

Chapter 15

Pre-Lecture Videos

1. All of the following are considered phases of the management process *except* **executing**.
2. The process by which managers run day-to-day operations is called **directing**.
3. **Continuous process improvement** is the philosophy of enhancing employees, business processes, and products on a regular basis
4. Which of the following are ways by which managerial accounting provides information and reports for managers to use in operating the business?
 - **Managerial accounting provides the cost of manufacturing a product, which can be used to determine its selling price.**
 - **Managerial accounting allows for comparing the costs of manufacturing products over time and can be used to monitor and control the cost of direct materials, direct labor, and factory overhead.**
 - **Performance reports allow management to identify any large amounts of scrap materials or employee downtime.**
5. Managerial accounting provides performance reports to internal users. Which of the following is considered an advantage of performance reports?
 - **Performance reports allow management to identify any large amounts of scrap materials or employee downtime.**
 - **A report could analyze the potential efficiencies and dollar savings of purchasing computerized equipment to speed up the production process.**
 - **A report could analyze how many units need to be sold to cover operating costs and expenses and used to set monthly selling targets and bonuses for sales personnel.**
6. **Direct costs** are identified with and can be traced to a cost object.
7. **Indirect costs** cannot be identified with or traced to a cost object.
8. **Period costs** consist of selling and administrative costs.
9. Inventory that consists of the costs of the direct and indirect materials that have not yet entered the manufacturing process is known as **materials inventory**.
10. Inventory that consists of the direct materials, direct labor, and factory overhead costs for products that have entered the manufacturing process but are not yet completed is known as **work in process inventory**.
11. The total cost of making products that are available for sale during the period is called **cost of goods manufactured**.

Mini Quiz

1. Managerial accounting information can be used for all of the following except **communicating with shareholders**.
2. Which of the following would not be considered a conversion cost by a baking company?
 - **Depreciation on oven**
3. Which of the following positions would have a salary or wage that is classified as a factory overhead cost by a baking company?
 - **Factory supervisor**

4. Which of the following would be classified as a factory overhead cost by a baking company?
 - **Depreciation of factory equipment**
5. Managerial accounting information uses **historical and estimated data**.
6. Ralph's Cafe has the following information for June:

Cost Type	Cost
Cost of materials placed in production	\$30,000
Direct labor	\$25,000
Factory overhead	\$14,000
Work in process inventory, June 1	\$2,900
Work in process inventory, June 30	\$3,500

What is the cost of goods manufactured?

- $2900 + (30000 + 25000 + 14000) - 3500 = 68400$
7. Which of the following would be classified as an indirect cost by a baking company?
 - **Salaries of production supervisors**
 8. How much of the U.S. economic activity as measured by gross domestic product is represented by services?
 - **Nearly 80%**
 9. Ultimate Luxury Hotel is a single hotel with 300 rooms. During the month of October, the hotel had 5,000 guests, who each stayed one night. What is the occupancy rate for October (rounded to the nearest whole percent)?
 - $\frac{5000}{300*31} = .537 = 54\%$
 10. The measure that captures the use of a fixed asset in serving customers relative to the asset's capacity is known as the **utilization** rate.
 11. Super Sleep Hotel has 2,000 guests who stayed for two nights and rented 150 rooms. How many guest nights did the hotel have during this period?
 - $2000 * 2 = 4000$
 12. Which of the following statements regarding the differences between managerial accounting applications for manufacturing and service companies is true?
 - **Service companies may use cost of services on the income statement rather than cost of goods sold.**

Practice Exercises

1. Three phases of the management process are planning, directing, and controlling. Match the following descriptions to the proper phase by clicking on the phase (on the left) and then clicking on the correct description (on the right).
 - **Directing** → Process by which managers, given their assigned levels of responsibilities, run day-to-day operations.
 - **Planning** → Developing long-range courses of action to achieve goals.
 - **Controlling** → Isolating significant departures from plans for further investigation and possible remedial action. It may lead to a revision of future plans.
2. Identify the following costs as direct materials, direct labor, or factory overhead for a magazine publisher:

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Item	Type
Staples used to bind magazines	Direct materials
Wages of printing machine employees	Direct labor
Maintenance on printing machines	Factory overhead
Paper used in the magazine	Direct materials

3. Indicate whether each of the following costs of an automobile manufacturer would be classified as *direct materials cost*, *direct labor cost*, or *factory overhead cost*:

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Item	Type
Automobile engine	Direct materials cost
Brake pads	Direct materials cost
Depreciation of robotic assembly line equipment	Factory overhead cost
Glass for front and rear windshields	Direct materials cost
Safety helmets and masks for assembly line workers	Factory overhead cost
Salary of quality control inspector	Factory overhead cost
Steering wheel	Direct materials cost
Tires	Direct materials cost
Wages of assembly line workers	Direct labor cost

4. Identify the following costs as a prime cost (**P**), conversion cost (**C**), or both (**B**) for a magazine publisher:

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Item	Type
Paper used for the magazine	Prime
Wages of printing machine employees	Both
Glue used to bind magazine	Prime
Maintenance on printing machines	Conversion

5. Identify the following costs as a product cost or a period cost for a magazine publisher:

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Item	Type
Sales salaries	Period
Paper used for the machine	Product
Maintenance on printing machines	Product
Depreciation expense—corporate headquarters	Period

6. For apparel manufacturer Abercrombie & Fitch, Inc. (ANF), classify each of the following costs as either a product cost or a period cost:

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Item	Type
Advertising expenses	Period
CFO's salary	Period
Depreciation on office equipment	Period
Depreciation on sewing machines	Product
Fabric used during production	Product
Factory janitorial supplies	Product
Factory supervisors' salaries	Product
Property taxes on factory building and equipment	Product
Oil used to lubricate sewing machines	Product
Repairs and maintenance costs for sewing machines	Product
Research and development costs	Period
Sales commissions	Period
Salaries of distribution center personnel	Period
Salaries of production quality control supervisors	Product
Travel costs of media relations employees	Period
Utility costs for office building	Period
Wages of sewing machine operators	Product

7. Glenville Company has the following information for April:

Line Item	
<i>Cost of direct materials</i> used in production	280000
<i>Direct labor</i>	324000
<i>Factory overhead</i>	188900
<i>Work in process inventory</i> , April 1	72300
<i>Work in process inventory</i> , April 30	76600
<i>Finished goods inventory</i> , April 1	39600
<i>Finished goods inventory</i> , April 30	41200

1. For April, determine the cost of goods manufactured. Using the data given, prepare a statement of Cost of Goods Manufactured.

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Statement of Cost of Goods Manufactured	
Work in process inventory, April 1	72300
Cost of direct materials used in production	280000
Direct Labor	324000
Factory overhead	<u>188900</u>
Total manufacturing costs incurred in April	<u>792900</u>
Total manufacturing costs	865200
Work in process inventory, April 30	<u>76600</u>
Cost of goods manufactured	<u>788600</u>

2. For April, determine the cost of goods sold. Using the data given, prepare a statement of Cost of Goods Sold.

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Statement of Cost of Goods Sold	
Finished goods inventory, April 1	39600
Cost of goods manufactured	<u>788600</u>
Cost of finished goods available for sale	828200
Finished goods inventory, April 30	<u>41200</u>
Cost of goods sold	<u>787000</u>

8. The following information is available for Fuller Manufacturing Company for the month ending October 31:

Line Item	
Cost of direct materials used in production	1323600
Direct labor	1680000
Work in process inventory, October 1	455300
Work in process inventory, October 31	378100
Total factory overhead	3544200

Determine Fuller Manufacturing's cost of goods manufactured for the month ended October 31.

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Statement of Cost of Goods Manufactured For the Month Ended October 31	
Work in process inventory, October 1	455300
Manufacturing costs incurred during October:	
Cost of direct materials used in production	1323600
Direct labor	1680000
Factory overhead	<u>3544200</u>
Total manufacturing costs incurred	<u>6547800</u>
Total manufacturing costs	7003100
Work in process inventory, October 31	<u>378100</u>
Cost of goods manufactured	<u>6625000</u>

9. Jake's Cabins is a small motel chain with locations near the national parks of Utah, Wyoming, and Montana. The chain has a total of 500 guest rooms. The following operating data are available for June:

Number of Guests	Nights per Visit	Guest Nights
4400	1	4400
1800	2	3600
750	3	2250
600	4	2400
20	5	100

1. Determine the guest nights for June
 - $(4400 * 1) + (1800 * 2) + (750 * 3) + (600 * 4) + (20 * 5) = 12750$
2. Determine the available room nights for June

■ $500 * 30 = 15000$

3. Determine the occupancy rate for June

■ $\frac{12750}{15000} = .85 = 85\%$

4. Assume that the occupancy rate for June of the prior year was 82%. Has the utilization rate for Jake's Cabins improved or declined?

■ **Improved**

10. The following information is available for Shanika Company for 20Y6:

Inventories	January 1	December 31
Materials	77350	95550
Work in process	109200	96200
Finished goods	113750	100100

Line Item	
Advertising expense	\$68,250
Depreciation expense-office equipment	22,750
Depreciation expense-factory equipment	14,560
Direct labor	186,550
Heat, light, and power-factory	5,850
Indirect labor	23,660
Materials purchased	123,500
Office salaries expense	77,350
Property taxes-factory	4,095
Property taxes-headquarters building	13,650
Rent expense-factory	6,825
Sales	864,500
Sales salaries expense	136,500
Supplies-factory	3,250
Miscellaneous costs-factory	4,420

1. Prepare the 20Y6 statement of cost of goods manufactured.

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Statement of Cost of Goods Manufactured For the Year Ended December 31, 20Y6				
Work in process inventory, January 1, 20Y6				109200
Direct materials:				
Materials inventory, January 1, 20Y6		77350		
Purchases		<u>123500</u>		
Cost of materials available for use		200850		
Materials inventory, December 31, 20Y6		<u>95550</u>		
Cost of Direct Materials used in Production			105300	
Direct Labor			186550	
Factory Overhead:				
Indirect labor		23660		
Depreciation expense-factory equipment		14560		
Heat, light, and power-factory		5850		
Property taxes-factory		4096		
Rent expense-factory		6825		
Supplies-factory		3250		
Miscellaneous costs-factory		<u>4420</u>		
Total factory overhead			<u>62660</u>	
Total manufacturing costs incurred in 20Y6				<u>354510</u>
Total manufacturing costs				463710
Work in process inventory, December 31, 20Y6				<u>96200</u>
Cost of goods manufactured				<u>367510</u>

2. Prepare the 20Y6 income statement

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Income Statement For the Year Ended December 31, 20Y6				
Sales				864500
Cost of good sold:				
Finished goods inventory, January 1, 20Y6				113750
Cost of goods manufactured				<u>367510</u>
Cost of finished goods available for sale				481260
Finished goods inventory, December 31, 20Y6				<u>100100</u>
Cost of goods sold				381160
Gross profit				483340
Operating expenses:				
Administrative expenses:				
Office salaries expense				77350
Depreciation expense-office equipment				22750
Property taxes-headquarters building			<u>13650</u>	113750
Selling expenses:				
Advertising expense				68250
Sales salaries expense			<u>136500</u>	<u>204750</u>
Total operating expenses				<u>318500</u>
Net income				164840

Homework Exercises

1. Which of the following items are properly classified as part of factory overhead for Ford Motor Company (F), a maker of heavy automobiles and trucks?

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Item	Part of Factory Overhead
Air conditioner units for installation in vehicles	No
Consultant fees for a study of production line efficiency	Yes
Dealership sales incentives	No
Depreciation on headquarters building in Dearborn, Michigan	No
Depreciation on mechanical robots used on the assembly line	Yes
Leather to be used on vehicles that have leather interiors	No
Machine lubricant used to maintain the assembly line at the Louisville, Kentucky, assembly plant	Yes
Plant manager's salary at Buffalo, New York, stamping plant, which manufactures auto and truck subassemblies	Yes
Property taxes on the Dearborn, Michigan, headquarters building	No
Vice president of human resource's salary	No

2. From the choices presented in parentheses, choose the appropriate term for completing each of the following sentences:

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Sentence	Appropriate term for completing sentence
A product, sales territory, department, or activity to which costs are traced is called a (direct cost, cost object).	cost object
Advertising costs are usually viewed as (period, product) costs.	period
Factory overhead costs combined with direct labor costs are called (prime, conversion) costs.	conversion
Feedback is often used to (improve, direct) operations.	improve
A sacrifice made to obtain some benefit is a (cost, expense).	cost
The balance sheet of a manufacturer would include an account for (cost of goods sold, work in process inventory).	work in process inventory
The implementation of automatic, robotic factory equipment normally (increases, decreases) the direct labor component of product costs.	decreases

3. From the choices presented in parentheses, choose the appropriate term for completing each of the following sentences:

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Sentence	Appropriate term for completing sentence
An example of factory overhead is (electricity used to run assembly line, CEO salary).	electricity used to run assembly line
Direct materials costs combined with direct labor costs are called (prime, conversion) costs.	prime
Long-term plans are called (strategic, operational) plans.	strategic
Materials for use in production are called (supplies, materials inventory).	materials inventory
The phase of the management process that uses process information to eliminate the source of problems in a process so that the process delivers the correct product in the correct quantities is called (directing, improving).	improving
The plant manager's salary would be considered (direct, indirect) to the product.	indirect
The salaries of salespeople are normally considered a (period, product) cost.	period

4. The following information is available for Fuller Manufacturing Company for the month ending October 31:

Line Item	
Cost of direct materials used in production	\$129,000
Direct labor	154,800
Work in process inventory, October 1	58,100
Work in process inventory, October 31	78,700
Total factory overhead	71,000

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Statement of Cost of Goods Manufactured For the Month Ended October 31			
Work in process inventory, October 1			58100
Manufacturing costs incurred during October:			
Cost of direct materials used in production		129000	
Direct labor		154800	
Factory overhead		<u>71000</u>	
Total manufacturing costs incurred			<u>354800</u>
Total manufacturing costs			412900
Work in process inventory, October 31			<u>78700</u>
Cost of goods manufactured			<u>334200</u>

Quiz

1. Factory overhead includes **indirect labor and indirect materials**.
2. Costs other than direct materials cost and direct labor cost incurred in the manufacturing process are classified as **factory overhead cost**.
3. Managers use managerial information for all of the following purposes *except* **to evaluate the company's stock performance**.
4. Indirect costs incurred in a manufacturing environment that cannot be traced directly to a product are treated as **product costs and expensed when the goods are sold**.
5. If the cost of a direct material is a small portion of total production cost, it may be classified as part of **factory overhead cost**.
6. A company manufactured 50,000 units of a product at a cost of \$450,000. It sold 45,000 units at \$15 each. The gross profit is:
 - o $(45000 * 15) - (\frac{450000}{50000} * 45000) = 270000$
7. Which of the following would be least likely to be considered a managerial accounting report?
 - o **statement of stockholders' equity**
8. Which of the following statements is false?
 - o **There is no overlap between financial and managerial accounting.**
9. Jensen Company reports the following:

Line Item	
Direct materials used	345,000
Direct labor incurred	250,000
Factory overhead incurred	400,000
Operating expenses	175,000

Jensen Company's period costs are

- 175000

10. Which of the following is *not* a prime cost?
 - **plant janitor's wages**
11. Finished goods inventory is reported on the **balance sheet as a current asset**.
12. In order to be useful to managers, managerial accounting reports should possess all of the following characteristics *except* **be prepared in accordance with generally accepted accounting principles**.
13. Prime costs are **direct materials and direct labor**.
14. On the income statement of a manufacturing company, which of the following replaces purchases in the "Cost of goods sold" section of a retail company?
 - **cost of goods manufactured**
15. Which of the following is part of factory overhead cost?
 - **depreciation of factory equipment and machines**
16. Which of the following accounts will be found on the income statement?
 - **cost of goods sold**
17. Which of the following is the principal reason for preparing managerial accounting reports?
 - **usefulness to management**
18. Which of the following is an example of direct materials cost for an automobile manufacturer?
 - **cost of interior upholstery**
19. Which of the following terms is used to describe the process of developing the organization's objectives and translating those into courses of action?
 - **planning**
20. Which of the following terms is used to describe the process of monitoring operating results and comparing actual results with the expected results?
 - **controlling**

Chapter 16

Pre-Lecture Videos

1. The two main types of cost accounting systems for manufacturing businesses are the **process** cost system and the **job order** cost system.
2. A **job order** cost system provides product costs for each quantity of product that is manufactured.

