# CHAPTER

**3**

**PREDETERMINED OVERHEAD RATES, FLEXIBLE BUDGETS, AND ABSORPTION/ VARIABLE COSTING**

**Learning Objectives**

After reading and studying Chapter 3, you should be able to answer the following questions:

1. Why and how are overhead costs allocated to products and services?
2. What causes underapplied or overapplied overhead and how is it treated at the end of a period?
3. What impact do different capacity measures have on setting predetermined overhead rates?
4. How is the high-low method used in analyzing mixed costs?
5. How do managers use flexible budgets to set predetermined overhead rates?
6. How do absorption and variable costing differ?
7. How do changes in sales or production levels affect net income computed under absorption and variable costing?
8. *(Appendix)* How is least squares regression used in analyzing mixed costs?

**Terminology**

**Absorption costing:** A cost accumulation and reporting method that treats the costs of all manufacturing components (direct material, direct labor, variable overhead, and fixed overhead) as inventoriable or product costs in accordance with generally accepted accounting principles

**Applied overhead:** The dollar amount of overhead assigned from an overhead account to Work in Process Inventory using the activity measure that was selected to develop the activity rate

**Contribution margin:** The difference between total revenues and total variable expenses (manufacturing and non-manufacturing) computed on either a total or per unit basis; the contribution margin indicates the dollar amount available to “contribute” to cover total fixed expenses, both manufacturing and nonmanufacturing

**Dependent variable:** An unknown variable that is to be predicted using one or more independent variables

**Direct costing:** See variable costing

**Expected capacity:** A short-run concept that represents the anticipated level of capacity to be used by a firm in the upcoming period, based on projected product demand

**Flexible budget:** A planning document that presents expected variable and fixed overhead costs at different activity levels

**Full costing:** See absorption costing

**Functional classification:** A group of costs that were all incurred for the same principle purpose (e.g., cost of goods sold, selling expenses, and administrative expenses)

**High-low method:** A technique that determines the fixed and variable portions of a mixed cost using only the highest and lowest levels of activity within the relevant range

**Independent variable:** A variable that, when changed, will cause consistent, observable changes in another variable; a variable used as the basis of predicting the value of a dependent variable

**Least squares regression analysis:** A statistical technique that analyzes the relationship between independent (causal) and dependent (effect) variables in order to develop an equation that can be used to predict the dependent variable; the method determines the line of “best fit” for a set of observations by minimizing the sum of the squares of the vertical deviations between actual points and the regression line; the method is used to determine the fixed and variable portions of a mixed cost

**Multiple regression:** A statistical technique that uses two or more independent variables to predict a dependent variable

**Normal capacity:** The long-run (5–10 years) average production or service volume of a firm; normal capacity represents an attainable level of activity since it takes into consideration cyclical and seasonal fluctuations; normal capacity is required by generally accepted accounting principles

**Normal costing:** An alternative to actual costing, this costing system assigns to WIP Inventory the actual costs of direct material and direct labor but an estimated amount of manufacturing overhead

**Outlier:** Abnormal or non-representative observations within a data set that should be disregarded when analyzing a mixed cost

**Overapplied overhead:** The credit balance in the overhead account that remains at the end of the period when the amount charged (applied) to production (i.e., debited to Work in Process) exceeds the actual amount of overhead incurred

**Phantom profit:** A temporary absorption costing profit caused by producing more inventory than is sold

**Practical capacity:** The physical production or service volume that a firm could achieve during normal working hours (i.e., theoretical capacity less ongoing, regular operating interruptions such as start-up time, and down time due to machine maintenance and holidays, for example)

**Product contribution margin:** The difference between the selling price and variable manufacturing cost of goods sold; this amount excludes non-manufacturing variable costs

**Regression line:** Any line that goes through the means (or averages) of the independent and dependent variables in a set of observations; mathematically, however, there is a line of “best fit”, which is the least squares regression line

**Simple regression:** A statistical technique that uses only one independent variable to predict a dependent variable

**Theoretical capacity:** The estimated maximum production or service volume that a firm could achieve during a period disregarding realities such as machine breakdowns and reduced or stopped plant operations on holidays

