and commissions are $10,000 when 80,000 units are sold, and $14,000 when 120,000 units are sold. Using the high-low method, what is the fixed portion of sales salaries and commissions?

a.) $ 2,000

Total cost	=	Total fixed cost + Total variable cost
$14,000	=	Total fixed cost + ($0.10 × 120,000 units)
Total fixed cost	=	$14,000 - $12,000
Total fixed cost	=	$2,000

Least-Squares Regression Method

A method used to analyze mixed costs if a scattergraph plot reveals an approximately linear relationship between the *X* and *Y* variables.

This method uses *all* of the data points to estimate the fixed and variable cost components of a mixed cost.

The goal of this method is to fit a straight line to the data that *minimizes the sum of the squared errors.*

Least-Squares Regression Method

- Software can be used to fit a regression line through the data points.
- The cost analysis objective is the same: $Y = a + bX$

Least-squares regression also provides a statistic, called the R^2, which is a measure of the goodness of fit of the regression line to the data points.

Comparing Results From the Two Methods

The two methods just discussed provide different estimates of the fixed and variable costs because they use differing amounts of the data points to provide estimates.

This is to be expected because each method provides the most accurate estimate because it uses all the data points.

Least-squares regression provides the most accurate estimate because it uses all the data points.

Learning Objective 6

Prepare income statements for a merchandising company using the traditional and contribution formats.

The Traditional and Contribution Formats

Comparison of the Contribution Income Statement with the Traditional Income Statement

Traditional Format		Contribution Format	
Sales	$ 100,000	Sales	$ 100,000
Cost of goods sold	70,000	Variable expenses	60,000
Gross margin	$ 30,000	Contribution margin	$ 40,000
Selling & admin. expenses	20,000	Fixed expenses	30,000
Net operating income	$ 10,000	Net operating income	$ 10,000

Used primarily for external reporting.

Used primarily by management.

Uses of the Contribution Format

The contribution income statement format is used as an internal planning and decision-making tool. We will use this approach for:

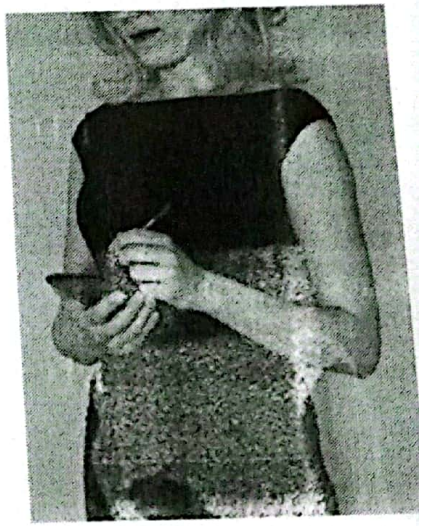
1. Cost-volume-profit analysis (Chapter 5).
2. Budgeting (Chapter 8).
3. Segmented reporting of profit data (Chapter 6).
4. Special decisions such as pricing and make-or-buy analysis (Chapter 12).

Learning Objective 7

Understand cost classifications used in making decisions: differential costs, opportunity costs, and sunk costs.

Cost Classifications for Decision Making

- Every decision involves a choice between at least two alternatives.
- Only those costs and benefits that differ between alternatives are relevant in a decision. All other costs and benefits can and should be ignored as irrelevant.



Differential Cost and Revenue

Costs and revenues that differ among alternatives.

Example: You have a job paying $1,500 per month in your hometown. You have a job offer in a neighboring city that pays $2,000 per month. The commuting cost to the city is $300 per month.

Differential revenue is:
$2,000 – $1,500 = $500

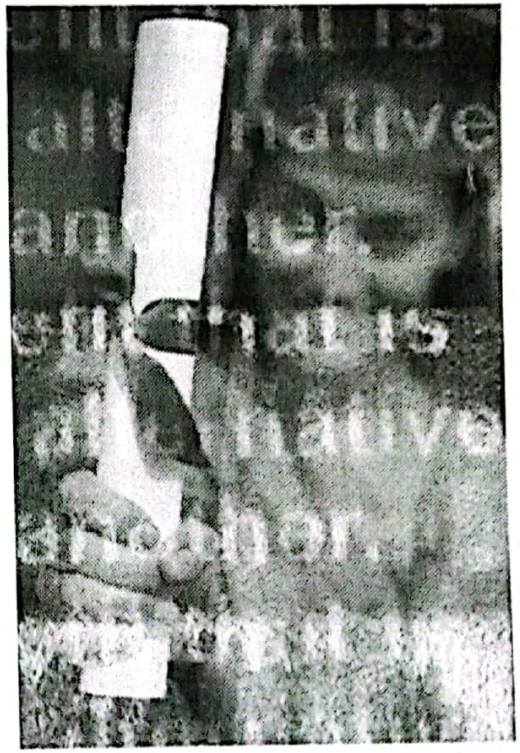
Differential cost is:
$300

Opportunity Cost

The potential benefit that is given up when one alternative is selected over another.

These costs are not usually entered into the accounting records of an organization, but must be explicitly considered in all decisions.

What are the opportunity costs you incur to attend this class?



Sunk Costs

Sunk costs have already been incurred and cannot be changed now or in the future. These costs should be ignored when making decisions.

Example: Suppose you had purchased gold for $1,100 an ounce, but now it is selling for $950 an ounce. Should you wait for the gold to reach $1,100 an ounce before selling it? You may say, "Yes" even though the $1,100 purchase is a sunk costs.

Quick Check ✓

Suppose you are trying to decide whether to drive or take the train to Portland to attend a concert. You have ample cash to do either, but you don't want to waste money needlessly. Is the cost of the train ticket relevant in this decision? In other words, should the cost of the train ticket affect the decision of whether you drive or take the train to Portland?

a. Yes, the cost of the train ticket is relevant.

b. No, the cost of the train ticket is not relevant.

Quick Check ✓

Suppose you are trying to decide whether to drive or take the train to Portland to attend a concert. You have ample cash to do either, but you don't want to waste money needlessly. Is the cost of the train ticket relevant in this decision? In other words, should the cost of the train ticket affect the decision of whether you drive or take the train to Portland?

A. Yes, the cost of the train ticket is relevant.

B. No, the cost of the train ticket is not relevant.

Quick Check ✓

Suppose you are trying to decide whether to drive or take the train to Portland to attend a concert. You have ample cash to do either, but you don't want to waste money needlessly. Is the annual cost of licensing your car relevant in this decision?

A. Yes, the licensing cost is relevant.

B. No, the licensing cost is not relevant.

Quick Check ✓

Suppose you are trying to decide whether to drive or take the train to Portland to attend a concert. You have ample cash to do either, but you don't want to waste money needlessly. Is the annual cost of licensing your car relevant in this decision?

A. Yes, the licensing cost is relevant.

(B.) No, the licensing cost is not relevant.

Quick Check ✓

Suppose that your car could be sold now for $5,000. Is this a sunk cost?

A. Yes, it is a sunk cost.

B. No, it is not a sunk cost.