3. The journal entry to record the direct materials used for the month is **a debit to Work in Process and a credit to Materials**.
4. The journal entry to record the direct labor costs for the month is **a debit to Work in Process and a credit to Wages Payable**.
5. Which of the following accounts are NOT likely appear in a job order cost system of a service business?
 - **Finished goods**
6. The primary costs for a service business includes **direct labor**.
7. Starfish Enterprises produces men's sports coats that are sold by popular department stores. Each retail order is treated as a job that accumulates materials, labor, and overhead costs for a batch of sports coats. Management has obtained data on the labor costs for four selected jobs over a six-month period. Each selected job represents a similar style and size of sports coat. The data are as follows:

	Count	Direct Labor Hour	Direct Labor Rate per Hour	Total Direct Labor Cost
Job 107	10	4.50	14.00	63.00
Job 125	14	7.00	14.00	98.00
Job 160	16	8.80	14.00	123.20
Job 190	8	3.20	14.00	51.20

The direct labor cost per unit for Job 125 is **\$7.00**.

8. Starfish Enterprises produces men's sports coats that are sold by popular department stores. Each retail order is treated as a job that accumulates materials, labor, and overhead costs for a batch of sports coats. Management has obtained data on the labor costs for four selected jobs over a six-month period. Each selected job represents a similar style and size of sports coat. The data are as follows:

	Count	Direct Labor Hour	Direct Labor Rate per Hour	Total Direct Labor Cost
Job 107	10	4.50	14.00	63.00
Job 125	14	7.00	14.00	98.00
Job 160	16	8.80	14.00	123.20
Job 190	8	3.20	14.00	51.20

The direct labor hour per unit for Job 190 is **0.40** hours.

Mini Quiz

1. For services, billing a customer can be done **at the end of the month, in advance, or once the work is completed**.
2. During July, Jamal Company incurred factory overhead as follows: utilities, \$6,500; accumulated depreciation, \$2,500; and indirect salaries, \$3,600. Which of the following journal entries is correct?
 - **Factory Overhead, \$12,600 Dr.; Utilities Payable, \$6,500 Cr.; Accumulated Depreciation, \$2,500 Cr.; Wages Payable, \$3,600 Cr.**

3. A job order system will be used by which of the following manufacturing companies?
- **Custom limousine factory**
4. Which of the following is the correct flow of manufacturing costs?
- **Materials, work in process, finished goods, cost of goods sold**
5. A hotel will use a job order cost system for which of the following expenses?
- **Room service**
6. Job cost sheets can be used to determine **product costs**.
7. An accounting firm, Shultz & Worsk, accumulates costs associated with individual cases using a job order cost system. For the upcoming year, the firm estimates that it will use 30,000 hours of direct labor for professional staff at an hourly rate of \$150 per hour. Estimated total overhead costs are \$900,000. The firm allocates overhead costs to individual client services on the basis of direct labor hours of its professional staff. What is the firm's predetermined overhead rate for the upcoming year?
- **\$30**
8. A cost accounting system that accumulates costs for each manufacturing department or process is called a **process cost system**.
9. A process cost system will be used by all of the following manufacturing companies except a(n) **custom sailboat factory**.
10. Which of the following products or services would most likely be accounted for using a job order cost system?
- **Custom aircraft manufacturer**
11. The purpose of a cost accounting system is to **measure, record, and report product costs**.
12. The job order cost system for a service business includes all of the following except **materials and supplies inventory**.
13. A law firm, Morris & Morris, accumulates costs associated with individual cases using a job order cost system. On August 5, the firm charged 200 hours of professional (lawyer) time to the Micro Systems Co. breach of contract suit to prepare for the trial, at a rate of \$340 per hour. What is the journal entry for this transaction?
- **Debit Work in Process and credit Salaries Payable for \$68,000**

Practice Exercises

1. On May 7, Bergan Company purchased on account 10,000 units of raw materials at \$8 per unit. During May, raw materials were requisitioned for production as follows: 7,500 units for Job 200 at \$8 per unit and 1,480 units for Job 305 at \$5 per unit.

Journalize the entry on May 7 to record the purchase. If an amount box does not require an entry, leave it blank.

◦

Line item	Debt	Credit
Materials	80000	
Accounts Payable		80000

Journalize the entry on May 31 to record the requisition from the materials storeroom. If an amount box does not require an entry, leave it blank.

◦

Line item	Debt	Credit
Work in process	67400	
Materials		67400

2. During May, Bergan Company accumulated 2,500 hours of direct labor costs on Job 200 and 3,000 hours on Job 305. The total direct labor was incurred at a rate of \$28 per direct labor hour for Job 200 and \$24 per direct labor hour for Job 305.

Journalize the entry to record the flow of labor costs into production during May. If an amount box does not require an entry, leave it blank.

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Line item	Debt	Credit
Work in process	142000	
Wages payable		142000

3. During May, Bergan Company incurred factory overhead costs as follows: indirect materials, \$8,800; indirect labor, \$6,600; utilities cost, \$4,800; and factory depreciation, \$9,000.

Journalize the entry to record the factory overhead incurred during May.

If an amount box does not require an entry, leave it blank.

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Line item	Debt	Credit
Factory overhead	29200	
Materials		8800
Wages payable		6600
Utilities Payable		4800
Accumulated Depreciation-Factory		9000

4. Bergan Company estimates that total factory overhead costs will be \$620,000 for the year. Direct labor hours are estimated to be 80,000.

1. For Bergan Company, determine the *predetermined factory overhead rate* using direct labor hours as the activity base. *If required, round your answer to two decimal places.*

$$\blacksquare \quad \frac{\$620000}{80000} = 7.75 \text{ per direct labor hour}$$

2. During May, Bergan Company accumulated 2,500 hours of direct labor costs on Job 200 and 3,000 hours on Job 305. Determine the amount of factory overhead applied to Jobs 200 and 305 in May.

$$\blacksquare \quad 2500 + 3000 = 5500 * \$7.75 = \$42625$$

3. Prepare the journal entry to apply factory overhead to both jobs in May according to the predetermined overhead rate. If an amount box does not require an entry, leave it blank.

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Line item	Debt	Credit
Work in process	42625	
Factory overhead		42625

5. Factory Overhead Rates, Entries, and Account Balance

Eclipse Solar Company operates two factories. The company applies factory overhead to jobs on the basis of machine hours in Factory 1 and on the basis of direct labor hours in Factory 2. Estimated factory overhead costs, direct labor hours, and machine hours are as follows:

	Factory 1	Factory 2
Estimated factory overhead cost for fiscal year beginning August 1	\$18,500,000	\$44,000,000
Estimated direct labor hours for year		800,000
Estimated machine hours for year	1,250,000	
Actual factory overhead costs for August	\$1,515,800	\$3,606,300
Actual direct labor hours for August		64,500
Actual machine hours August	105,000	

1. Determine the factory overhead rate for Factory 1. *Round your answer to two decimal places.*

- $\frac{\$18500000}{1,250,000} = \$14.80 \text{ per machine hour}$

2. Determine the factory overhead rate for Factory 2.

- $\frac{\$44000000}{800000} = \$55 \text{ per direct labor hour}$

3. Journalize the entries to apply factory overhead to production in each factory for August. If an amount box does not require an entry, leave it blank.

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Factory 1	Debt	Credit
Work in process	$105000 * \$14.80 = \1554000	
Factory overhead		1554000

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Factory 2	Debt	Credit
Work in process	$64500 * \$55 = \3547500	
Factory overhead		3547500

4. Determine the balances of the factory overhead accounts for each factory as of August 31, and indicate whether the amounts represent *overapplied factory overhead* or *underapplied factory overhead*.

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Factory			
Factory 1	$1554000 - 1515800 = 38200$	Credit	Overapplied
Factory 2	$3606300 - 3547500 = 58800$	Debit	Underapplied

6. Exotic Engine Shop uses a *job order cost system* to determine the cost of performing engine repair work.

Estimated costs and expenses for the coming period are as follows:

Line item	Value
Engine parts	\$380,000
Shop direct labor	1,872,000
Shop and repair equipment depreciation	62,500
Shop supervisor salaries	240,000
Shop property taxes	36,940
Shop supplies	10,000
Advertising expense	28,000
Administrative office salaries	150,000
Administrative office depreciation expense	<u>8,000</u>
Total costs and expenses	<u>\$2787440</u>

The average shop direct labor rate is \$37.50 per hour.

Determine the predetermined shop overhead rate per direct labor hour.

$$\begin{aligned} \frac{1872000}{\$37.50} &= \$49920 & (1) \\ \circ & \\ 62500 + 240000 + 36940 + 10000 &= 349440 \\ \frac{349440}{49920} &= \$7 \end{aligned}$$

7. At the end of May, Bergan Company had completed Jobs 200 and 305. Job 200 is for 2,390 units, and Job 305 is for 2,053 units.

The following data relate to these two jobs:

On May 7, Bergan Company purchased on account 10,000 units of raw materials at \$8 per unit. During May, raw materials were requisitioned for production as follows: 7,500 units for Job 200 at \$8 per unit and 1,480 units for Job 305 at \$5 per unit.

During May, Bergan Company accumulated 2,500 hours of direct labor costs on Job 200 and 3,000 hours on Job 305. The total direct labor was incurred at a rate of \$28 per direct labor hour for Job 200 and \$24 per direct labor hour for Job 305.

Bergan Company estimates that total factory overhead costs will be \$620,000 for the year. Direct labor hours are estimated to be 80,000.

1. Determine the balance on the *job cost sheets* for Jobs 200 and 305 at the end of May.

Job	Balance at the end of May
Job 200	$8 * 7500 = 60000$ $28 * 2500 = 70000$ $7.75 * 2500 = 19375$ $60000 + 70000 + 19375 = 149375$
Job 305	$5 * 1480 = 7400$ $24 * 3000 = 72000$ $7.75 * 3000 = 23250$ $7400 + 72000 + 23250 = 102650$

2. Determine the cost per unit for Jobs 200 and 305 at the end of May. If required, round your answers to two decimal places.

Job	Cost per unit at the end of May
Job 200	$\frac{149375}{2390} = \$62.50$
Job 305	$\frac{102650}{2053} = \$50.00$

8. Pine Creek Company completed 200,000 units during the year at a cost of \$3,000,000. The beginning finished goods inventory was 25,000 units at \$310,000. Determine the cost of goods sold for 210,000 units, assuming a FIFO cost flow.
- Beginning inventory: $\frac{\$310000}{25000} = \12.40
 - Completed Units: $\frac{\$3000000}{200000} = \15
 - Cost of goods: $(25000 * 12.40) + [(210000 - 25000) * 25] = 310000 + 2775000 = \3085000
9. Ginocera Inc. is a designer, manufacturer, and distributor of custom gourmet kitchen knives. A new kitchen knife series called the Kitchen Ninja was released for production in early 20Y8. In January, the company spent \$600,000 to develop a late-night advertising infomercial for the new product. During 20Y8, the company spent an additional \$1,400,000 promoting the product through these infomercials, and \$800,000 in legal costs. The knives were ready for manufacture on January 1, 20Y8.
- Ginocera uses a job order cost system to accumulate costs associated with the Kitchen Ninja Knife. The unit direct materials cost for the knife is:

Line item	
Hardened steel blanks (used for knife shaft and blade)	\$4.00
Wood (for handle)	1.50
Packaging	0.50

The production process is straightforward. First, the hardened steel blanks, which are purchased directly from a raw material supplier, are stamped into a single piece of metal that includes both the blade and the shaft. The stamping machine requires one hour per 250 knives.

After the knife shafts are stamped, they are brought to an assembly area where an employee attaches the handle to the shaft and packs the knife into a decorative box. The direct labor cost is \$0.50 per unit.

The knives are sold to stores. Each store is given promotional materials, such as posters and aisle displays. Promotional materials cost \$60 per store. In addition, shipping costs average \$0.20 per knife.

Total completed production was 1,200,000 units during the year. Other information is as follows:

Line item	
Number of customers (stores)	60,000
Number of knives sold	1,120,000
Wholesale price (to store) per knife	\$16

Factory overhead cost is applied to jobs at the rate of \$800 per stamping machine hour after the knife blanks are stamped. There were an additional 25,000 stamped knives, handles, and cases in process and waiting to be assembled on December 31, 20Y8.

In your computations, if required, round interim per unit costs to two decimal places.

1. Prepare an annual income statement for the Kitchen Ninja knife series.

■

Income Statement for the Year Ended December 31, 20Y8			
Sales			$1120000 * \$16 = \17920000
Cost of goods sold			$1120000 * \$9.70 = \10864000
Gross profit			$17920000 - 10864000 = \$7056000$
Selling and admin expenses:			
Selling expenses:			
Infomercial campaign	2000000		
Promo materials	$60000 * \$60 = \3600000		
Shipping expenses	$1120000 * \$0.20 = \224000		
Total selling expenses		$2000000 + 3600000 + 224000 = 5824000$	
Admin expenses:			
Legal expenses		800000	
Total selling and admin expenses			<u>6624000</u>
Operating income			<u>432000</u>

2. Determine the balances in the work in process and finished goods inventories for the Kitchen Ninja knife series on December 31, 20Y8.

