

BEC-2

Decision Making

**Corporate Governance, Internal Control &
Enterprise Risk Management**

Decision Making

A primary purpose of cost measurement is to allocate the costs of production (direct materials, direct manufacturing labor, and manufacturing overhead) to the units produced. It also provides important information for management decisions, such as product pricing decisions.

Cost Definitions

$$y = A + Bx \quad [TC = \text{Fixed} + \text{Var} (X)]$$

In this formula:

- The **y** is equal to **total cost** and is referred to as the *dependent variable* since its amount is dependent on the other factors.
- The **x** is equal to **volume** and is referred to as the *independent variable* since it can be increased or decreased at the company's discretion. This is also often referred to as the **cost driver** as the amount of costs incurred will be largely dependent on the volume of this variable.
- The **A** is equal to **fixed costs** and remains constant at any volume as long as the company is operating within a given range of volume.
- The **B** is equal to the **variable cost** per unit.

Note: These cost assumptions only remain valid within the **Relevant Range**.

- **Mixed cost** (Semi-Variable – Fixed and Variable Component)
- **High-Low Method** – This method computes the slope for the variable rate based on the highest and lowest observations. The difference in cost is divided by the difference in activity to obtain the variable cost.

Hi-Low Method

Total Cost	Hours
\$ 110,000	30,000
\$ 80,000	20,000
\$ 30,000	/10,000
	= \$3hr

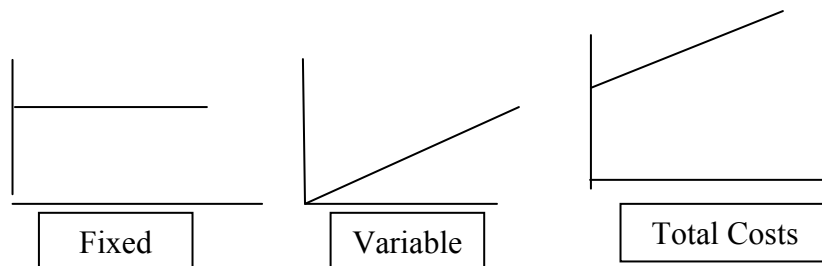
Total Cost/Hours = \$3 per hour

$$TC = F + V(X)$$

$$110 = F + 3(30,000)$$

$$F = 20$$

$$TC = 20 + 3(X)$$



Cost Classifications

Cost accounting refers to the calculation of the cost of manufactured inventory. There are three types of *Product costs* included:

- **Direct materials** – These are the materials that are physically included in the final manufactured product. For example, if a company is manufacturing metal paper clips, the only direct material is the metal. Some costs might include freight in, insurance in transit, storage, import duties and purchasing and receiving dept costs.
- **Direct labor** – These are the wages paid to those employees working with the direct materials to change them from their raw state to finished goods.
- **Overhead** – All other costs related to manufacturing are reported here. These include *indirect materials* (for example, sandpaper used to smooth edges of the paper clips and cleaning supplies to keep the assembly line in good condition) and *indirect labor* (for example, supervisors and maintenance workers in the factory building). Other examples of overhead include payroll taxes and fringe benefits for manufacturing employees, rent and depreciation on factory assets, lubricants, shop supplies and utilities to keep the factory in operation.

Direct materials and direct labor are known as the **prime costs** of manufacturing. Direct labor and overhead are known as the **conversion costs** of production.

Manufacturing costs are often called **product costs**, since they are matched to the product and not expensed until the product is sold. Costs that are not associated with manufacturing, such as selling, general, and administrative expenses, are often described as **period costs**, as they are *expensed* in the period incurred. *Normal spoilage* in a manufacturing process is treated as a product cost, while *abnormal spoilage* is expensed as a period cost.