**Underapplied overhead:** The debit balance in the overhead account that remains at the end of the period when the amount of overhead charged (applied) to production (i.e., debited to Work in Process) is less than the actual overhead incurred

**Variable costing:** A cost accumulation and reporting method that includes only variable production costs (direct material, direct labor, and variable overhead) as inventoriable or product costs; it treats fixed overhead as a period cost; variable costing is not acceptable for external reporting and tax returns

**Volume variance:** The monetary impact of the difference between the budgeted capacity used to determine the fixed overhead application rate and the actual capacity at which the company operates

**Lecture Outline**

**LO.1 Why and how are overhead costs allocated to products and services?**

1. Introduction
	1. This chapter discusses normal costing and its use of predetermined overhead rates to determine product cost. Separation of mixed costs into variable and fixed elements, flexible budgets, and various production capacity measures are also discussed. Finally, the chapter discusses two methods of presenting information on financial statements: absorption and variable costing.
	2. Overhead consists of all non-direct material and non-direct labor costs incurred in the production area and in selling and administrative departments.
	3. Historically, direct material and direct labor were the manufacturer’s primary costs but today such firms have begun to invest more heavily in automation which has led to an increasing significance of overhead costs.
	4. Overhead presents a costing problem since it cannot be traced directly to distinguishable outputs.
2. Normal Costing and Predetermined Overhead
	1. General
		1. Normal costing is an alternative costing system to actual costing.
		2. As shown in text **Exhibit 3.1 (p. 63)** normal costing differs from actual costing in that normal costing assigns actual direct material and direct labor to products but allocates production overhead to products using a predetermined overhead rate.
		3. There are four primary reasons for using predetermined overhead rates in product costing:
			1. A predetermined overhead rate allows overhead to be assigned during the period as goods are produced or sold and services rendered thus providing more timely information;
			2. Predetermined overhead rates adjust for variations in actual overhead costs that are unrelated to activity. For example, electricity costs run higher in the summer because of the costs of air conditioning;
			3. Predetermined overhead rates overcome the problem of fluctuations in activity levels that have no impact on actual fixed overhead costs. Since unit fixed costs vary with activity level changes, a uniform annual predetermined overhead rate for all units produced during the year is needed to avoid significant variations in unit costs during the period; and
			4. Using predetermined overhead rates allows managers to be more aware of individual product or product line profitability as well as the profitability of doing business with a particular customer or vendor.
	2. Formula for Predetermined Overhead Rate
		1. Overhead is assigned to production (i.e., charged or debited to Work in Process) using a predetermined rate computed as follows:

Predetermined OH rate = Total Budgeted OH Cost at a Specified Activity Level

Volume of Specified Activity Level

* + 1. Overhead is typically budgeted for one year although a longer period may be used by some companies (e.g., ship builder).
		2. To allocate overhead effectively to heterogeneous products or services, a measure of activity that is common to all output must be selected.
		3. The activity base should be a cost driver that directly causes the incurrence of overhead costs.
		4. Common activity bases include direct labor hours, direct labor dollars, and machine hours. Other activity bases could include:
			1. Number of purchase orders;
			2. Physical characteristics such as tons or gallons;
			3. Number of, or amount of time used for performing, machine setups;
			4. Number of parts;
			5. Material handling time;
			6. Product complexity; and
			7. Number of product defects.
	1. Applying Overhead to Production
		1. The journal entries required under normal costing are identical to those made in an actual cost system with one exception: the amount of overhead applied to production.
		2. **Applied overhead** is the amount of overhead assigned (charged, debited) to Work in Process Inventory using the activity that was employed to develop the application rate. For convenience, both actual and applied overhead are recorded in a single general ledger control account.
		3. The amount of applied overhead is determined as follows:

		OH Applied = *Actual Volume* of Activity Level x the *Predetermined OH Rate*
		4. Increasingly, because overhead represents an ever-larger part of product cost in automated factories, firms are applying variable and fixed overhead using separate rates. In this case, the general ledger will have separate variable and fixed overhead accounts as illustrated in text **Exhibit 3.2 (p. 65)**.
		5. Actual overhead costs are charged (debited) to the overhead control account.
			1. Accounts are credited as appropriate (e.g., Cash, Accounts Payable, Accumulated Depreciation, Pre-paid Insurance, etc.)