Type	Value
Finished goods	$80000 * [(1200000 - 1120000) * \$9.70] = \$776000$
Work in process	$25000 * (\$6.00 + \$3.20) = \$230000$

10. Technology Accessories Inc. is a designer, manufacturer, and distributor of accessories for consumer electronic products. Early in 20Y3, the company began production of a leather cover for tablet computers, called the iLeather. The cover is made of stitched leather with a velvet interior and fits snugly around most tablet computers. In January, \$750,000 was spent on developing marketing and advertising materials. For the first six months of 20Y3, the company spent an additional \$1,400,000 promoting the iLeather. The product was ready for manufacture on January 21, 20Y3.

Technology Accessories Inc. uses a *job order cost system* to accumulate costs for the iLeather. Direct materials unit costs for the iLeather are as follows:

Item	Value
Leather	\$10.00
Velvet	5.00
Packaging	<u>0.40</u>
Total	<u>\$15.40</u>

The actual production process for the iLeather is fairly straightforward. First, leather is brought to a cutting and stitching machine. The machine cuts the leather and stitches an exterior edge into the product. The machine requires one hour per 125 iLeathers.

After the iLeather is cut and stitched, it is brought to assembly, where assembly personnel affix the velvet interior and pack the iLeather for shipping. The direct labor cost for this work is \$0.50 per unit.

The completed packages are then sold to retail outlets through a sales force. The sales force is compensated by a 20% commission on the wholesale price for all sales.

Total completed production was 500,000 units during the year. Other information is as follows:

Item	Value
Number of iLeather units sold in 20Y3	460,000
Wholesale price per unit	\$40

Factory overhead cost is applied to jobs at the rate of \$1,250 per machine hour. There were an additional 22,000 cut and stitched iLeathers waiting to be assembled on December 31, 20Y3.

In your computations, if required, round interim per unit costs to two decimal places.

1. Prepare an annual income statement for the iLeather product.

Income Statement For the Year Ended December 31, 20Y3		
Sales		\$40 * 460000 = \$18400000
Cost of goods sold		<u>\$25.90 * 460000 = \$11914000</u>
Gross profit		18400000 – 11914000 = 6486000
Selling expenses:		
Salesperson commissions	20% * 18400000 = 3680000	
Advertising design	750000	
Advertising expenses	<u>1400000</u>	
Total selling expenses		3680000 + 750000 + 1400000 = <u>\$5830000</u>
Income from operations		6486000 – 5830000 = <u>\$656000</u>

2. Determine the balances in the finished goods and work in process inventories for the iLeather product on December 31, 20Y3.

Type	Value
Finished goods	$40000 * \$25.90 = \1036000
Work in process	$22000 * (15.4 + \$10) = \558800

Homework Exercises

1. On May 7, Keenan Company purchased on account 670 units of raw materials at \$25 per unit. During May, raw materials were requisitioned for production as follows: 241 units for Job 200 at \$22 per unit and 301 units for Job 305 at \$25 per unit.

Journalize the entry on May 7 to record the purchase. If an amount box does not require an entry, leave it blank.

o

May 7	Debt	Credit
Materials	$670 * 25 = \$16750$	
Accounts Payable		\$16750

Journalize the entry on May 31 to record the requisition from the materials storeroom. If an amount box does not require an entry, leave it blank.

o

May 31	Debt	Credit
Work in process	$(22 * 241) + (25 * 301) = \12827	
Materials		\$12827

2. During May, Jernigan Company accumulated 630 hours of direct labor costs on Job 200 and 530 hours on Job 305. The total direct labor was incurred at a rate of \$21 per direct labor hour for Job 200 and \$25 per direct labor hour for Job 305.

Journalize the entry to record the flow of labor costs into production during May. If an amount box does not require an entry, leave it blank.

o

	Debt	Credit
Work in process	$(630 * 21) + (530 * 25) = \26480	
Wages payable		\$26480

3. During May, Jernigan Company incurred factory overhead costs as follows: indirect materials, \$3,780; indirect labor, \$3,220; utilities cost, \$1,840; and factory depreciation, \$5,340.

Journalize the entry to record the factory overhead incurred during May.

If an amount box does not require an entry, leave it blank.

- o

Line item	Debt	Credit
Factory overhead	$3780 + 3220 + 1840 + 5340 = 14180$	
Materials		3780
Wages payable		3220
Utilities Payable		1840
Accumulated Depreciation-Factory		5340

4. Hatch Company estimates that total factory overhead costs will be \$432,000 for the year. Direct labor hours are estimated to be 27,000.

- For Hatch Company, determine the *predetermined factory overhead rate* using direct labor hours as the activity base. *If required, round your answer to two decimal places.*
 - $\frac{432000}{27000} = \$16$ per direct labor hour
- During May, Hatch Company accumulated 760 hours of direct labor costs on Job 200 and 860 hours on Job 305. Determine the amount of factory overhead applied to Jobs 200 and 305 in May.
 - $(760 + 860) * 16 = \$25920$
- Prepare the journal entry to apply factory overhead to both jobs in May according to the predetermined overhead rate. If an amount box does not require an entry, leave it blank.
 - | | Debt | Credit |
|------------------|-------|--------|
| Work in process | 25920 | |
| Factory overhead | | 25920 |

5. Eclipse Solar Company operates two factories. The company applies factory overhead to jobs on the basis of machine hours in Factory 1 and on the basis of direct labor hours in Factory 2. Estimated factory overhead costs, direct labor hours, and machine hours are as follows:

	Factory 1	Factory 2
Estimated factory overhead cost for fiscal year beginning August 1	\$420,400	\$600,600
Estimated direct labor hours for year		9,100
Estimated machine hours for year	21,020	
Actual factory overhead costs for August	\$33,620	\$51,960
Actual direct labor hours for August		820
Actual machine hours August	1,640	

- Determine the factory overhead rate for Factory 1.

- $\frac{420400}{21020} = \$20$ per machine hour

2. Determine the factory overhead rate for Factory 2.

- $\frac{600600}{9100} = \$66$ per direct labor hour

3. Journalize the entries to apply factory overhead to production in each factory for August. If an amount box does not require an entry, leave it blank.

- | Factory 1 | Debt | Credit |
|------------------|-----------------------|--------|
| Work in process | $1640 * 20 = \$32800$ | |
| Factory overhead | | 32800 |

- | Factory 2 | Debt | Credit |
|------------------|------------------------|--------|
| Work in process | $820 * \$66 = \54120 | |
| Factory overhead | | 54120 |

4. Determine the balances of the factory overhead accounts for each factory as of August 31, and indicate whether the amounts represent *overapplied factory overhead* or *underapplied factory overhead*.

- | Factory | | | |
|-----------|------------------------|--------|--------------|
| Factory 1 | $32800 - 33620 = -820$ | Debit | Underapplied |
| Factory 2 | $54120 - 51960 = 2160$ | Credit | Overapplied |

6. Exotic Engine Shop uses a *job order cost system* to determine the cost of performing engine repair work. Estimated costs and expenses for the coming period are as follows:

Line item	Value
Engine parts	\$861,700
Shop direct labor	629,000
Shop and repair equipment depreciation	36,400
Shop supervisor salaries	101,300
Shop property taxes	18,400
Shop supplies	18,400
Advertising expense	14,100
Administrative office salaries	17,200
Administrative office depreciation expense	<u>9500</u>
Total costs and expenses	<u>\$1761700</u>

The average shop direct labor rate is \$17.00 per hour.

Determine the predetermined shop overhead rate per direct labor hour. Round the answer to nearest whole cent.

$$\frac{629000}{\$17} = \$37000 \quad (2)$$

o $36400 + 101300 + 18400 + 14100 = 170200$

$$\frac{170200}{37000} = \$4.60$$

7. Poehling Medical Center has a single operating room that is used by local physicians to perform surgical procedures. The cost of using the operating room is accumulated by each patient procedure and includes the direct materials costs (drugs and medical devices), physician surgical time, and operating room overhead. On January 1 of the current year, the annual operating room overhead is estimated to be:

Item	Value
Disposable supplies	\$179300
Depreciation expense	32300
Utilities	18800
Nurse salaries	269300
Technician wages	<u>88300</u>
Total operating room overhead	\$588000

The overhead costs will be assigned to procedures, based on the number of surgical room hours. Poehling Medical Center expects to use the operating room an average of eight hours per day, seven days per week. In addition, the operating room will be shut down two weeks per year for general repairs.

1. Determine the predetermined operating room overhead rate for the year.

■ $\frac{588000}{8*7*50} = \210 per hour

2. Bill Harris had a 7-hour procedure on January 22. How much operating room overhead would be charged to his procedure, using the rate determined in part (a)?

■ $210 * 7 = \$1470$

3. During January, the operating room was used 186 hours. The actual overhead costs incurred for January were \$38,200. Determine the *overapplied operating overhead* or *underapplied operating overhead* for the period.

■ $38200 - (210 * 186) = 860$ **overapplied**

8. Technology Accessories Inc. is a designer, manufacturer, and distributor of accessories for consumer electronic products. Early in 20Y3, the company began production of a leather cover for tablet computers, called the iLeather. The cover is made of stitched leather with a velvet interior and fits snugly around most tablet computers. In January, \$779,000 was spent on developing marketing and advertising materials. For the first six months of 20Y3, the company spent an additional \$1,405,000 promoting the iLeather. The product was ready for manufacture on January 21, 20Y3.

Technology Accessories Inc. uses a job order cost system to accumulate costs for the iLeather. Direct materials unit costs for the iLeather are as follows:

Item	Value
Leather	\$10.00
Velvet	5.00
Packaging	0.40
Total	\$15.40

The actual production process for the iLeather is fairly straightforward. First, leather is brought to a cutting and stitching machine. The machine cuts the leather and stitches an exterior edge into the product. The machine requires one hour per 130 iLeathers.

After the iLeather is cut and stitched, it is brought to assembly, where assembly personnel affix the velvet interior and pack the iLeather for shipping. The direct labor cost for this work is \$0.50 per unit.

The completed packages are then sold to retail outlets through a sales force. The sales force is compensated by a 20% commission on the wholesale price for all sales.

Total completed production was 540,000 units during the year. Other information is as follows:

Item	Value
Number of iLeather units sold in 20Y3	500,000
Wholesale price per unit	\$40

Factory overhead cost is applied to jobs at the rate of \$1,300 per machine hour. There were an additional 21,000 cut and stitched iLeathers waiting to be assembled on December 31, 20Y3.

In your computations, if required, round interim per unit costs to two decimal places and final answers to the nearest whole dollar.

1. Prepare an annual income statement for the iLeather product.

Income Statement For the Year Ended December 31, 20Y3	
Sales	$\$40 * 500000 = \2000000
Cost of goods sold	$(15.40 + .5 + \frac{1300}{130}) * 500000 = \12950000
Gross profit	$20000000 - 12950000 = 7050000$
Selling expenses:	
Salesperson commissions	$20\% * 2000000 = 4000000$
Advertising design	779000
Advertising expenses	<u>1405000</u>
Total selling expenses	$4000000 + 779000 + 1405000 = \6184000
Income from operations	$7050000 - 6184000 = \$866000$

2. Determine the balances in the finished goods and work in process inventories for the iLeather product on December 31, 20Y3.

Type	Value
Finished goods	$40000 * \$25.90 = \1036000
Work in process	$21000 * (15.4 + \$10) = \533400

9. Cost accounting systems measure, record, and report product costs.
- **True**
10. A process cost accounting system provides product costs for each of the departments or processes within the factory.
- **True**
11. A job order cost system would be appropriate for a crude oil refining business.
- **False**
12. The materials requisition serves as the source document for debiting the accounts in the materials ledger.
- **False**
13. Depreciation expense on factory equipment is part of factory overhead cost.
- **True**
14. If factory overhead applied exceeds the actual costs, overhead is said to be underapplied.
- **False**
15. Each account in the work in process subsidiary ledger in a job order costing system is called a job cost sheet.
- **True**
16. Generally accepted accounting principles require companies to use only one factory overhead rate for product costing.
- **False**
17. The debit to Factory Overhead for the cost of indirect materials is obtained from the summary of the materials requisitions.
- **True**
18. The current year's advertising costs are normally considered period costs.
- **True**

Quiz

1. Selected accounts with some amounts omitted are as follows

Work in Process					
August 1	Balance	275000	August 31	Goods finished	1030000
31	Direct materials	X			
31	Direct labor	450000			
31	Factory overhead	X			

Factory overhead						
August 1-31	Costs incurred	145000	August 1	Balance	15000	
			31	Applied	X	

If the balance of Work in Process on August 31 is \$220,000, what was the amount debited to Work in Process for factory overhead in August, assuming a factory overhead rate of 30% of direct labor costs?

- o Amount debited to Work in Process for factory overhead in August = Direct labor costs × Factory overhead rate = $\$450,000 \times 30\% = \$135,000$
2. Journalizing the entry to record the indirect labor costs incurred for general factory use would include a debit to **factory overhead**.
 3. At the end of the fiscal year, the balance in Factory Overhead is small. The balance will be **transferred to cost of goods sold**.
 4. Reynolds Manufacturers Inc. has estimated total factory overhead costs of \$95,000 and expected direct labor hours of 9,500 for the current fiscal year. If Job 117 incurs 2,300 direct labor hours, Work in Process will be debited and Factory Overhead will be credited for
 - o Predetermined Factory Overhead Rate = Estimated Total Factory Overhead Costs ÷ Estimated Activity Base = $\frac{\$95,000}{9,500 \text{ labor hours}} = \$10 \text{ per labor hour}$
 5. Journalizing the entry to record a job completed would include a credit to **work in process**.
 6. The controlling account for the job cost sheets is **work in process**.
 7. When Job 117 was completed, direct materials totaled \$4,400; direct labor, \$5,600; and factory overhead, \$2,400. A total of 1,000 units were produced at a per-unit cost of $\frac{4400+5600+2400}{1000} = \12.40
 8. Journalizing the entry to record jobs shipped and customers billed would include a debit to **cost of goods sold**.
 9. Selected accounts with some amounts omitted are as follows

Work in Process						
August 1	Balance	275000	August 31	Goods finished	1030000	
31	Direct materials	X				
31	Direct labor	450000				
31	Factory overhead	X				

Factory overhead						
August 1-31	Costs incurred	145000	August 1	Balance	15000	
			31	Applied (30% of direct labor cost)	X	

If the balance of Work in Process on August 31 is \$220,000, what was the amount debited to Work in Process for factory overhead in August?

- Amount debited to Work in Process for direct materials in August = Finished goods + Balance of Work in Process on August 31 – Balance of Work in Process on August 1 – Direct labor – Applied factory overhead = $\$1030000 + \$220000 - \$275000 - \$450000 - (\$450000 \times 30\%) = \390000

10. Selected accounts with a credit amount omitted are as follows:

Work in process					
April 1	Balance	7000	April 30	Goods finished	X
30	Direct materials	78400			
30	Direct labor	195000			
30	Factory overhead	136500			

Finished goods					
April 1	Balance	42000			
30	Goods finished	387000			

What was the balance of Work in Process as of April 30?