- **Manufacturing costs** – Product costs (added to the cost of the finished product)
 - **DM** (Direct materials – an integral part of the product)
 - **DL** (Direct Labor – The labor to convert a raw material to a finished good)
 - **Manufacturing Overhead** (Mfg O/h) (all factory costs except DM & DL)
 - Indirect materials
 - Indirect labor
- Prime costs = DM + DL
- Conversion costs = DL + MFG o/h

- **Non-MFG costs** – Period costs
 - Selling, General and Administrative costs (SG&A)
 - Marketing costs, freight out, re-handling costs
 - Abnormal spoilage
 - An expense in the period

Cost Systems

- **Actual cost system** (DM, DL & Mfg O/H are all actual)
- **Standard cost system** (All costs based on standards)
- **Normal cost system** (DM & DL based on actual, Mfg O/H based on standards)

Predetermined O/H rate

Accounting for manufacturing overhead is an important part of a costing system. The distinguishing feature of manufacturing overhead is that while it must be incurred in order to produce goods, it cannot be directly traced to the final product as can direct material and direct manufacturing labor. Therefore, overhead must be applied, rather than directly charged, to goods produced.

$$\frac{\text{Estimated o/h costs}}{\text{Estimated DL \$/hrs}} = \text{Predetermined O/H rate} \times \text{actual production} = \text{applied o/h}$$

Applied O/H

WIP Control	300	
Factory OH Applied		300

Actual O/H

Factory OH Control	500	
Cash		500

Underapplied

Factory OH Applied (a temporary account)	300	
Expense – COGS (Underapplied)	200	
Factory OH Control		500

COST of SALES calculations

The calculation of cost of sales in a manufacturing company (one that manufactures the products that it sells) is more complicated than the equivalent computation for a merchandising company (one that purchases from outsiders the products that it sells).

- For a **merchandising** company, the calculation is:

Beginning inventory
+ <u>Purchases</u>
= Cost of goods available for sale
- <u>Ending inventory</u>
= Cost of sales

- For a **manufacturing** company the **FLOW OF A COST SYSTEM** looks as follows:

Raw Materials	WIP	Finished Goods	Cost of Goods Sold
Beg RM	Beg WIP	Beg FG	CoGS
+ Purchases	+ DM Used	+ CoGM	+ Underapplied
= Available	+ DL	= FG Available	(Overapplied)
(Ending RM)	<i>Applied Mfg O/H</i>	(Ending FG)	= CoGS
= Materials Used	= WIP Available	= CoGS	
	(Ending WIP)		
	= CoGM		
	(mfg/completed)		

To determine **Direct Materials used**, the calculation is:

Beginning direct materials inventory
 + Direct materials purchased
 - Ending direct materials inventory
 = Direct materials used

To determine **Cost of goods Manufactured**, the calculation is:

Direct materials used
 + Direct labor incurred
 + Overhead applied
 = Costs added to production
 + Beginning work-in-process inventory
 - Ending work-in-process inventory
 = Cost of goods manufactured

To determine **Cost of goods Sold**

Beginning finished goods inventory
 + Cost of goods manufactured
 = Cost of goods available for sale
 - Ending finished goods inventory
 = **Cost of Sales**

In the computation of cost of goods manufactured, **overhead is applied** to production. This is not the same as the actual overhead costs incurred during the period. The reason is that the matching principle requires an approach to overhead that systematically and rationally allocates it to the benefits, and companies normally do not have the same amount of production in every period.

For example, assume a company is leasing factory equipment with rental payments of \$500 per quarter (\$2,000 per year) paid to the lessor. Over the course of the year, the company manufactures 1,000 units, so rental costs are \$2,000 / 1,000 units = \$2 per unit that year. Production is not paced evenly, however, since demand for the product varies through the year. Unit production and actual rent per unit each quarter are:

Quarter	1 st	2 nd	3 rd	4 th	Total
Actual Rent	500	500	500	500	2,000
Units	125	250	125	500	1,000
Rent / Unit	\$4	\$2	\$4	\$1	\$2

The problem with this approach is that the calculation of inventory cost per unit varies considerably from quarter to quarter, and it appears that rent is extremely high in the first and third quarters and extremely low in the fourth quarter. In fact, however, the rent is a stable amount. To follow the matching principle, more of the rent costs should be recognized in the periods of higher production. In this example, the simplest way is to apply rent at the rate of \$2 per unit, which is the average over the course of the year:

Quarter	1 st	2 nd	3 rd	4 th	Total
Units	125	250	125	500	1,000
Rent / Unit	\$2	\$2	\$2	\$2	\$2
Applied Rent	250	500	250	1,000	2,000

In the first and third quarters, only \$250 of rent is applied, even though \$500 is paid, so the rent is underapplied by \$250 in both of those quarters. In the fourth quarter, \$1,000 is applied, even though \$500 is paid, so the rent is overapplied by \$500. By the end of the year, however, total applied and actual rent are the same, as long as actual production equals the number of units estimated at the beginning of the year, when the application rate of \$2 was determined.