**LO.2 What causes underapplied or overapplied overhead and how is it treated at the end of a period?**

* + 1. Actual overhead incurred during a period will rarely equal applied overhead.
			1. **Underapplied overhead** is the debit balance in the overhead control account that remains at the end of the period when the applied overhead is less than the actual overhead.
			2. **Overapplied overhead** is the credit balance in the overhead control account that remains at the end of the period when the applied overhead is greater than the actual overhead.
		2. Two factors cause underapplied or overapplied overhead:
			1. A difference between actual and budgeted overhead costs (numerator differences); and
			2. A difference between actual and budget activity levels (denominator differences).
	1. Disposition of underapplied or overapplied overhead
		1. Since overhead accounts are temporary accounts, their ending balances must be closed at the end of the accounting period.
		2. The method of disposition of underapplied or overapplied overhead depends upon the materiality of the amount involved.
			1. If immaterial, the ending balances in the overhead control accounts are closed entirely to Cost of Goods Sold. Text **Exhibit 3.3 (p. 67)** illustrates the impact of under-and-over-applied overhead on Cost of Good Sold expense.
			2. If material, the ending balances in the overhead control accounts should be prorated to the accounts containing applied overhead: Work in Process Inventory, Finished Goods Inventory, and Cost of Goods Sold. Text **Exhibit 3.4 (p. 68)** illustrates the proration of overapplied fixed overhead.

**LO.3 What impact do different capacity measures have on setting predetermined overhead rates?**

* 1. Alternative Capacity Measures
		1. The choice of activity level (i.e., the denominator in the predetermined OH rate equation) impacts the amount of underapplied and overapplied overhead.
			1. **Theoretical capacity** is the estimated maximum production or service volume that a firm could achieve during a period, disregarding realities such as machine breakdowns and reduced or stopped plant operations on holidays.
			2. **Practical capacity** is the physical production or service volume that a firm could achieve during regular working hours with consideration given to ongoing, expected operating interruptions.
			3. **Normal capacity** is the long-run (5–10 years) average production or service volume of a firm that takes into consideration cyclical and seasonal fluctuations.
			4. **Expected capacity** is a short-run concept that represents the anticipated level of capacity to be used by a firm in the upcoming period, based on projected product demand.
		2. If actual results are close to budgeted results (in both dollars and volume), expected capacity should result in product costs that most closely reflect actual costs and thus result in immaterial amounts of underapplied and overapplied overhead.
			1. Unless otherwise noted in the text, overhead rates are based on expected capacity.
			2. The level selected for use in computing predetermined overhead rates is often referred to as the Denominator Level.
		3. See text **Exhibit 3.5 (p. 69)** for a visual representation of measures of capacity.
			1. Note that expected capacity and practical capacity may be closer to equal than depicted in the exhibit, especially in highly automated factories.

**LO.4 How is the high-low method used in analyzing mixed costs?**

1. Separating Mixed Costs
	1. General
		1. Accountants describe a given cost’s behavior pattern according to the way its total cost (rather than its unit cost) reacts to changes in a related activity measure.
		2. Accountants assume that costs are linear rather than curvilinear.
			1. Therefore, the general formula for a straight line can be used to describe any cost within a relevant range of activity:

			 y = a + bx

Where:

y = total cost (dependent variable)

a = fixed portion of total cost (y-intercept)

b = unit change of variable cost relative to unit changes in activity (slope)

x = activity base to which y is being related (the predictor, cost driver, or independent variable)