- Balance of Work in Process as of April 30 = Finished goods – Balance of Work in Process on April 1 – Direct materials – Direct labor – Factory overhead = $\$387000 - \$7000 - \$78400 - \$195000 - \$136500 = \29900

11. If the amount of factory overhead cost incurred exceeds the amount applied, the factory overhead account will have a **debit balance and be underapplied**.

- At the end of July, the first month of the current fiscal year, the factory overhead account had a debit balance. Which of the following describes the nature of this balance and how it would be reported on the interim balance sheet?
 - underapplied, deferred debit**
- The journal entries to record the cost and sale of a finished good on account are
 - debit Cost of Goods Sold, credit Finished Goods; debit Accounts Receivable, credit Sales**
- In a job order cost accounting system, the journal entry to record the flow of direct labor costs into production consists of a **debit to Work in Process and a credit to Wages Payable**.
- Journalizing the entry to record a job completed would include a debit to **finished goods**.
- Selected accounts with a credit amount omitted are as follows:

Work in process					
October 1	Balance	20000	October 31	Finished goods	X
31	Direct materials	96700			
31	Direct labor	201000			
31	Factory overhead	X			

Finished goods						
October 1		Balance	52000			
31		Goods finished	360000			

If the balance of Work in Process on October 31 is \$21,000, what was the amount of factory overhead applied in October?

- Amount of factory overhead applied in October = Finished goods + Balance of Work in Process on October 31 – Balance of Work in Process on October 1 – Direct materials – Direct labor =

$$\$360000 + \$21000 - \$20000 - \$96700 - \$201000 = \$63300$$

17. A widely used activity base for developing factory overhead rates in highly automated settings is **machine hours**.
18. The finished goods account is the controlling account for the **stock ledger**.
19. Journalizing the entry to record jobs shipped and customers billed would include a credit to **finished goods**.
20. Journalizing the entry to record the application of factory overhead costs to jobs would include a credit to **factory overhead**.

Chapter 17

Pre-Lecture Videos

1. Which of the following manufacturers is most likely to use a process cost system?
 - **Sports drink manufacturer**
2. Process and job order cost systems are similar in that both systems
 - **record and summarize product costs**
 - **classify product costs as direct materials, direct labor, and factory overhead**
 - **allocate factory overhead costs to products**
3. The first step in preparing a cost of production report is to **determine the units to be assigned costs**.
4. The last step in preparing a cost of production report is to **allocate costs to units transferred out and partially completed units**.
5. The journal entry to recognize depreciation on machinery is **a debit to Factory Overhead and a credit to Accumulated Depreciation**.
6. Which of the following represents the computation of direct materials cost per equivalent unit?
 - **Total direct cost for the period divided by total equivalent units of direct materials.**
7. What is the conversion cost per equivalent unit, when the total conversion cost for the period is \$1,225 and the total units of packaged drinking water produced during the same period is 5,000 gallons (70 percent complete).
 - $$\frac{1225}{\frac{5000}{70} * 100} = .1715$$
8. Rambo-Conduit Corporation manufactures plastic conduit that is used in the cable industry. A conduit is a tube that encircles and protects the underground cable. In the process of making the plastic conduit, called extrusion, the melted plastic (resin) is pressed through a die to form a tube. Scrap is produced in this process. Information from the cost of production reports for three months is as follows, assuming that inventory remains constant:

	May	June	July
Resin pounds input into the process	470,000	700,000	650,000
Price per pound	x\$1.50	x\$1.50	x\$1.50
Plastic material costs	\$493,000	\$640,000	\$677,000
Conversion costs	\$80,000	\$120,000	\$115,000
Conduit output from the process (feet)	800,000	1,200,000	1,130,000

Assuming that there is one-half pound of resin per foot of the finished product, determine the resin materials cost per foot of finished product for June.

$$\circ \frac{640000}{1200000} = 0.53$$

9. Rambo-Conduit Corporation manufactures plastic conduit that is used in the cable industry. A conduit is a tube that encircles and protects the underground cable. In the process of making the plastic conduit, called extrusion, the melted plastic (resin) is pressed through a die to form a tube. Scrap is produced in this process. Information from the cost of production reports for three months is as follows, assuming that inventory remains constant:

	May	June	July
Resin pounds input into the process	470,000	700,000	650,000
Price per pound	x\$1.50	x\$1.50	x\$1.50
Plastic material costs	\$493,000	\$640,000	\$677,000
Conversion costs	\$80,000	\$120,000	\$115,000
Conduit output from the process (feet)	800,000	1,200,000	1,130,000

Assuming that there is one-half pound of resin per foot of the finished product, determine the conversion cost per foot of finished product for May.

$$\circ \frac{80000}{800000} = 0.10$$

10. Under the **average cost** method, all production costs (materials and conversion costs) are combined together for determining equivalent units and cost per equivalent unit.
11. The cost per equivalent unit is determined by dividing the **total production costs** by the **total equivalent units of production**.

Mini Quiz

1. Conversion costs are comprised of **direct labor and factory overhead**.
2. The journal entry to record applied factory overhead includes a(n) **decrease to Factory Overhead**.
3. The cost of production report may be used for all the following except analyzing the change in **general and administrative costs per equivalent units between periods**.
4. Conversion costs are **one part of a cost of production report that is prepared to show greater detail, including multiple cost categories**.

5. For the month of September, Florida, Inc., incurs a direct materials cost of \$12,000 for 7,500 gallons of strawberry lemonade produced in its Mixing Department. It also incurs conversion costs of \$6,000 with 80% completed. If the direct materials cost per equivalent unit was \$0.90 in August and the conversion cost per equivalent unit was \$1.15 per gallon in August, what is the difference in the direct materials cost per equivalent unit between the two months?

o **0.10**

6. The cost of production report may include all of the following except **advertising costs**.
7. The last step in preparing a cost of production report is **allocating costs to units transferred out**.
8. Guardino Company manufactures a single product by a continuous process, involving three production departments. The records indicate that direct materials, direct labor, and applied factory overhead for Department 1 were \$100,000, \$125,000, and \$150,000, respectively. The records further indicate that direct materials, direct labor, and applied factory overhead for Department 2 were \$50,000, \$60,000, and \$70,000, respectively. In addition, work in process at the beginning of the period for Department 1 totaled \$75,000, and work in process at the end of the period totaled \$60,000.

The journal entry to record the flow of costs into Department 1 during the period for factory overhead is

o

Department 1		
Work in Process	150,000	
Factory Overhead		150,000

9. If the materials output is less than the materials input into a process, a company may be experiencing **materials losses from waste**.
10. The cost of energy consumed in producing good units in the Canning Department of Mandarin Orange Processing Company was \$10,790 and \$5,170 for March and April, respectively. The number of equivalent units produced in March and April was 83,000 and 47,000 liters, respectively. What is the cost of energy for the two months?
- o **\$0.13 and \$0.11 for March and April, respectively**
11. For which of the following businesses would a process cost system be appropriate?
- o **Beverage producer**
12. During the current month, Grey Company sold 60,000 units for \$10 each. Each unit had an equivalent cost of \$6 each. The journal entry to record the sale would include which of the following?

o

Grey Company		
Cost of Goods Sold	360,000	
Finished Goods		360,000

13. The third step in preparing a cost of production report is **determining the cost per equivalent unit of production**.
14. What is the journal entry for the application of Factory Overhead to Work in Process if the driver is imprints, the rate is \$1.80 per imprint, and the imprint meter reads 1,780 at the start of the day and 2,890 at the end of the day?

o

Imprints		
Work in Process	1,998	
Factory Overhead		1,998

15. Libby Company manufactures a single product by a continuous process, involving the production departments. The records indicate that direct materials, direct labor, and applied factory overhead for Department 1 were \$160,000, \$125,000, and \$150,000, respectively.

The journal entry to record the cost of direct labor for the period is

o

Department 1		
Work in Process	125,000	
Wages Payable		125,000

Practice Exercises

1. Which of the following industries would typically use job order costing, and which would typically use process costing?

o

Industry	Designation
Steel manufacturing	Process costing
Business consulting	Job order costing
Web designer	Job order costing
Computer chip manufacturing	Process costing
Candy making	Process costing
Designer clothes manufacturing	Job order costing

2. In October, the cost of materials transferred into the Rolling Department from the Casting Department of Kraus Steel Company is \$3,000,000. The conversion cost for the period in the Rolling Department is \$462,600 (\$275,000 factory overhead applied and \$187,600 direct labor). The total cost transferred to Finished Goods for the period was \$3,392,400. The Rolling Department had a beginning inventory of \$163,800.

1. Journalize the cost of transferred-in materials. If an amount box does not require an entry, leave it blank.

■

	Debit	Credit
Work in process - Rolling	3,000,000	
Work in process - Casting		3,000,000

2. Journalize the conversion costs. If an amount box does not require an entry, leave it blank.

	Debit	Credit
Work in process - Rolling	462,600	
Factory overhead - Rolling		275,000
Wages payable		187,600

3. Journalize the costs transferred out to Finished Goods. If an amount box does not require an entry, leave it blank.

	Debit	Credit
Finished Goods	3392400	
Work in process - Rolling		3392400

4. Determine the balance of Work in Process—Rolling at the end of the period.

$$163800 + 3000000 + 462600 - 3392400 = 234000$$

3. Radford Inc. manufactures a sugar product by a continuous process, involving three production departments—Refining, Sifting, and Packing. Assume that records indicate that direct materials, direct labor, and applied factory overhead for the first department, Refining, were \$1,250,000, \$660,000, and \$975,000, respectively. Also, work in process in the Refining Department at the beginning of the period totaled \$328,000, and work in process at the end of the period totaled \$295,000.

1. Journalize the entries to record the flow of costs into the Refining Department during the period for (1) direct materials, (2) direct labor, and (3) factory overhead. If an amount box does not require an entry, leave it blank.

Direct Materials	Debit	Credit
Work in process - Refining	1250000	
Materials		1250000

Direct Labor	Debit	Credit
Work in process - Refining	660000	
Wages payable		660000

Factory Overhead	Debit	Credit
Work in process - Refining	975000	
Factory overhead - Refining		975000

2. Journalize the entry to record the transfer of production costs to the second department, Sifting. If an amount box does not require an entry, leave it blank.

	Debit	Credit
Work in process - Sifting	$328000 + 1250000 + 660000 + 975000 - 295000 = 2918000$	
Work in process - Refining		2918000

4. The Converting Department of Tender Soft Tissue Company uses the weighted average method and had 1,900 units in work in process that were 60% complete at the beginning of the period. During the period, 15,800 units were completed and transferred to the Packing Department. There were 1,200 units in process that were 30% complete at the end of the period.

- Determine the number of *whole units* to be accounted for and to be assigned costs for the period.
 - $15800 + 1200 = 17000$
- Determine the number of equivalent units of production for the period. Assume that direct materials are placed in process during production.
 - $(15800 * 100\%) + (1200 * 30\%) = 16160$

5. The charges to Work in Process—Baking Department for a period as well as information concerning production are as follows. The Baking Department uses the weighted average method, and all direct materials are placed in process during production.

Work in Process	Units			To	Units
Balance	900	40%	2466	Finished Goods	8100
Direct materials	8400		34500		
Direct labor			16200		
Factory overhead			8574		
Balance	1200	60%	?		

- Determine the number of *whole units* to be accounted for and to be assigned costs.
 - $8100 + 1200 = 9300$
- Determine the number of equivalent units of production.
 - $8100 + (1200 * 60\%) = 8820$
- Determine the cost per equivalent unit.
 - $\frac{2466+34500+16200+8574}{8820} = 7$
- Determine the cost of units transferred to Finished Goods.
 - $8100 * 7 = 56700$
- Determine the cost of units in ending Work in Process.
 - $1200 * 60\% * 7 = 5040$
- Assuming that direct materials are placed in process during production, use the weighted average method with the following data:

	Units	% Completed	Cost
Work in process, January 1	3400	75	
Materials added during January from Weaving Department	64000		23000
Direct labor for January			105100
Factory overhead for January			80710
Goods finished during January (includes goods in process, January 1)	63500		
Work in process, January 31	3900	10	

Prepare a cost of production report for the Cutting Department of Dalton Carpet Company for January. *If required, round your cost per equivalent unit answer to the nearest cent.*

- o Unit information

Units charged to production:	
Inventory in process, January 1	3400
Received from Weaving Department	<u>64000</u>
Total units accounted for by the Cutting Department	<u>67400</u>

Units to be assigned costs:	Whole Units	Equivalent Units of Production
Transferred to finished goods in January	63500	63500
Inventory in process, January 31	<u>3900</u>	$3900 * 10\% = \underline{390}$
Total units to be assigned costs	<u>67400</u>	<u>63890</u>

- o Cost information

Cost per equivalent unit:	Costs
Total costs for January in Cutting Department	$23000 + 366200 + 105100 + 80710 = 575010$
Total equivalent units	<u>63890</u>
Cost per equivalent unit	$\frac{575010}{63890} = \underline{9}$

Costs assigned to production:	Costs
Inventory in process, January 1	23000
Costs incurred in January	$366200 + 105100 + 80710 = \underline{552010}$
Total costs accounted for by the Cutting Department	$23000 + 552010 = \underline{\underline{575010}}$

Costs allocated to completed and partially completed units:	Costs
Transferred to finished goods in January	$63500 * 9 = 571500$
Inventory in process, January 31	$(3900 * 10\%) * 9 = \underline{3510}$
Total costs assigned by the Cutting Department	$571500 + 3510 = \underline{\underline{575010}}$

7. Blue Ribbon Flour Company manufactures flour by a series of three processes, beginning in the Milling Department. From the Milling Department, the materials pass through the Sifting and Packaging departments, emerging as packaged refined flour.

The balance in the account Work in Process—Sifting Department was as follows on May 1:

	Units	% Completed	Cost
Work in process - Sifting Department	1500	75	3400
The following costs were charged to Work in Process—Sifting Department during May:			
Direct materials transferred from Milling Department:	18300		32600
Direct labor			14560
Factory overhead			7490

During May, 18,000 units of flour were completed and transferred to finished goods. Work in Process—Sifting Department on May 31 was 1,800 units, 75% completed.

Required:

Prepare a cost of production report for the Sifting Department for May, using the weighted average method. Assume that direct materials are placed in process during production.