Overhead costs are not usually applied based on *units of production*, the method used in the example. One reason is that it can be difficult to determine the number of units that have been produced, especially with three different types of inventory: raw materials, work-in-process, and finished goods. Another is that most overhead costs are closely related to direct labor, so this might be a more accurate way to match costs. For example, payroll taxes and fringe benefit costs are overhead costs clearly associated with the amount of labor and not necessarily the productivity of those laborers. By applying overhead based on direct labor, it is more likely that applied overhead will be close to actual overhead.

The most common base selected is **direct labor hours**, which is usually easy for the company to determine, since these hours are necessary for wage computations. A company may also use **direct labor dollars**, though this requires the added step of applying wage rates to hours, and is not as popular as a method of allocating overhead as a result. For a company that is highly automated, overhead is occasionally computed based on **machine hours**, but this is quite rare on the CPA exam.

For example, assume the company paying \$2,000 of rent on factory equipment and expecting to produce 1,000 units during the year also estimates that it requires approximately 2 hours for each unit to be produced, and expected wage rates to average \$10 per hour. If the company chooses to apply overhead based on *direct labor hours*, then it will use:

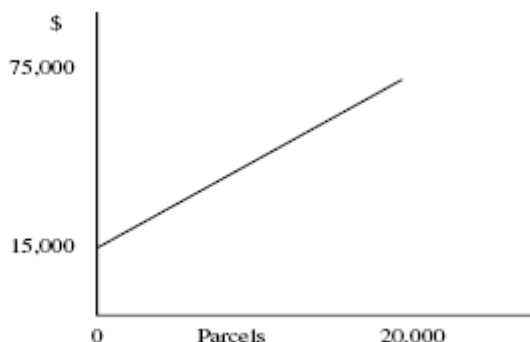
$$\$2,000 / 2,000 \text{ hours} = \$1 \text{ per direct labor hour}$$

If the company chooses *direct labor dollars*, the result is:

$$\$2,000 / \$20,000 = 10\% \text{ of direct labor cost}$$

Class Questions

1. Sender, Inc. estimates parcel mailing costs using data shown on the chart below.



What is Sender's estimated cost for mailing 12,000 parcels?

- \$36,000
 - \$45,000
 - \$51,000
 - \$60,000
2. The fixed portion of the semivariable cost of electricity for a manufacturing plant is a
- | | <u>Period cost</u> | <u>Product cost</u> |
|----|--------------------|---------------------|
| a. | Yes | No |
| b. | Yes | Yes |
| c. | No | Yes |
| d. | No | No |
3. In a job-costing system, issuing indirect materials to production increases which account?
- Materials control.
 - Work in process control
 - Manufacturing overhead control.
 - Manufacturing overhead allocated.
4. In developing a predetermined variable factory overhead application rate for use in a process costing system, which of the following could be used in the numerator and denominator?

	<u>Numerator</u>	<u>Denominator</u>
a.	Actual variable factory overhead	Actual machine hours
b.	Actual variable factory overhead	Estimated machine hours
c.	Estimated variable factory overhead	Actual machine hours
d.	Estimated variable factory overhead	Estimated machine hours

Items 5 through 7 are based on the following information pertaining to Arp Co.'s manufacturing operations:

<u>Inventories</u>	<u>3/1/X3</u>	<u>3/31/X3</u>
Direct materials	\$36,000	\$30,000
Work in process	18,000	12,000
Finished goods	54,000	72,000

Additional information for the month of March 20X3:

Direct materials purchased	\$84,000
Direct manufacturing labor payroll	60,000
Direct manufacturing labor rate per hour	7.50
Factory overhead rate per direct labor hour	10.00