* + 1. A fixed cost remains constant in total within the relevant range of activity under consideration.
			1. The linear formula for a fixed cost is y = a.
		2. A variable cost varies in total as production changes, but the cost per unit remains constant.
			1. The linear formula for a variable cost is y = bx.
		3. Mixed costs contain both a variable and a fixed cost element.
			1. The linear formula for a mixed cost is y = a + bx
	1. The High-Low Method
	2. The **high-low method** is a technique for determining the fixed and variable portions of a mixed cost by using only the highest and lowest levels of activity and related costs within the relevant range.
	3. The method determines the variable cost per unit *b* as follows:

Cost at High Activy Level – Cost at Low Activity Level
*b* = High Activity Level – Low Activity Level

 Changes in Total Cost
*b* = Changes in Activity Level

* 1. The fixed portion of a mixed cost *a* is found by subtracting total variable cost from total cost at either the high or low activity level:

	 *a* = y – *b*x

	 where: y = total cost for either one of the observations used to determine *b*
	 *b* = variable cost per unit (determined in the previous step)
	 x = activity volume of the observation used to determine y
	2. **Outliers** are abnormal or nonrepresentative observations within a data set that should be discarded when applying the high-low method.
	3. Text **Exhibit 3.6 (p. 71)** illustrates the high low method.
	4. Two potential weaknesses of the high-low method are that outliers can inadvertently be used and the method uses only two data points (observations) to determine the cost equation.

**LO. 8 (*Appendix*) How is least squares regression used in analyzing mixed costs?**

* 1. Least Squares Regression Analysis
		1. Ordinary Least Squares (OLS) regression is a statistical technique that analyzes the association between dependent and independent variables.
			1. A **dependent variable (cost)** is an unknown variable that is to be predicted using one or more independent variables.
			2. An **independent variable (activity)** is a variable that, when changed, will cause consistent, observable changes in another variable; a variable used as the basis of predicting the value of a dependent variable.
		2. OLS determines the line of “best fit” for a set of observations by minimizing the sum of the squares of the vertical deviations between actual points and the regression line.
		3. When multiple independent variables exist, the least squares method can be used to select the best predictor of the dependent variable based on which independent variable has the highest correlation with the dependent variable.
		4. **Simple regression** is a statistical technique that uses only one independent variable to predict a dependent variable while **multiple regression** uses two or more independent variables to predict a dependent variable.
		5. A **regression line** is any line that goes through the means (or averages) of the set of observations for an independent variable and its dependent variables.
			1. As depicted in text **Exhibit 3.15 (p. 81)**, mathematically, there is a line of “best fit” which is referred to as the **least squares regression line** (the red line in Graph B).
			2. It is possible for a least squares regression line not to pass through any of the actual observation points since the line has been determined mathematically to best fit the data.
		6. OLS can be used to determine the fixed and variable portions of a mixed cost.
			1. The equations needed to compute the variable cost per unit (b) and total fixed cost (a) are provided and illustrated in the text on pages 81-82.
		7. The following considerations are important when using the OLS model:
			1. For regression analysis to be useful, the independent variable must be a valid predictor of the dependent variable; this relationship can be tested by computing the coefficient of correlation;
			2. OLS should only be used within a relevant range of activity; and
			3. The OLS model is useful only as long as the circumstances existing at the time of its development remain constant.

**LO.5 How do managers use flexible budgets to set predetermined overhead rates?**

* 1. Flexible Budgets
		1. A **flexible budget** is a planning document that presents expected variable and fixed overhead costs at different levels of activity within a relevant range.
		2. Estimated variable costs at a given activity level may be computed by multiplying the variable cost per unit by the activity level volume.
		3. See text **Exhibit 3.7 (p. 72)** for an example of a flexible overhead budget.
	2. Plantwide versus Departmental Overhead Rates.
		1. Because companies may produce many types of products, a single plantwide overhead rate often does not produce relevant unit cost estimates.
		2. Text **Exhibit 3.8 (p. 73)** illustrates the significant differences in unit costs that can occur between using a single plantwide overhead rate versus separate departmental overhead rates.
		3. Departmental overhead rates can provide more useful information by using the most appropriate cost driver for each department.
			1. A company with multiple departments that use significantly different types of work effort as well as diverse materials that require considerably different processing times in those departments, should use separate departmental overhead rates.
			2. Furthermore, the use of separate variable and fixed categories within each department helps management understand how costs react to changes in activity and makes it easier to generate different reports for external and internal reporting purposes.