- o Unit information

Units charged to production:	
Inventory in process, May 1	1500
Received from Milling Department	<u>18300</u>
Total units accounted for by the Sifting Department	$1500 + 18300 = \underline{\underline{19800}}$

Units to be assigned costs:	Whole Units	Equivalent Units of Production
Transferred to finished goods in January	18000	18000
Inventory in process, May 31	<u>1800</u>	$1800 * 75\% = \underline{1350}$
Total units to be assigned costs	<u>19800</u>	<u>19350</u>

- Cost information

Cost per equivalent unit:	Costs
Total costs for May in Sifting Department	$3400 + 32600 + 14560 + 7490 + 58050$
Total equivalent units	<u>19350</u>
Cost per equivalent unit	$\frac{58050}{19350} = \underline{3}$

Costs assigned to production:	Costs
Inventory in process, May 1	3400
Costs incurred in May	$32600 + 14560 + 7490 = \underline{54560}$
Total costs accounted for by the Cutting Department	$3400 + 54650 = \underline{58050}$

Costs allocated to completed and partially completed units:	Costs
Transferred to finished goods in May	$18000 * 3 = 54000$
Inventory in process, May 31	$(1800 * 75\%) * 3 = \underline{4050}$
Total costs assigned by the Cutting Department	$54000 + 4050 = \underline{58050}$

8. Kraus Steel Company has two departments, Casting and Rolling. In the Rolling Department, ingots from the Casting Department are rolled into steel sheet. The Rolling Department received 4,000 tons from the Casting Department in October. During October, the Rolling Department completed 3,900 tons, including 200 tons of work in process on October 1. The ending work in process inventory on October 31 was 300 tons.

How many tons were started and completed during October?

- $3900 - 200 = 3700$

9. The Rolling Department of Kraus Steel Company had 200 tons in beginning work in process inventory (60% complete) on October 1. During October, 3,900 tons were completed. The ending work in process inventory on October 31 was 300 tons (25% complete).

What are the total equivalent units for direct materials for October if materials are added at the beginning of the process?

- $(3900 - 200) + (300 * 100\%) = 4000$

10. The Rolling Department of Kraus Steel Company had 200 tons in beginning work in process inventory (60% complete) on October 1. During October, 3,900 tons were completed. The ending work in process inventory on October 31 was 300 tons (25% complete).

What are the total equivalent units for conversion costs?

- $3900 - (.6 * 200) + (.25 * 300) = 3855$

11. The cost of direct materials transferred into the Rolling Department of Kraus Company is \$3,000,000. The conversion cost for the period in the Rolling Department is \$462,600. The total equivalent units for direct materials and conversion are 4,000 tons and 3,855 tons, respectively.

Determine the direct materials and conversion costs per equivalent unit.

- Direct materials cost per equivalent unit: $\frac{300000}{4000} = 750$
- Conversion cost per equivalent unit: $\frac{462600}{3855} = 120$

12. The *costs per equivalent unit* of direct materials and conversion in the Rolling Department of Kraus Steel Company are \$750 and \$120, respectively. The equivalent units to be assigned costs are as follows:

Equivalent Units ->	Direct Materials	Conversion
Inventory in process, October 1	0	80
Started and completed during October	<u>3700</u>	<u>3700</u>
Transferred out of Rolling (Completed)	3700	3780
Inventory in process, October 31	<u>300</u>	<u>75</u>
Total units to be assigned costs	<u>4000</u>	<u>3855</u>

The beginning work in process inventory on October 1 had a cost of \$163,800. Determine the cost of completed and transferred-out production, the ending work in process inventory, and the total costs assigned by the Rolling Department.

- Completed and transferred-out production: $(750 * 3700) + (120 * 3780) + 163800 = 3392400$
- Inventory in process, October 31: $(750 * 300) + (120 * 75) = 234000$
- Total costs assigned by the Rolling Department: $(750 * 4000) + (120 * 3855) + 163800 = 3626400$

13. The costs of materials consumed in producing good units in the Forming Department of Thomas Company were \$76,000 and \$77,350 for September and October, respectively. The number of equivalent units produced in September and October was 800 tons and 850 tons, respectively. Evaluate the change in the cost of materials between the two months.

- Material cost per ton, September: $\frac{76000}{800} = 95$
- Material cost per ton, October: $\frac{77350}{850} = 91$

The cost of materials **decreased** by $95 - 91 = 4$ per ton between September and October

14. *The Hershey Company (HSY)* manufactures chocolate confectionery products. The three largest raw materials are cocoa, sugar, and dehydrated milk. These raw materials first go into the Blending Department. The blended product is then sent to the Molding Department, where the bars of candy are formed. The candy is then sent to the Packing Department, where the bars are wrapped and boxed. The boxed candy is then sent to the distribution center, where it is eventually sold to food brokers and retailers.

Show the accounts debited and credited for each of the following business events:

-

Materials used by the Blending Department	
Debit	Work in process - Blending department
Credit	Materials - Cocoa
Credit	Materials - Sugar
Credit	Materials - Dehydrated milk

o

Transfer or blended product to the Molding Department	
Debit	Work in process - Molding department
Credit	Work in process - Blending department

o

Transfer of chocolate to the Packing Department	
Debit	Work in process - Packing department
Credit	Work in process - Molding department

o

Transfer of boxed chocolate to the distribution center	
Debit	Finished goods
Credit	Work in process - Packing department

o

Sale of boxed chocolate	
Debit	Cost of goods sold
Credit	Finished goods

15. *Alcoa Inc.* (AA) is the world's largest producer of aluminum products. One product that Alcoa manufactures is aluminum sheet products for the aerospace industry. The entire output of the Smelting Department is transferred to the Rolling Department. Part of the fully processed goods from the Rolling Department are sold as rolled sheet, and the remainder of the goods are transferred to the Converting Department for further processing into sheared sheet.

Indicate the flow of costs from the processing department accounts into the finished goods accounts and then into the cost of goods sold account. The relevant accounts are as follows:

Accounts	Accounts Cont.
Cost of Goods Sold	Finished Goods—Rolled Sheet
Materials	Finished Goods—Sheared Sheet
Factory Overhead—Smelting Department	Work in Process—Smelting Department
Factory Overhead—Rolling Department	Work in Process—Rolling Department
Factory Overhead—Converting Department	Work in Process—Converting Department

1. Materials flow to which department?
 - **Work in process - Smelting department**
2. The costs from Factory Overhead-Converting Department flow to which department?
 - **Work in process - Converting department**
3. The costs from Work in process-Smelting Department flow to which department?
 - **Work in process - Rolling department**
4. The costs from Finished Goods-Sheared Sheet flow to which account?
 - **Cost of goods sold**

Homework Exercises

1. In October, the cost of materials transferred into the Rolling Department from the Casting Department of Kraus Steel Company is \$552,200. The conversion cost for the period in the Rolling Department is \$106,600 (\$64,800 factory overhead applied and \$41,800 direct labor). The total cost transferred to Finished Goods for the period was \$520,000. The Rolling Department had a beginning inventory of \$29,800.

1. Journalize the cost of transferred-in materials. If an amount box does not require an entry, leave it blank.

■

	Debit	Credit
Work in process - Rolling	552200	
Work in process - Casting		552200

2. Journalize the conversion costs. If an amount box does not require an entry, leave it blank.

■

	Debit	Credit
Work in process - Rolling	106600	
Factory overhead - Rolling		64800
Wages payable		41800

3. Journalize the costs transferred out to Finished Goods. If an amount box does not require an entry, leave it blank.

■

	Debit	Credit
Finished Goods	520000	
Work in process - Rolling		520000

4. Determine the balance of Work in Process—Rolling at the end of the period.

$$\blacksquare \quad 29800 + 552200 + 106600 - 520000 = 168600$$

2. Radford Inc. manufactures a sugar product by a continuous process, involving three production departments—Refining, Sifting, and Packing. Assume that records indicate that direct materials, direct labor, and applied factory overhead for the first department, Refining, were \$405,100, \$141,800, and \$93,200, respectively. Also, work in process in the Refining Department at the beginning of the period totaled \$22,700, and work in process at the end of the period totaled \$28,000.

1. Journalize the entries to record the flow of costs into the Refining Department during the period for (1) direct materials, (2) direct labor, and (3) factory overhead. If an amount box does not require an entry, leave it blank.

■

Direct Materials	Debit	Credit
Work in process - Refining	405100	
Materials		405100

■

Direct Labor	Debit	Credit
Work in process - Refining	141800	
Wages payable		141800

■

Factory Overhead	Debit	Credit
Work in process - Refining	93200	
Factory overhead - Refining		93200

2. Journalize the entry to record the transfer of production costs to the second department, Sifting. If an amount box does not require an entry, leave it blank.

■

	Debit	Credit
Work in process - Sifting	$22700 + 405100 + 141800 + 93200 - 28000 = 634800$	
Work in process - Refining		634800

3. The Converting Department of Tender Soft Tissue Company uses the weighted average method and had 3,100 units in work in process that were 70% complete at the beginning of the period. During the period, 39,100 units were completed and transferred to the Packing Department. There were 1,700 units in process that were 20% complete at the end of the period.

1. Determine the number of *whole units* to be accounted for and to be assigned costs for the period.

- $39100 + 1700 = 40800$
2. Determine the number of equivalent units of production for the period. Assume that direct materials are placed in process during production.
- $(39100 * 100\%) + (1700 * 20\%) = 39440$
4. The following information concerns production in the Finishing Department for May. The Finishing Department uses the Weighted average method.

Date	Item	Units	%	Debit	Credit	Balance Debit	Balance Credit
May 1	Bal.	4200	70			36500	
31	Direct materials	23600		125800		162300	
31	Direct labor			75400		237700	
31	Factory overhead			82675		320375	
31	Goods transferred	24700			308750	11625	
31	Bal		30			11625	

- Determine the number of units in work in process inventory at the end of the month.
 - $23600 + 4200 - 24700 = 3100$
- Determine the number of *whole units* to be accounted for and to be assigned costs and the equivalent units of production for May. Assume that direct materials are placed in process during production.
 - Whole units to be accounted for: $4200 + 23600 = 27800$
 - Whole units to be assigned costs: 27800
 - Equivalent units of production: $((4200 + 23600 - 24700) * 30\%) + 24700 = 25630$
- The increases to Work in Process—Roasting Department for Highlands Coffee Company for May as well as information concerning production are as follows:

	Units	% Completed	Cost
Work in proces, May 1	1150	40	1700
Coffee beans added during may	10900		28600
Conversion costs during May			12504
Work in process, May 31	800	80	
Goods finishing during May	11250		

Prepare a cost of production report for May, using the Weighted average method. Assume that direct materials are placed in process during production. *If required, round cost per equivalent unit answers to the nearest cent.*

- Unit information

Units charged to production:	
Inventory in process, May 1	1150
Received from materials storeroom	<u>10900</u>
Total units accounted for by the Roasting Department	$1150 + 10900 = \underline{12050}$

Units to be assigned costs:	Whole Units	Equivalent Units of Production
Transferred to finished goods in May	11250	11250
Inventory in process, May 31	<u>800</u>	$800 * 80\% = \underline{640}$
Total units to be assigned costs	<u>12050</u>	<u>11890</u>

- o Cost information

Cost per equivalent unit:	Costs
Total costs for May in Roasting Department	$1700 + 28600 + 12504 = 42804$
Total equivalent units	<u>11890</u>
Cost per equivalent unit	$\frac{42804}{11890} = \underline{3.6}$

Costs assigned to production:	Costs
Inventory in process, May 1	1700
Costs incurred in May	$28600 + 12504 = \underline{41104}$
Total costs accounted for by the Roasting Department	$1700 + 41104 = \underline{42804}$

Costs allocated to completed and partially completed units:	Costs
Transferred to finished goods in May	$11250 * 3.6 = 40500$
Inventory in process, May 31	$640 * 3.6 = \underline{2304}$
Total costs assigned by the Roasting Department	$40500 + 2304 = \underline{42804}$

6. Sunrise Coffee Company roasts and packs coffee beans. The process begins in the Roasting Department. From the Roasting Department, the coffee beans are transferred to the Packing Department. The following is a partial work in process account of the Roasting Department at May 31:

	Units	% Completed	Cost
Work in proces - Sifting Department	1500	75	3400
The following costs were charged to Work in Process—Sifting Department during May:			
Direct materials transferred from Milling Department:	18300		32600
Direct labor			14560
Factory overhead			7490

Prepare a cost of production report, using the weighted average method, and identify the missing amounts for Work in Process—Roasting Department. Assume that direct materials are placed in process during production. If required, round your cost per equivalent unit answer to two decimal places.

- o Unit information

Units charged to production:	
Inventory in process, May 1	19200
Received from Milling Department	<u>332200</u>
Total units accounted for by the Sifting Department	$19200 + 332200 = \underline{\underline{351400}}$

Units to be assigned costs:	Whole Units	Equivalent Units of Production
Transferred to finished goods in January	335000	335000
Inventory in process, May 31	$351400 - 335000 = \underline{16400}$	$16400 * 80\% = \underline{\underline{13120}}$
Total units to be assigned costs	$335000 + 16400 = \underline{\underline{351400}}$	$335000 + 13120 = \underline{\underline{348120}}$

- o Cost information

Cost per equivalent unit:	Costs
Total costs for May in Sifting Department	1984284
Total equivalent units	<u>384120</u>
Cost per equivalent unit	$\frac{1984284}{384120} = \underline{\underline{5.7}}$

Costs assigned to production:	Costs
Inventory in process, May 1	81024
Costs incurred in May	$793958 + 454814 + 654488 = \underline{1903260}$
Total costs accounted for by the Cutting Department	$81024 + 1903260 = \underline{\underline{1984284}}$

Costs allocated to completed and partially completed units:	Costs
Transferred to finished goods in May	$335000 * 5.7 = 1909500$
Inventory in process, May 31	$13120 * 5.7 = \underline{74784}$
Total costs assigned by the Cutting Department	$1909500 + 74784 = \underline{\underline{1984284}}$

Quiz

1. Both process and job order cost systems maintain perpetual inventory accounts with subsidiary ledgers.
 - o **True**
2. If the products of a manufacturing process are produced to customer specifications, a process cost system is more appropriate than a job order cost system.
 - o **False**
3. In a process costing system, a separate work in process inventory account is maintained for each customer's job.
 - o **False**
4. In a process costing system, each process will have a work in process inventory account.
 - o **True**
5. Equivalent units are the sum of direct materials used and direct labor incurred.
 - o **False**
6. Industries that typically use process cost systems include chemicals, oil, metals, food, paper, and pharmaceuticals.
 - o **True**
7. Process manufacturers typically use large machines to process a continuous flow of raw materials into a finished state.
 - o **True**
8. The Mountain Springs Water Company has two departments, Purifying and Bottling. The Bottling Department received 67,000 liters from the Purifying Department. During the period, the Bottling Department completed 65,000 liters, including 3,000 liters of work in process at the beginning of the period. The ending work in process was 5,000 liters. How many liters were started and completed during the period?
 - o $65000 - 3000 = 62000$ liters started and completed
9. Process manufacturing usually reflects a manufacturer that produces small quantities of unique items.
 - o **False**
10. The cost of direct materials transferred into the Bottling Department of the Mountain Springs Water Company is \$28,072. The conversion cost for the period in the Bottling Department is \$10,275. The total equivalent units for direct materials and conversion are 63,800 liters and 68,500 liters, respectively. Determine the direct materials and conversion cost per equivalent unit.