5. For the month of March 20X3, prime cost was

- a. \$ 90,000
- b. \$120,000
- c. \$144,000
- d. \$150,000

6. For the month of March 20X3, conversion cost was

- a. \$ 90,000
- b. \$140,000
- c. \$144,000
- d. \$170,000

7. For the month of March 20X3, cost of goods manufactured was

- a. \$218,000
- b. \$224,000
- c. \$230,000
- d. \$236,000

8. Birk Co. uses a job order cost system. The following debits (credit) appeared in Birk's work in process account for the month of April 20X3:

<u>April</u>	<u>Description</u>	<u>Amount</u>
1	Balance	\$ 4,000
30	Direct materials	24,000
30	Direct manufacturing labor	16,000
30	Factory overhead	12,800
30	To finished goods	(48,000)

Birk applies overhead to production at a predetermined rate of 80% of direct manufacturing labor costs. Job No. 5, the only job still in process on April 30, 20X3, has been charged with direct manufacturing labor of \$2,000. What was the amount of direct materials charged to Job No. 5?

- a. \$ 3,000
- b. \$ 5,200
- c. \$ 8,800
- d. \$24,000

9. Using the variable costing method, which of the following costs are assigned to inventory?

	<u>Variable selling and administrative costs</u>	<u>Variable factory overhead costs</u>
a.	Yes	Yes
b.	Yes	No
c.	No	No
d.	No	Yes

10. At the end of Killo Co.'s first year of operations, 1,000 units of inventory remained on hand. Variable and fixed manufacturing costs per unit were \$90 and \$20, respectively. If Killo uses absorption costing rather than variable (direct) costing, the result would be a higher pretax income of

- a. \$0
- b. \$20,000
- c. \$70,000
- d. \$90,000

11. At the breakeven point, the contribution margin equals total

- a. Variable costs.
- b. Sales revenues.
- c. Selling and administrative costs.
- d. Fixed costs.

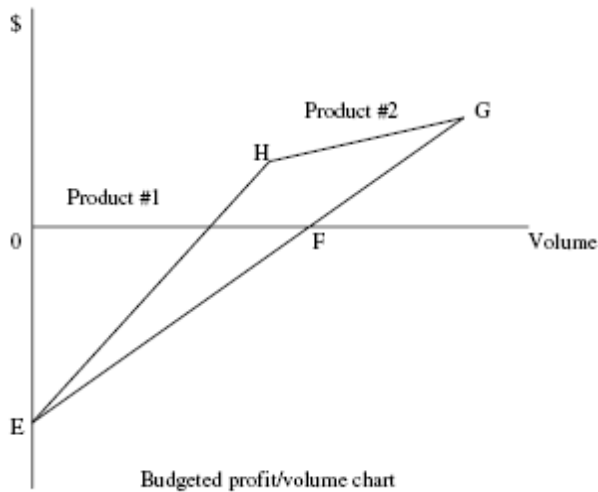
12. Breakeven analysis assumes that over the relevant range

- a. Unit revenues are nonlinear.
- b. Unit variable costs are unchanged.
- c. Total costs are unchanged.
- d. Total fixed costs are nonlinear.

13. Del Co. has fixed costs of \$100,000 and breakeven sales of \$800,000. What is its projected profit at \$1,200,000 sales?

- a. \$ 50,000
- b. \$150,000
- c. \$200,000
- d. \$400,000

14. In the budgeted profit/volume chart below, EG represents a two-product company's profit path. EH and HG represent the profit paths of products #1 and #2, respectively.



Sales prices and cost behavior were as budgeted, actual total sales equaled budgeted sales, and there were no inventories. Actual profit was greater than budgeted profit. Which product had actual sales in excess of budget, and what margin does OE divided by OF represent?

	<u>Product with excess sales</u>	<u>OE/OF</u>
a.	#1	Contribution margin
b.	#1	Gross margin
c.	#2	Contribution margin
d.	#2	Gross margin

15. Snyder Co. manufactures fans with direct material costs of \$10 per unit and direct labor of \$7 per unit. A local carrier charges Snyder \$5 per unit to make deliveries. Sales commissions are paid at 10% of the selling price. Fans are sold for \$100 each. Indirect factory costs and administrative costs are \$6,800 and \$37,200 per month, respectively. How many fans must Snyder produce to break even?