**LO 6 How do absorption and variable costing differ?**

1. Overview of Absorption and Variable Costing
	1. General
		1. Cost accumulation involves determining which manufacturing costs are recorded as product costs and which are recorded as period costs.
		2. Cost presentation involves determining how costs are shown on external financial statements or internal management reports.
		3. The two methods of cost accumulation and presentation are absorption costing and variable costing.
	2. **Absorption costing**, also known as **full costing**, is a cost accumulation and reporting method that treats the costs of all manufacturing components (direct material, direct labor, variable overhead, and fixed overhead) as inventoriable or product costs. The types of costs included are shown on the left panel of text **Exhibit 3.9 (p. 74)**.
		1. Absorption costing presents expenses on an income statement according to their functional classifications.
			1. A **functional classification** is a group of costs that were all incurred for the same principle purpose. Examples include cost of goods sold, selling expenses, and administrative expenses.
			2. Thus, as shown on the right side of text Exhibit 3.9, the absorption costing income statement format is as follows:

			Revenue – Cost of Goods Sold – Selling & Administrative Expenses = Income before Tax
		2. Non-manufacturing costs (selling and administrative) are considered to be period costs and are expensed in the period incurred.
	3. **Variable costing**, also known as **direct costing**, is a cost accumulation and reporting method that includes only variable production costs (direct material, direct labor, and variable overhead) as inventoriable or product costs. The types of costs included are shown on the left panel of text **Exhibit 3.10 (p. 75)**.
		1. As shown on the right side of text Exhibit 3.10, the variable costing income statement presents expenses according to cost behavior (variable and fixed):

		Revenue – Variable CGS = Product CM – Variable S&A Expenses = Total CM – Fixed Expenses (OH and S&A) = Income before Tax
			1. *Cost of goods sold* is more appropriately called *variable cost of goods sold* since it is composed of only the variable production costs (DM, DL, VOH) related to the units sold.
		2. **Product contribution margin** is the difference between selling price and variable cost of goods sold and indicates how much revenue is available to cover all period costs and to potentially provide net income. Product contribution margin is commonly called *manufacturing margin.*
		3. Total **contribution margin** is the difference between revenue and all variable costs regardless of the area of incurrence (production or nonproduction).
		4. See text **Exhibit 3.11 (p. 76)** for a diagram of variable costing relationships.
	4. Thus, two differences exist between absorption and variable costing: one relates to cost accumulation and the other relates to cost presentation.
		1. The cost accumulation difference is that absorption costing treats fixed overhead as a product cost while variable costing treats it as a period cost.
			1. Absorption costing advocates contend that fixed overhead costs should be considered product costs since production could not take place without the incurrence of fixed overhead.
			2. Variable costing advocates contend that fixed overhead costs would be incurred whether or not any products are manufactured; thus, such costs are not caused by production and cannot be product costs.
		2. The cost presentation difference is that absorption costing classifies expenses by function whereas variable costing categorizes expenses by behavior first and then by function.
	5. Absorption costing is the traditional approach to product costing and must be used for external financial statements and tax returns.
		* 1. Authoritative accounting bodies such as the FASB and the SEC believe absorption costing furnishes external parties with a more informative picture of earnings, as compared to variable costing.
			2. Variable costing is not acceptable for external reporting and tax returns.
	6. Since variable costing distinguishes costs by behavior, variable costing reports are more useful for managerial activities such as budgeting, cost-volume-profit analysis, and relevant costing where an understanding of cost behavior is extremely important.
	7. Absorption and Variable Costing Illustrations
		1. Text **Exhibit 3.12 (p. 77)** provides unit production costs, annual budgeted nonmanufacturing costs, and other basic operating data needed to illustrate the differences between absorption and variable costing. The case assumptions include:
			1. All costs remain constant over the three years in question;
			2. All units started were completed and thus there are no WIP inventories at the end of the period; and
			3. All actual costs are assumed to be equal to standard and budgeted costs for the years presented.
		2. Text **Exhibit 3.13 (p. 78)** presents absorption and variable costing income statements for the three years.
		3. Although production and operating costs were equal to standard costs and budgeted costs for the three years, differences in actual and budgeted capacity utilization occurred during the last two years creating a volume variance for each of those years under absorption costing.
			1. The **volume variance** is the monetary impact of a difference between the budgeted capacity used to determine the fixed overhead application rate and the actual capacity at which the company operates:

			Volume Variance = Fixed OH Rate x Unit Change in Inventory
			2. There was no change in inventory in Year 1, but ending inventory increased by 20,000 units in Year 2, and then decreased by 20,000 units in Year 3 creating a difference in income (i.e., the volume variance) under the two methods.
		4. **Phantom profits** are temporary absorption costing profits caused by producing more inventory than is sold.
			1. Absorption costing creates phantom profits when more inventory is produced than is sold because fixed overhead costs are deferred in the ending inventory whereas all fixed costs are expensed under variable costing in the period incurred.
			2. When previously produced inventory is sold, phantom profits disappear.

**LO.7 How do changes in sales or production levels affect net income computed under absorption and variable costing?**

* 1. Comparison of the Two Approaches
		1. As summarized in text **Exhibit 3.14 (p. 79)**, absorption costing income will equal variable costing income if production is equal to sales.
			1. Absorption costing income will be greater than variable costing income if production is greater than sales as some fixed overhead cost is deferred as part of inventory cost on the balance sheet under absorption costing whereas the total amount of fixed overhead cost is expensed as a period cost under variable costing.
		2. Absorption costing income will be less than variable costing income if production is less than sales.
			1. Absorption costing expenses all of the current period fixed overhead cost as well as releasing some fixed overhead cost from beginning inventory where it had been deferred from a prior period.
			2. Variable costing shows on the income statement only current period fixed overhead, so that the additional fixed overhead released from beginning inventory makes absorption costing income lower.
		3. The differences in income between the two methods are only timing differences based on when fixed overhead costs flow through to the income statement as part of cost of goods sold under absorption costing. Total income over the life of the enterprise will ultimately be the same under both methods.
		4. The process of deferring and releasing fixed overhead costs into and from inventory does make it possible to manipulate income under absorption costing by adjusting levels of production relative to sales. This leads some people to believe that variable costing might be more useful for external reporting purposes than absorption costing.
		5. To plan, control, and make decisions, managers need to understand and be able to project how costs will change in reaction to changes in activity levels. Thus, variable costing is more useful than absorption costing since variable costing provides information about the behavior of costs.

**Multiple Choice Questions**

* + - 1. (LO.1) All of the following are reasons for using predetermined overhead rates in product costing *except*:
1. to overcome the problem of fluctuations in activity levels that have no impact on fixed overhead costs.
2. to overcome the problem caused by overhead containing both fixed and variable costs.
3. to adjust for variations in actual overhead costs that are unrelated to fluctuations in activity.
4. to allow management to determine whether a product, product line, or customer is profitable.
	* + 1. (LO.2) What is the best method for disposing of significant underapplied factory overhead?
				1. Charge the underapplied amount to cost of goods sold
				2. Prorate the underapplied amount to cost of goods sold, finished goods, and work in process
				3. Prorate the underapplied amount to inventory only (work in process and finished goods)
				4. Charge the underapplied amount to a loss account at the end of the period
			2. (LO.2) Select the *incorrect* statement concerning overapplied overhead.
				1. The overhead control account will have a debit balance.
				2. The amount of overhead transferred to WIP from the overhead control account exceeded the actual amount of overhead incurred.
				3. Overapplied overhead must be closed at year-end because a single year’s activity level was used to set the predetermined overhead rate.
				4. Overapplied overhead may result if the company’s actual utilization of capacity is greater than expected.
			3. (LO.3) In determining cost behavior in business, the cost function is often expressed as *y* = *a* + *bx*. What does the “a” term represent?