- o Cost per equivalent unit of materials: $\frac{28072}{63800} = .44$
- Cost per equivalent unit of conversion: $\frac{10275}{68500} = .15$

11. Match each business that follows with the job cost system it would most likely utilize.

- o

Industry	Cost System
Tax consultant	Job order
Paint manufacturer	Process
Nail manufacturer	Process

12. The debits to Work in Process—Assembly Department for April, together with data concerning production, are as follows:

	Units	%	Value
April 1, work in process:			
Materials cost	3000		7500
Conversion costs	3000	80	6000
Materials added during April	10000		29000
Conversion costs during April			35000
Goods finished during April	11500		
April 30, work in process	1500	60	

All direct materials are placed in process at the beginning of the process, and the weighted average method is used to cost inventories.

The materials cost per equivalent unit (to the nearest cent) for April is $\frac{7500+29000}{11500+(1500*100\%)} = 2.81$

13. Department F had 4,000 units in Work in Process that were 40% completed at the beginning of the period at a cost of \$12,500. Of the \$12,500, \$8,000 was for material and \$4,500 was for conversion costs, 14,000 units of direct materials were added during the period at a cost of \$28,700, 15,000 units were completed during the period, and 3,000 units were 75% completed at the end of the period. All materials are added at the beginning of the process. Direct labor was \$32,450 and factory overhead was \$18,710.

If the weighted average method is used, the conversion cost per unit (rounded to the nearest cent) would be $\frac{4500+32450+18710}{15000+(3000*75\%)} = 3.23$

14. If the principal products of a manufacturing process are identical, a process cost system is more appropriate than a job order cost system.

- o True

15. Department E had 4,000 units in Work in Process that were 40% completed at the beginning of the period at a cost of \$12,500, 14,000 units of direct materials were added during the period at a cost of \$28,700, 15,000 units were completed during the period, and 3,000 units were 75% completed at the end of the period. All materials are added at the beginning of the process. Direct labor was \$32,450 and factory overhead was \$18,710.

The number of equivalent units of production for the period for conversion if the weighted average method is used to cost inventories was $15000 + (3000 * 75\%) = 17250$

16. Department E had 4,000 units in Work in Process that were 40% completed at the beginning of the period at a cost of \$12,500, 14,000 units of direct materials were added during the period at a cost of \$28,700, 15,000 units were completed during the period, and 3,000 units were 75% completed at the end of the period. All materials are added at the beginning of the process. Direct labor was \$32,450 and factory overhead was \$18,710.

The number of equivalent units of production for the period for conversion if the weighted average method is used to cost inventories was $\frac{8000+28700}{15000+3000} = 2.04$

17. The debits to Work in Process—Assembly Department for April, together with data concerning production, are as follows:

	Units	%	Value
April 1, work in process:			
Materials cost	3000		7500
Conversion costs	3000	80	6000
Materials added during April	10000		29000
Conversion costs during April			35000
Goods finished during April	11500		
April 30, work in process	1500	60	

All direct materials are placed in process at the beginning of the process, and the weighted average method is used to cost inventories.

The materials cost per equivalent unit (to the nearest cent) for April is $\frac{6000+35000}{11500+(1500*60\%)} = 3.31$

18. Direct materials, direct labor, and factory overhead are assigned to each manufacturing process in a process costing system.
- **True**
19. Process cost systems use job order cost cards to accumulate cost data.
- **False**
20. Custom-made goods would be accounted for using a process costing system.
- **False**

Chapters 15-17 Exam

1. Gallons of output for October and November were 45,000 and 56,000, respectively. Gallons of input for October and November were 46,000 and 64,000, respectively. Which of the following statements is true?

- **The yield for October was 0.98 ($\frac{45000}{46000} = 0.98$)**

2. The following information is available for Shanika Company for 20Y6:

FIX NUMBERS IN SOLUTION

Inventories	January 1	December 31
Materials	364890	452460
Work in process	656800	615350
Finished goods	631260	628920

Item	Value
Advertising expense	307220
Depreciation expense - office equipment	43440
Depreciation expense - factory equipment	58370
Direct labor	696790
Heat, light, and power - facotry	23080
Indirect labor	81440
Materials purchased	683210
Office salaries expense	238450
Property taxes - factory	19000
Property taxes - headquarters building	39360
Rent expense - factory	32120
Sales	3198890
Sales salaries expense	392740
Supplies - factory	15840
Miscellaneous costs - factory	9950

1. Prepare the 20Y6 statement of cost of goods manufactured.

■

Statement of Cost of Goods Manufactured For the Year Ended December 31, 20Y6				
Work in process inventory, January 1, 20Y6				109200
Direct materials:				
Materials inventory, January 1, 20Y6		364890		
Purchases		<u>683210</u>		
Cost of materials available for use		1048100		
Materials inventory, December 31, 20Y6		<u>-452460</u>		
Cost of Direct Materials used in Production			595640	
Direct Labor			696790	
Factory Overhead:				
Indirect labor		81440		
Depreciation expense-factory equipment		58370		
Heat, light, and power-factory		23080		
Property taxes-factory		19000		
Rent expense-factory		32120		
Supplies-factory		15840		
Miscellaneous costs-factory		<u>9950</u>		
Total factory overhead			<u>239800</u>	
Total manufacturing costs incurred in 20Y6				<u>1532230</u>
Total manufacturing costs				2189030
Work in process inventory, December 31, 20Y6				<u>-615350</u>
Cost of goods manufactured				<u>1573780</u>

2. Prepare the 20Y6 income statement

■

Income Statement For the Year Ended December 31, 20Y6			
Sales			3198890
Cost of good sold:			
Finished goods inventory, January 1, 20Y6		631260	
Cost of goods manufactured		<u>1573680</u>	
Cost of finished goods available for sale		2204940	
Finished goods inventory, December 31, 20Y6		<u>-628920</u>	
Cost of goods sold			-1576020
Gross profit			1662870
Operating expenses:			
Administrative expenses:			
Office salaries expense	238450		
Depreciation expense-office equipment	43440		
Property taxes-headquarters building	<u>39360</u>	321250	
Selling expenses:			
Advertising expense	307220		
Sales salaries expense	<u>392740</u>	<u>699960</u>	
Total operating expenses			<u>-1021210</u>
Net income			601660

3. The source document for the data for debiting Work in Process for direct materials is a **materials requisition**.
4. Indirect costs incurred in a manufacturing environment that cannot be traced directly to a product are treated as **product costs and expensed when the goods are sold**.
5. Which of the following are basic phases of the management process?
 - o **planning and controlling**
6. Indicate whether the following costs of Procter & Gamble (PG), a maker of consumer products, would be classified as *direct materials cost*, *direct labor cost*, or *factory overhead cost*:
 - o

Cost	Classification
Depreciation on assembly line equipment in the Methopany, Pennsylvania, paper products plant	Factory overhead cost
Licensing payments for use of Disney characters on children products	Factory overhead cost
Maintenance supplies	Factory overhead cost
Packaging materials	Direct materials cost
Paper used in bath tissue	Direct materials cost
Plant manager salary for the Iowa City, Iowa, plant	Factory overhead cost
Resins for body wash products	Direct materials cost
Salary of process engineers	Factory overhead cost
Scents and fragrances used in making soaps and detergents	Direct materials cost
Wages of production line employees at the Pinevill, Louisiana, soap and detergent plant	Direct labor cost

7. The cost system best suited to industries that manufacture a large number of identical units of commodities on a continuous basis is **process**.
8. Radford Inc. manufactures a sugar product by a continuous process, involving three production departments—Refining, Sifting, and Packing. Assume that records indicate that direct materials, direct labor, and applied factory overhead for the first department, Refining, were \$641,900, \$224,700, and \$147,600, respectively. Also, work in process in the Refining Department at the beginning of the period totaled \$35,900, and work in process at the end of the period totaled \$44,300.
- 1.
 2. 1. Journalize the entries to record the flow of costs into the Refining Department during the period for (1) direct materials, (2) direct labor, and (3) factory overhead. If an amount box does not require an entry, leave it blank.

Direct Materials	Debit	Credit
Work in process - Refining	405100	
Materials		405100

Direct Labor	Debit	Credit
Work in process - Refining	141800	
Wages payable		141800

Factory Overhead	Debit	Credit
Work in process - Refining	93200	
Factory overhead - Refining		93200

2. Journalize the entry to record the transfer of production costs to the second department, Sifting. If an amount box does not require an entry, leave it blank.

	Debit	Credit
Work in process - Sifting	$35900 + 641900 + 224700 + 147600 - 44300 = 1005800$	
Work in process - Refining		1005800

9. Technology Accessories Inc. is a designer, manufacturer, and distributor of accessories for consumer electronic products. Early in 20Y3, the company began production of a leather cover for tablet computers, called the iLeather. The cover is made of stitched leather with a velvet interior and fits snugly around most tablet computers. In January, \$775,000 was spent on developing marketing and advertising materials. For the first six months of 20Y3, the company spent an additional \$1,402,000 promoting the iLeather. The product was ready for manufacture on January 21, 20Y3.

Technology Accessories Inc. uses a job order cost system to accumulate costs for the iLeather. Direct materials unit costs for the iLeather are as follows:

Item	Value
Leather	10
Velvet	5
Packaging	.4
Total	<u>15.4</u>

The actual production process for the iLeather is fairly straightforward. First, leather is brought to a cutting and stitching machine. The machine cuts the leather and stitches an exterior edge into the product. The machine requires one hour per 130 iLeathers.

After the iLeather is cut and stitched, it is brought to assembly, where assembly personnel affix the velvet interior and pack the iLeather for shipping. The direct labor cost for this work is \$0.50 per unit.

The completed packages are then sold to retail outlets through a sales force. The sales force is compensated by a 20% commission on the wholesale price for all sales.

Total completed production was 500,000 units during the year. Other information is as follows:

Item	Value
Number of iLeather units sold in 20Y3	460000
Wholesale price per unit	40

Factory overhead cost is applied to jobs at the rate of \$1,300 per machine hour. There were an additional 22,000 cut and stitched iLeathers waiting to be assembled on December 31, 20Y3.

In your computations, if required, round interim per unit costs to two decimal places and final answers to the nearest whole dollar.

1. Prepare an annual income statement for the iLeather product.

Income Statement For the Year Ended December 31, 20Y3	
Sales	\$40 * 460000 = \$18400000
Cost of goods sold	(15.4 + .5 + 10) * 460000 = \$11914000
Gross profit	18400000 - 11914000 = 6486000
Selling expenses:	
Salesperson commissions	20% * 18400000 = 3680000
Advertising design	775000
Advertising expenses	<u>1402000</u>
Total selling expenses	3680000 + 775000 + 1409000 = <u>-5857000</u>
Income from operations	6486000 - 5857000 = <u>\$629000</u>

2. Determine the balances in the finished goods and work in process inventories for the iLeather product on December 31, 20Y3.

Type	Value
Finished goods	40000 * \$25.90 = \$1036000
Work in process	22000 * (15.4 + \$10) = \$558800

10. In order to be useful to managers, managerial accounting reports should possess all of the following characteristics **except be prepared in accordance with generally accepted accounting principles.**
11. A summary of the materials requisitions completed during a period serves as the basis for transferring the cost of the materials from the controlling account in the general ledger to the controlling accounts for **work in process and factory overhead.**
12. At the end of July, the first month of the current fiscal year, the factory overhead account had a debit balance. Which of the following describes the nature of this balance and how it would be reported on the interim balance sheet?
 - o **underapplied, deferred debt**

13. Sunrise Coffee Company roasts and packs coffee beans. The process begins in the Roasting Department. From the Roasting Department, the coffee beans are transferred to the Packing Department. The following is a partial work in process account of the Roasting Department at December 31:

Date	Item	Units	%	Debit	Credit	Balance Debit	Balance Credit
December 1	Bal.	11100	40			36186	
31	Direct materials	192000		355200		391386	
31	Direct labor			204228		595614	
31	Factory overhead			293890		889504	
31	Goods transferred	193700			?	?	
31	Bal	?	90			?	

Required:

Prepare a cost of production report, using the weighted average method, and identify the missing amounts for Work in Process—Roasting Department. Assume that direct materials are placed in process during production. If required, round your cost per equivalent unit answer to two decimal places.

- o Unit information

Units charged to production:	
Inventory in process, December 1	11100
Received from materials storeroom	<u>192000</u>
Total units accounted for by the Roasting Department	11100 + 192000 <u>203100</u>

Units to be assigned costs:	Whole Units	Equivalent Units of Production
Transferred to finished goods in January	193700	193700
Inventory in process, May 31	$203100 - 193700 = 9400$	$9400 * 90\% = \underline{\underline{8460}}$
Total units to be assigned costs	$193700 + 9400 = \underline{\underline{203100}}$	$193700 + 8460 = \underline{\underline{202160}}$

- o Cost information

Cost per equivalent unit:	Costs
Total costs for December in Roasting Department	889504
Total equivalent units	<u>202160</u>
Cost per equivalent unit	$\frac{889504}{202160} = \underline{\underline{4.4}}$

Costs assigned to production:	Costs
Inventory in process, December 1	36186
Costs incurred in December	$355200 + 204228 + 293890 = \underline{853318}$
Total costs accounted for by the Roasting Department	$36186 + 853318 = \underline{\underline{889504}}$

Costs allocated to completed and partially completed units:	Costs
Transferred to finished goods in December	$193700 * 4.4 = 852280$
Inventory in process, December 31	$8460 * 4.4 = \underline{37224}$
Total costs assigned by the Roasting Department	$852280 + 37224 = \underline{\underline{889504}}$

14. Managerial accountants could prepare all of the following reports *except* a(n) **annual report for external regulators such as the SEC.**
15. Department B had 3,000 units in Work in Process that were 25% completed at the beginning of the period at a cost of \$12,500, 13,700 units of direct materials were added during the period at a cost of \$28,700, 15,000 units were completed during the period, and 1,700 units were 95% completed at the end of the period. All materials are added at the beginning of the process. Direct labor was \$32,450 and factory overhead was \$18,710.
The number of equivalent units of production for the period for conversion, if the first-in, first-out method is used to cost inventories, was $(3000 * 75\%) + (12000 * 100\%) + (1700 * 95\%) = 15865$
16. Exotic Engine Shop uses a *job order cost system* to determine the cost of performing engine repair work. Estimated costs and expenses for the coming period are as follows:

Line item	Value
Engine parts	\$813800
Shop direct labor	594000
Shop and repair equipment depreciation	41000
Shop supervisor salaries	114100
Shop property taxes	20700
Shop supplies	15900
Advertising expense	16300
Administrative office salaries	70000
Administrative office depreciation expense	<u>9000</u>
Total costs and expenses	<u>\$1694800</u>

The average shop direct labor rate is \$22.00 per hour.