- a. 1,375
- b. 648
- c. 564
- d. 530

Class Solutions

- (c) The graph depicts Sender's fixed and variable parcel mailing costs. Fixed costs total \$15,000, since this amount of cost is incurred even when zero parcels are mailed. Variable costs at a mailing volume of 20,000 parcels is \$60,000 (\$75,000 total cost – \$15,000 fixed cost), resulting in a per unit variable cost of \$3.00 (\$60,000 VC / 20,000 units). Therefore, Sender's estimated cost of mailing 12,000 parcels is \$51,000 [\$15,000 FC + (\$3 VC x 12,000 units)].
- (c) Product costs are costs that can be associated with the production of specific revenues. These costs attach to a physical unit and become expenses in the period in which the unit to which they attach is sold. Product costs include direct labor, direct material, and factory overhead. Period costs, on the other hand, cannot be associated with specific revenues and, therefore, become expenses as time passes. Answer (c) is correct because the cost of electricity for a manufacturing plant, whether fixed or variable, is included in factory overhead and, therefore, is a product cost.
- (c) The requirement is to identify the account that is increased when indirect materials are issued to production. Answer (c) is correct because the cost of indirect materials used increases the Manufacturing Overhead Control account and decreases Materials Control. Answer (a) is incorrect because Materials Control is decreased with the transfer. Answer (b) is incorrect because Work in Process Control is increased by costs of direct materials and direct labor and the allocation of manufacturing overhead. Manufacturing Overhead Allocated is credited when overhead is allocated to work in process and debited when it is closed out at the end of the period.
- (d) A variable overhead application rate is commonly called a predetermined variable overhead rate and is computed as follows:

$$\frac{\text{Estimated overhead costs}}{\text{Estimated activity level}} = \text{Predetermined rate}$$

Estimated figures are used because actual figures are not known at the beginning of a period. Estimated factory overhead (the numerator) is estimated overhead costs, and estimated machine hours (the denominator) is an estimated activity level. Actual figures (either overhead costs or activity levels) are not known until the end of the period.

- (d) Prime cost is the sum of direct materials and direct manufacturing labor. Direct manufacturing labor is \$60,000. Direct materials used must be computed. The solutions approach is to enter the information given into the materials T-account and solve for the unknown:

	Direct Materials Control		
3/1/03 bal.	36,000		
Purchases	84,000	?	Materials used
3/30/03	30,000		

Using the T-account above, direct materials used are easily computed as \$90,000. Thus, prime cost incurred was \$150,000 (\$90,000 + \$60,000).

6. (b) Conversion cost is the sum of direct manufacturing labor (\$60,000, as given) and applied factory overhead. The factory overhead rate per direct manufacturing labor hour is \$10.00. To compute the number of direct manufacturing labor hours worked, the direct manufacturing labor payroll (\$60,000) is divided by the direct manufacturing labor rate per hour (\$7.50), resulting in 8,000 direct manufacturing labor hours. Factory overhead applied is 8,000 hours at \$10 per hour, or \$80,000. Thus, conversion cost incurred was \$140,000 (\$60,000 of direct manufacturing labor plus \$80,000 of applied factory overhead).

7. (d) Cost of goods manufactured (CGM) is the cost of goods completed **and** transferred to finished goods. It is the sum of direct materials used, direct manufacturing labor used, applied factory overhead, and any adjustment for work in process inventories. Direct manufacturing labor used (\$60,000) is given. Direct materials used (\$90,000) and applied factory overhead (\$80,000) were computed in the answers to the two previous questions. Beginning work in process (\$18,000) and ending work in process (\$12,000) are given. Using this data, CGM can be computed as follows:

B-WIP	\$18,000
DM used	90,000
DML	60,000
OH applied	80,000
Costs to account for	\$248,000
E-WIP	(12,000)
CGM	\$236,000

8. (b) The requirement is to determine the amount of direct materials charged to Job No. 5. The problem states that Job 5 is the only job still in process on April 30, so the total costs charged to this job must equal the ending balance in work in process.

	Work in Process Control	
Beg. bal.	4,000	
DM	24,000	
DML	16,000	
O/H	12,800	48,000 To FG
End. bal.	<u>8,800</u>	

The total costs charged to Job 5 are \$8,800. Direct manufacturing labor accounts for \$2,000 of this figure and overhead accounts for \$1,600 (\$2,000 DL x 80% O/H rate).