a. Total variable costs

b. Total fixed costs

c. Unit variable cost

d. Unit fixed cost

* + - 1. (LO3) M Company derived the following cost equation to explain its monthly manufacturing overhead cost:

 OH = $80,000 + $12MH, where MH = machine hours

The standard time required to manufacture one unit is 4 machine hours. The company applies manufacturing overhead to production on the basis of machine hours and its normal annual production is 50,000 units. What is the estimated variable manufacturing overhead cost for a month in which scheduled production is 5,000 units?

a. $360,000

b. $320,000

c. $240,000

d. $80,000

* + - 1. (LO.4 & LO.8) Which method of separating mixed costs ensures the best fitting regression line?
				1. High-low method
				2. Scattergraph method
				3. Proration method
				4. Least squares regression method
			2. (LO.4) W Company is working on its annual profit plan for the coming year. The company wants to determine the cost behavior pattern of its maintenance costs. The prior year’s data regarding maintenance hours and costs are as follows.

 Hours of Maintenance

 Activity Costs

 January 480 $ 4,200

 February 320 3,000

 March 400 3,600

 April 300 2,820

 May 500 4,350

 June 310 2,960

 July 320 3,030

 August 520 4,470

 September 490 4,260

 October 470 4,050

 November 350 3,300

 December 340 3,160

 Using the high-low method, estimate the amount of maintenance cost per hour.

a. $2,781

b. $570

c. $7.50

d. $0.13

* + - 1. (LO.8) X Company uses simple regression to separate its selling costs (*y*) into fixed and variable components based on units sold (*x*). A computer software program generated the following regression analysis results:

 Average *x* 400
 Average *y*  3600

 *a*  684.65

 Standard error of *a*  49.515

 *b* 7.2884

 Standard error of *b*  0.12126

Std error of the estimate 34.469

 r2 0.99724

What equation should X Company use to estimate its selling costs?

a. y = $3,600 + 400x

b. y = $684.65 + 7.2884x

c. y = $3,600 + 7.2884x

d. y = $684.65 + .12126x

* + - 1. (LO.5) In applying overhead, individual department rates would be used instead of a plant wide rate if

a. the manufactured products differ in the resources consumed from the individual departments in the plant.

b. a company wants to adopt a standard cost system.

c. a company’s manufacturing operations are highly automated.

d. manufacturing overhead is the largest component of product cost.

* + - 1. (LO.6) Which cost accumulation and reporting system treats the costs of all manufacturing components (direct material, direct labor, and both variable and fixed overhead) as product costs?

a. Absorption costing

b. Variable costing

c. Mixed costing

d. None of the above

* + - 1. (LO.6) Which cost accumulation and reporting system reports the total contribution margin?

a. Absorption costing

b. Variable costing

c. Mixed costing

d. None of the above

* + - 1. (LO.6) Which cost accumulation and reporting system is required for external reporting and tax purposes?

a. Absorption costing

b. Variable costing

c. Mixed costing

d. None of the above

* + - 1. (LO.7) The primary difference between absorption and variable costing lies in the treatment of:

a. variable selling and administrative costs.

b. variable overhead costs.

c. fixed overhead costs.

d. fixed selling and administrative costs.

* + - 1. (LO.7) Which cost accumulation and reporting system provides management an incentive to over-produce (i.e., produce more units than can be sold)?

a. Absorption costing

b. Variable costing

c. Mixed costing

d. None of the above

* + - 1. (LO.7) In a period in which there is no change in inventory, which cost accumulation and reporting system will report higher profits?

a. Absorption costing

b. Variable costing

c. Mixed costing

d. None of the above

**Multiple Choice Solutions**

1. b

2. b

3. a

4. b

5. c (CMA Adapted)

5,000 units × 4 machine hours per unit = 20,000 machine hours × $12 per machine hour **= $240,000** variable overhead

6. d

7. c (CMA Adapted)

 Unit variable cost = ($4,470 - $2,820) / (520 – 300) = $7.50

8. b (CMA Adapted)

9. a (CMA Adapted)

10. a

11. b

12. a

13. c

14. a

15. d