Determine the predetermined shop overhead rate per direct labor hour. *Round the answer to nearest whole cent.*

- o $\frac{41000+114100+20700+15900}{594000} = 7.10$

Chapter 18

Pre-Lecture Videos

1. Product costs consist of **direct materials, direct labor, and factory overhead**.
2. All of the following are common methods of allocating factory overhead to products except the **inventory costing** method.
3. **Single plantwide factory overhead rate** method uses only one rate to allocate the factory overhead costs.
4. Assume that Valdez Company, which manufactures snow shovels and snow blowers in a single factory, has total budgeted factory overhead costs of \$2,750,000 for the year and 25,000 total budgeted direct labor hours. Revenue is estimated to be \$10,000,000. Using the single plantwide rate method, what would be the factory overhead rate to apply?
 - o $\frac{2750000}{25000} = 110$
5. Production department factory overhead rate is computed by dividing budgeted department factory overhead by budgeted department allocation base.
 - o **True**
6. The **multiple production department factory overhead rate** method uses different rates for each production department to allocate factory overhead costs to products.
7. The **activity-based costing (ABC)** method provides an alternative approach for allocating factory overhead that uses multiple factory overhead rates based on different activities.
8. Conversion cost per equivalent unit is arrived at by dividing budgeted activity cost by total equivalent units of conversion cost.
 - o **False**
9. **Activity rates** are the budgeted activity costs assigned to products using factory overhead rates for each activity.
10. **GAAP** require that selling and administrative expenses be reported as period expenses on the income statement.
11. Which of the following is a disadvantage of allocating selling and administrative expenses to products based on sales volume?
 - o **Products may consume activities in ways that are unrelated to their sales volumes.**
12. Which of the following activities is identified with a service business?
 - o **Diagnostic imaging**
13. Jacobsville Hospital has budgeted costs of \$850,000 in diagnostic imaging. The total estimated activity-based usage is 2,500 images. Total costs for the entire hospital are estimated to be \$3,000,000. The activity rate per image is $\frac{850000}{2500} = 340$

Mini Quiz

1. Jason's Outdoors manufactures two products: snow skis and water skis. Jason's managerial accountant suspects that product cost distortion through factory overhead allocation is occurring where snow skis are underpriced and water skis are overpriced. As a result, all of the following statements are true except **Jason's accountant should consider a single plantwide rate to correct the problem.**
2. Managers use product cost information for decisions regarding **product price, product mix, whether to discontinue a product line.**

3. The total factory overhead for Norton Company is budgeted for the year at \$300,000, divided into three activities: assembly, \$200,000; setup, \$50,000; and materials handling, \$150,000. Norton manufactures two products: Product A and Product B. The activity-based usage quantities for each product by each activity are estimated as follows:

	Assembly	Setup	Materials Handling
Product A	2000	8000	5
Product B	<u>10000</u>	<u>24000</u>	<u>15</u>
Total activity-base usage	<u>12000</u>	<u>32000</u>	<u>20</u>

What is the activity rate for the assembly activity?

- $\frac{200000}{12000} = 16.67$

4. Which of the following statements is true?
- **Using the activity-based costing method typically results in more accurate product costs than using the single plantwide rate.**
5. The total factory overhead for Martin Company is budgeted for the year at \$375,000. Martin manufactures two garden products: a leaf blower and a garden wagon. These products each require 4 direct labor hours (dlh) to manufacture. Each product is budgeted for 2,500 units of production for the year. What would the single plantwide factory overhead rate be?
- $\frac{375000}{(2500*4)+(2500*4)} = 18.75$
6. Under activity-based costing, selling and administrative expenses may be allocated using which of the following formulas for activity rate?
- **Activity Rate = Budgeted Activity Cost ÷ Total Activity-Base Usage**
7. Using ABC product cost information when considering reducing cost, which of the following would not be a way to reduce activity costs?
- Switch to a plantwide allocation rate.
8. Using the single plantwide factory overhead rate may cause product cost distortions due to which of the following?
- **Differences in production department factory overhead rates and differences among products in the ratios of allocation base usage within a department and across departments**
9. Which of the following is an important feature when considering the use of a single plantwide factory overhead rate?
- **It is easy to use**
10. Activity rates for use in service businesses are calculated by **dividing the budgeted activity cost by the total activity-base usage.**
11. When production departments differ significantly in their manufacturing processes, factory overhead costs may be more accurately allocated using which of the following?
- **Multiple production department overhead rates**
12. The total factory overhead for Simmons Company is budgeted for the year at \$450,000 and divided into two departments: Fabrication, \$315,000 and Assembly, \$135,000. Simmons manufactures two products: chairs and tables. Each chair requires 1 direct labor hour in Fabrication and 3 direct labor hours in Assembly. Each table requires 3 direct labor hours in Fabrication and 6 direct labor hours in Assembly. Each product is budgeted for

3,750 units of production for the year. What would the factory overhead allocated per unit for each table be, using the department factory overhead allocation rates?

$$\circ [3 * \frac{315000}{(3750*1)+(3750*3)}] + [6 * \frac{135000}{(3750*3)+(3750*6)}] = 87$$

13. Single plantwide factory overhead rate is calculated as **total budgeted factory overhead divided by total budgeted plantwide allocation base.**
14. Using ABC product cost information when considering reducing cost, which of the following would be recommended?
 - **Using an activity-based approach with multiple overhead allocation rates**
15. Which of the following is not one of the steps for applying activity-based costing in a service business?
 - **Pay the vendor for raw materials.**
16. Countryside Bank uses activity-based costing to determine the cost of servicing customers. There are three activity pools: teller transaction processing (\$2.60 per teller transaction), check processing (\$0.20 per canceled check), and ATM transaction processing (\$0.15 per ATM transaction). Rosa Bush had 5 teller transactions, 10 canceled checks, and 7 ATM transactions during the month. What is the total monthly activity-based cost for Rosa Bush during the month?
 - $(5 * 2.60) + (10 * 0.20) + (7 * 0.15) = 16.05$
17. Which of the following is a common method of allocating factory overhead costs to products?
 - **Multiple production department factory overhead rate method**
18. Under activity-based costing, selling and administrative expenses may be allocated to **both products and customers.**
19. Sebastian Company manufactures and sells sportswear products. Sebastian uses activity-based costing to determine the cost of the customer return processing and shipping activities. The customer return processing activity has an activity rate of \$60 per return, and the shipping activity has an activity rate of \$20 per shipment. Sebastian shipped 4,000 units of Product 1 in 800 shipments (some shipments are more than one unit). There were 90 returns. What is the total activity cost for the return and shipping activities of Product 1?
 - $(800 * 20) + (60 * 90) = 21400$

Practice Exercises

Single Plantwide Factory Overhead Rate

1. The total factory overhead for Bardot Marine Company is budgeted for the year at \$600,000. Bardot Marine manufactures two types of boats: speedboats and bass boats. The speedboat and bass boat each require 12 direct labor hours for manufacture. Each product is budgeted for 250 units of production for the year.
 1. Determine the total number of budgeted direct labor hours for the year.
 - $(250 * 2) * 12 = 6000$
 2. Determine the single plantwide factory overhead rate.
 - $\frac{600000}{6000} = 100$
 3. Determine the factory overhead allocated per unit for each product using the single plantwide factory overhead rate.
 - Speedboats: $12 * 100 = 1200$
 - Bass boats: $12 * 100 = 1200$

Multiple Production Department Factory Overhead Rates

2. The total factory overhead for Bardot Marine Company is budgeted for the year at \$600,000 divided into two departments: Fabrication, \$420,000, and Assembly, \$180,000. Bardot Marine manufactures two types of boats: speedboats and bass boats. The speedboats require 8 direct labor hours in Fabrication and 4 direct labor hours in Assembly. The bass boats require 4 direct labor hours in Fabrication and 8 direct labor hours in Assembly. Each product is budgeted for 250 units of production for the year.

If required, round all per unit answers to the nearest cent.

- Determine the total number of budgeted direct labor hours for the year in each department.

- Fabrication: $(250 * 8) + (250 * 4) = 3000$ direct labor hours

- Assembly: $(250 * 4) + (250 * 8) = 3000$ direct labor hours

- Determine the departmental factory overhead rates for both departments.

- Fabrication department rate: $\frac{420000}{3000} = 140$

- Assembly department rate: $\frac{180000}{3000} = 60$

- Determine the factory overhead allocated per unit for each product using the department factory overhead allocation rates.

- Total factory overhead per speedboat: $(140 * 8) + (60 * 4) = 1360$

- Total factory overhead per bass boat: $(140 * 4) + (60 * 8) = 1040$

Activity-Based Costing: Factory Overhead Costs

3. The total factory overhead for Bardot Marine Company is budgeted for the year at \$600,000, divided into four activities: fabrication, \$204,000; assembly, \$105,000; setup, \$156,000; and inspection, \$135,000. Bardot Marine manufactures two types of boats: speedboats and bass boats. The *activity-base* usage quantities for each product by each activity are as follows:

	Fabrication	Assembly	Setup	Inspection
Speedboat	2000	1000	300	1100
Bass boat	<u>1000</u>	<u>2000</u>	<u>100</u>	<u>400</u>
Total	<u>3000</u>	<u>3000</u>	<u>400</u>	<u>1500</u>

Each product is budgeted for 250 units of production for the year.

- Determine the *activity rates* for each activity.

- Fabrication: $\frac{204000}{3000} = 68$

- Assembly: $\frac{105000}{3000} = 35$

- Setup: $\frac{156000}{400} = 390$

- Inspection: $\frac{135000}{1500} = 90$

- Determine the activity-based factory overhead per unit for each product

- Speedboats per unit: $\frac{(2000*68)+(1000*35)+(300*390)+(1100*90)}{250} = 1548$

- Bass boats per unit: $\frac{(1000*68)+(2000*35)+(100*390)+(400*90)}{250} = 852$

Activity-Based Costing: Selling and Administrative Expenses

4. Jungle Junior Company manufactures and sells outdoor play equipment. Jungle Junior uses activity-based costing to determine the cost of the sales order processing and the customer return activity. The sales order processing activity has an *activity rate* of \$20 per sales order, and the customer return activity has an activity rate of \$100 per return. Jungle Junior sold 2,500 swing sets, which consisted of 750 orders and 80 returns.
 1. Determine the total sales order processing and customer return activity cost for swing sets.
 - $(750 * 20) + (80 * 100) = 23000$
 2. Determine the per-unit sales order processing and customer return activity cost for swing sets. Round your answer to the nearest cent.
 - $\frac{15000}{2000} + \frac{8000}{2500} = 9.20$

Activity-Based Costing for a Service Business

5. Sterling Hotel uses activity-based costing to determine the cost of servicing customers. There are three activity pools: guest check-in, room cleaning, and meal service. The activity rates associated with each activity pool are \$8 per guest check-in, \$25 per room cleaning, and \$4 per served meal (not including food). Ginny Campbell visited the hotel for a three-night stay. Campbell had three meals in the hotel during her visit.

Determine the total activity-based cost for Campbell's visit.

 - $(8 * 1) + (25 * 3) + (4 * 3) = 95$

Product Costing and Decision Analysis for a Service Company

6. Pleasant Stay Medical Inc. wishes to determine its product costs. Pleasant Stay offers a variety of medical procedures (operations) that are considered its "products." The overhead has been separated into three major activities. The annual estimated activity costs and activity bases follow:

Activity	Budgeted Activity Cost	Activity Base
Scheduling and admitting	432000	Number of patients
Housekeeping	4212000	Number of patient days
Nursing	<u>5376000</u>	Weighted care unit
Total costs	<u>10020000</u>	

Total "patient days" are determined by multiplying the number of patients by the average length of stay in the hospital. A weighted care unit (wcu) is a measure of nursing effort used to care for patients. There were 192,000 weighted care units estimated for the year. In addition, Pleasant Stay estimated 6,000 patients and 27,000 patient days for the year. (The average patient is expected to have a little more than a four-day stay in the hospital.)

During a portion of the year, Pleasant Stay collected patient information for three selected procedures, as follows:

Activity-Base Usage ->	Procedure A	Procedure B	Procedure C
Number of patients	280	650	1200
Average length of stay	6	6	4
Patient Days	<u>1680</u>	<u>3250</u>	<u>4800</u>
Weighted care units	19200	6000	24000

Private insurance reimburses the hospital for these activities at a fixed daily rate of \$406 per patient day for all three procedures.

1. Determine the activity rates

Activity	Activity Rate
Scheduling and admitting	$\frac{432000}{6000} = 72$
Housekeeping	$\frac{4212000}{27000} = 156$
Nursing	$\frac{5376000}{192000} = 28$

2. Determine the activity cost for each procedure

Activity	Total Activity Cost by Procedure
Procedure A	$(72 * 280) + (156 * 1680) + (28 * 19200) = 819840$
Procedure B	$(72 * 650) + (156 * 3250) + (28 * 6000) = 721800$
Procedure C	$(72 * 1200) + (156 * 4800) + (28 * 24000) = 1507200$

3. Determine the excess or deficiency of reimbursements to activity cost.

Activity	Excess (deficiency) of reimbursement over activity cost
Procedure A	$(406 * 1680) - 819840 = -137760$
Procedure B	$(406 * 3250) - 721800 = 597700$
Procedure C	$(406 * 4800) - 1507200 = 441600$

- 4.

1. Based on the determination of the excess or deficiency of reimbursement to activity cost, indicate which procedure cost is too high.