Direct manufacturing labor	\$2,000
Factory overhead	1,600
Direct materials	---
Total cost of Job 5	\$8,800

The remaining cost of \$5,200 [\$8,800 – (\$2,000 + \$1,600)] must be the amount of direct materials.

9. (d) Under variable costing, both variable direct and variable indirect manufacturing costs are assigned to inventory. All fixed costs are considered sunk costs and thus are written off as an expense of the period. Additionally, variable selling and administrative costs are also treated as period costs and thus not assigned to inventory.

10. (b) The requirement is to determine the different results obtained using absorption and variable costing. Under absorption costing, fixed costs are applied to units produced and are inventoried as product costs. Variable costing considers fixed costs to be period rather than product costs. Killo Co.'s inventoried costs under both methods are as follows:

	<u>Absorption</u>	<u>Variable</u>
Variable costs	$1,000 \times \$90 = \$90,000$	$1,000 \times \$90 = \$90,000$
Fixed costs	$1,000 \times \$20 = \underline{20,000}$	<u> </u>
Total cost of inventory	<u>\$110,000</u>	<u>\$90,000</u>

Under the variable method, the \$20,000 of fixed cost was charged to income, whereas with absorption costing the fixed costs were absorbed into inventory. Therefore, absorption costing results in a pretax income that is higher by \$20,000.

11. (d) Any income statement can be expressed as

$$\text{Sales} - \text{Variable costs} - \text{Fixed costs} = \text{Operating income}$$

At the breakeven point, operating income = \$0. In addition, the Contribution margin = Sales – Variable costs. Therefore, the above equation may be restated as

$$\begin{aligned} \text{Sales} - \text{Variable costs} - \text{Fixed costs} &= 0 \\ \text{Sales} - \text{Variable costs} &= \text{Fixed costs} \\ \text{Contribution margin} &= \text{Fixed costs} \end{aligned}$$

This makes sense because, by definition, the breakeven point is the point at which revenues equal expenses; after variable costs are subtracted from sales, the contribution margin remaining will be just enough to cover fixed costs.

12. (b) Breakeven analysis is based on several simplified assumptions. One assumption is that, over the relevant range, variable costs **per unit** remain unchanged. It is assumed that over the relevant range, selling price per unit remains constant. Thus, unit revenues are linear. Total variable costs increase with increases in production; therefore, total costs also increase. Over the relevant range, total fixed costs are always linear since they do not change.

13. (a) The solutions approach is to work backward from breakeven sales to determine the contribution margin (CM) ratio. The CM ratio can then be used to determine Del's projected profit at \$1,200,000 sales. This is accomplished by plugging fixed costs and breakeven sales into the breakeven equation.

$$\begin{aligned} \text{Breakeven sales} &= \frac{\text{Fixed costs}}{\text{CM ratio}} \\ \$800,000 &= \frac{\$100,000}{\text{CM ratio}} \\ \text{CM ratio} &= 0.125, \text{ or } 12.5\% \end{aligned}$$

Therefore, projected total contribution margin from \$1,200,000 sales is \$150,000 (\$1,200,000 x 12.5%), and projected profit is \$50,000 (\$150,000 CM – \$100,000 fixed costs).

14. (a) If sales prices, cost behavior, and actual **total** sales were as budgeted, then the excess profit must have resulted from a departure from budget by the **individual** products. Since the slope of line EH is greater than that of line HG (the slope representing profit per unit), Product 1 had the excess sales. Line OE represents fixed costs and line OF represents quantity sold up to the breakeven point. OE/OF is the contribution margin that may offset fixed costs until the breakeven point, F, is reached.

15. (b) The requirement is to compute how many fans must be produced to break even. The breakeven point is determined by dividing the product's contribution margin by the amount of fixed cost. The contribution margin for each fan is equal to \$68 (\$100 sales price – \$10 commission – \$10 direct materials – \$7 direct labor – \$5 delivery charge). Therefore, answer (b) is correct because breakeven in units is equal to 648 ($\$44,000$ indirect costs \div \$68 per unit).