- **Procedure A**

2. Hospital management has decided to further investigate the nursing effort. Determine the weighted care units per patient days for each procedure. *Round to one decimal place.*

- Procedure A: $\frac{19200}{1680} = 11.4$

$$\text{Procedure B: } \frac{6000}{3250} = 1.8$$

$$\text{Procedure C: } \frac{24000}{4800} = 5.0$$

7. Blue Star Airline provides passenger airline service, using small jets. The airline connects four major cities: Charlotte, Pittsburgh, Detroit, and San Francisco. The company expects to fly 170,000 miles during a month. The following costs are budgeted for a month:

Item	Value
Fuel	2120000
Ground personnel	788500
Crew salaries	850000
Depreciation	<u>430000</u>
Total costs	<u>4188500</u>

Blue Star management wishes to assign these costs to individual flights in order to gauge the profitability of its service offerings. The following activity bases were identified with the budgeted costs:

Airline Cost	Activity Base
Fuel, crew, and depreciation costs	Number of miles flown
Ground personnel	Number of arrivals and departures at an airport

The size of the company's ground operation in each city is determined by the size of the workforce. The following monthly data are available from corporate records for each terminal operation:

Terminal City	Ground Personnel Cost	Number of Arrivals/Departures
Charlotte	256000	320
Pittsburgh	97500	130
Detroit	129000	150
San Francisco	<u>306000</u>	<u>340</u>
Total	<u>788500</u>	<u>940</u>

Three recent representative flights have been selected for the profitability study. Their characteristics are as follows:

Flight Number	Description	Miles Flown	Number of Passengers	Ticket Price per Passenger
Flight 101	Charlotte to San Francisco	2000	80	695
Flight 102	Detroit to Charlotte	800	50	441.5
Flight 103	Charlotte to Pittsburgh	400	20	382

1. Determine the fuel, crew, and depreciation cost per mile flown.

- $\frac{850000+2120000+430000}{170000} = 20$

2. Determine the cost per arrival or departure by terminal city.

- Charlotte: $\frac{256000}{320} = 800$
- Pittsburgh: $\frac{97500}{130} = 750$
- Detroit: $\frac{129000}{150} = 860$
- San Francisco: $\frac{306000}{340} = 900$

3. Use the information in (1) and (2) to construct a profitability report for the three flights. Each flight has a single arrival and departure to its origin and destination city pairs.

- Blue Star Airline Flight Profitability Report for Three Representative Flights

	Flight 101	Flight 102	Flight 103
Passenger revenue	<u>55600</u>	<u>22075</u>	<u>7640</u>
Fuel, crew, and depreciation costs	40000	16000	8000
Ground personnel	<u>1700</u>	<u>1660</u>	<u>1550</u>
Total costs	<u>41700</u>	<u>17660</u>	<u>9550</u>
Flight operating income (loss)	<u>13900</u>	<u>4415</u>	<u>-1910</u>

Homework Exercises

1. Managers depend on the accuracy of product costing to make decisions regarding continuing operations and product mix.
 - **True**
2. Bob's Biscuit Corporation budgeted \$1,200,000 of factory overhead cost for the coming year. Its plantwide allocation base, machine hours, is budgeted at 100,000 hours. Budgeted units to be produced are 200,000 units. Bob's plantwide factory overhead rate is \$12 per machine hour.
 - **True**
3. Use of a plantwide factory overhead rate does *not* distort product costs when there are differences in the factory overhead rates across different production departments.
 - **False**
4. Activity-based costing can be used to allocate period costs to various products that the company sells.

- o True

5. Which of the following does *not* rely on managerial decisions involving accurate product costing?

- o product constraints

6. Ramapo Company produces two products, Blinks and Dinks. They are manufactured in two departments, Fabrication and Assembly. Data for the products and departments are listed below.

Product	Number of Units	Labor Hours per Unit	Machine Hours per Unit
Blinks	1000	4	5
Dinks	2000	2	8

All of the machine hours take place in the Fabrication Department, which has an estimated overhead of \$84,000. All of the labor hours take place in the Assembly Department, which has an estimated total overhead of \$72,000.

Ramapo Company uses a single plantwide overhead rate to apply all factory overhead costs. The single plantwide rate, if it is based on machine hours instead of labor hours, is $\frac{84000+72000}{(1000*5)+(2000*8)} = 7.43$

7. Blue Ridge Marketing Inc. manufactures two products, A and B. Presently, the company uses a single plantwide factory overhead rate for allocating overhead to products. However, management is considering moving to a multiple department rate system for allocating overhead. The following table presents information about estimated overhead and direct labor hours.

	Overhead	Direct Labor Hours	Product A	Product B
Painting department	248000	10000	16	4
Finishing department	72000	10000	4	16
Totals	320000	20000	20	20

The factory overhead allocated per unit of Product B in the Painting Department if Blue Ridge Marketing Inc. uses the multiple production department factory overhead rate method is $\frac{248000}{10000} * 4 = 99.2$

8. Scoresby Co. uses 6 machine hours and 2 direct labor hours to produce Product X. It uses 8 machine hours and 16 direct labor hours to produce Product Y. Scoresby's Assembly and Finishing departments have factory overhead rates of \$240 per machine hour and \$160 per direct labor hour, respectively. How much total factory overhead will be allocated to a unit of each of the two products?

- o Product X: $(6 * 240) + (2 * 160) = 1760$
- o Product Y: $(8 * 240) + (16 * 160) = 4480$

9. Panamint Systems Corporation is estimating activity costs associated with producing disk drives, tapes drives, and wire drives. The indirect labor can be traced to five separate activity pools. The budgeted activity cost and activity base data by product are provided below.

	Activity Cost	Activity Base
Procurement	370000	Number of purchase orders
Scheduling	250000	Number of production orders
Materials handling	500000	Number of moves
Product development	730000	Number of engineering changes
Production	1500000	Machine hours

	Number of Purchase Orders	Number of Production Orders	Number of Moves	Number of Engineering Changes	Machine Hours	Number of Units
Disk drives	4000	300	1400	10	2000	2000
Tape drives	4000	150	800	10	8000	4000
Wire drives	12000	800	4000	25	10000	2500

The activity rate for the production cost pool is $\frac{1500000}{2000+8000+10000} = 75$

10. Beauty Beyond Words Salon uses an activity-based costing system to determine the cost of services. The salon has determined the costs of services by activity and activity usage as follows:

Activity	Activity Rate
Hair washing	4
Conditioning	3.5
Chemical treatment	25
Styling	10

	Hair Washing	Conditioning	Chemical Treatment	Styling
Haircut	1	1	0	0
Complete style	1	1	0	0
Perm	2	3	1	1
Highlights	3	4	2	1

The cost of services for a haircut is $(1 * 4) + (1 * 3.5) = 7.5$

Single Plantwide Factory Overhead Rate

11. The total factory overhead for Bardot Marine Company is budgeted for the year at \$841,500. Bardot Marine manufactures two types of boats: speedboats and bass boats. The speedboat and bass boat each require three direct labor hours for manufacture. Each product is budgeted for 8,500 units of production for the year.

When required, round all per unit answers to the nearest cent.

- Determine the total number of budgeted direct labor hours for the year

$$\blacksquare (8500 * 2) * 3 = 51000$$

- Determine the single plantwide factory overhead rate

$$\blacksquare \frac{841500}{51000} = 16.5$$

- Determine the factory overhead allocated per unit for each product using the single plantwide factory overhead rate.

$$\blacksquare \text{Speedboats: } 16.5 * 3 = 49.5$$

$$\blacksquare \text{Bass boats: } 16.5 * 3 = 49.5$$

12. Kennedy Appliance Inc.'s Machining Department incurred \$133,000 of factory overhead cost in producing hoses and valves. The two products consumed a total of 3,500 direct machine hours. Of that amount, hoses consumed 1,800 direct machine hours.

Determine the total amount of factory overhead that should be allocated to hoses using machine hours as the allocation base.

$$\circ 133000 * \frac{1800}{3500} = 68400$$

13. Bach Instruments Inc. makes three musical instruments: flutes, clarinets, and oboes. The budgeted factory overhead cost is \$116,480. Overhead is allocated to the three products on the basis of direct labor hours. The products have the following budgeted production volume and direct labor hours per unit:

	Budgeted Production Volume	Direct Labor Hours per Unit
Flutes	3100	.6
Clarinets	800	1.5
Oboes	1100	1

If required, round all per unit answers to the nearest cent.

- Determine the single plantwide overhead rate.

$$\blacksquare \frac{116480}{(3100*.6)+(800*1.5)+(1100*1)} = 28$$

- Use the overhead rate in (a) to determine the amount of total and per-unit overhead allocated to each of the three products.

■

	Total Factory Overhead Cost	Per Unit Factory Overhead Cost
Flutes	$(3100 * .6) * 28 = 52080$	$\frac{52080}{3100} = 16.8$
Clarinets	$(800 * 1.5) * 28 = 33600$	$\frac{33600}{800} = 42$
Oboes	$(1100 * 1) * 28 = 30800$	$\frac{30800}{1100} = 28$
Total	$52080 + 33600 + 30800 = 116480$	

Multiple Production Department Factory Overhead Rates

14. The total factory overhead for Bardot Marine Company is budgeted for the year at \$800,000, divided into two departments: Fabrication, \$300,000, and Assembly, \$500,000. Bardot Marine manufactures two types of boats: speedboats and bass boats. The speedboats require one direct labor hour in Fabrication and four direct labor hours in Assembly. The bass boats require one direct labor hour in Fabrication and one direct labor hour in Assembly. Each product is budgeted for 8,000 units of production for the year.

If required, round all per unit answers to the nearest cent.

- Determine the total number of budgeted direct labor hours for the year in each department.

- Fabrication direct labor hours: $(8000 * 1) + (8000 * 1) = 16000$
Assembly direct labor hours: $(8000 * 4) + (8000 * 1) = 40000$

- Determine the departmental factory overhead rates for both departments.

- Fabrication: $\frac{300000}{16000} = 18.75$
Assembly: $\frac{500000}{40000} = 12.5$

- Determine the factory overhead allocated per unit for each product using the department factory overhead allocation rates.

- Speedboat per unit: $(18.75 * 1) + (12.5 * 4) = 68.75$
Bass boat per unit: $(18.75 * 1) + (12.5 * 1) = 31.25$

Activity-Based Costing: Factory Overhead Costs

15. The total factory overhead for Bardot Marine Company is budgeted for the year at \$1,196,800, divided into four activities: fabrication, \$608,000; assembly, \$272,000; setup, \$172,800; and inspection, \$144,000. Bardot Marine manufactures two types of boats: speedboats and bass boats. The *activity-base* usage quantities for each product by each activity are as follows:

	Fabrication	Assembly	Setup	Inspection
Speedboat	8000	25500	58	100
Bass boat	<u>24000</u>	<u>8500</u>	<u>422</u>	<u>700</u>
Total	32000	34000	480	800

Each product is budgeted for 5,000 units of production for the year.

- Determine the *activity rates* for each activity.

- Fabrication: $\frac{608000}{32000} = 19$
Assembly: $\frac{272000}{34000} = 8$

$$\text{Setup: } \frac{172800}{480} = 360$$

$$\text{Inspection: } \frac{144000}{800} = 180$$

2. Determine the activity-based factory overhead per unit for each product

- Speedboats per unit: $\frac{(19*8000)+(8*25500)+(360*58)+(180*100)}{5000} = 79$

- Bass boats per unit: $\frac{(19*24000)+(8*8500)+(360*422)+(180*700)}{5000} = 160$

Activity-Based Costing for a Service Business

16. Sterling Hotel uses activity-based costing to determine the cost of servicing customers. There are three activity pools: guest check-in, room cleaning, and meal service. The activity rates associated with each activity pool are \$8.70 per guest check-in, \$24.00 per room cleaning, and \$3.00 per served meal (not including food). Tara Campbell visited the hotel for a 3-night stay. Tara had 3 meals in the hotel during the visit.

Determine the total activity-based cost for Campbell's visit during the month. Round your answer to the nearest cent.

- $(8.7 * 1) + (24 * 3) + (3 * 3) = 89.7$

Activity Rates and Product Costs using Activity-Based Costing

17. Lonsdale Inc. manufactures entry and dining room lighting fixtures. Five activities are used in manufacturing the fixtures. These activities and their associated budgeted activity costs and *activity bases* are as follows:

Activity	Budgeted Activity Cost	Activity Base
Casting	328100	Machine hours
Assembly	165000	Direct labor hours
Inspecting	24840	Number of inspections
Setup	50660	Number of setups
Materials handling	39360	Number of loads

Corporate records were obtained to estimate the amount of activity to be used by the two products. The estimated activity-base usage quantities and units produced follow:

Activity Base	Entry	Dining	total
Machine hours	5110	4540	9650
Direct labor hours	4400	6600	11000
Number of inspections	1570	500	2070
Number of setups	280	60	340
Number of loads	650	170	820
Units produced	10200	5100	15300

1. Determine the activity rate for each activity. *If required, round the rate to the nearest dollar.*

Activity	Activity Rate	
Casting	$\frac{328100}{9650} = 34$	per machine hour
Assembly	$\frac{165000}{11000} = 15$	per direct labor hour
Inspecting	$\frac{24840}{2070} = 12$	per inspection
Setup	$\frac{50660}{340} = 149$	per setup
Materials handling	$\frac{39360}{820} = 48$	per load

2. Use the activity rates in (a) to determine the total and per-unit activity costs associated with each product. *Round the per unit amounts to the nearest cent.*

Product	Total Activity Cost	Activity Cost per Unit
Entry lighting fixtures	$(5110 * 34) + (4400 * 15) + (1570 * 12) + (280 * 149) + (650 * 48) = 331500$	$\frac{331500}{10200} = 32.5$
Dining room lighting fixtures	$(4540 * 34) + (6600 * 15) + (500 * 12) + (60 * 149) + (170 * 48) = 276460$	$\frac{276460}{5100} = 54.21$

Quiz

- If selling and administrative expenses are allocated to different products, they should be reported as a **period cost**.
- Dawson Company manufactures small table lamps and desk lamps. The following shows the activities per product and the total overhead information:

	Units	Setups	Inspections	Assembly
Small table lamps	3000	8000	9000	16000
Desk lamps	6000	16000	15000	12000

Activity	Total Activity-Based Usage	Budgeted Activity Cost
Setups	24000	60000
Inspections	24000	120000
Assembly	28000	280000

The total factory overhead to be allocated to each unit of small table lamps is

$$\frac{(\frac{60000}{24000} * 16000) + (\frac{120000}{24000} * 15000) + (\frac{280000}{28000} * 12000)}{3000} = 75$$

- Aleutian Company produces two products: Rings and Dings. They are manufactured in two departments: Fabrication and Assembly. Data for the products and departments are listed below.

Product	Number of Units	Direct Labor Hours per Unit	Machine Hours per Unit
Rings	1000	4	6
Dings	2000	3	9

All of the machine hours take place in the Fabrication Department, which has estimated total factory overhead of \$90,000. All of the labor hours take place in the Assembly Department, which has estimated total factory overhead of \$105,000.

Aleutian Company uses the multiple production department factory overhead rate method. The Fabrication Department uses machine hours as an allocation base, and the Assembly Department uses direct labor hours.

- The total factory overhead allocated per unit of Rings is $[6 * \frac{90000}{(1000*6)+(2000*9)}] + [4 * \frac{105000}{(1000*4)+(2000*3)}] = 64.5$
- The Fabrication Department's factory overhead rate is $\frac{90000}{(1000*6)+(2000*9)} = 3.75$
- Panamint Systems Corporation is estimating activity costs associated with producing disk drives, tapes drives, and wire drives. The indirect labor can be traced to five separate activity pools. The budgeted activity cost and activity base data by product are provided below.

	Activity Cost	Activity Base
Procurement	\$370,000	Number of purchase orders
Scheduling	250,000	Number of production orders
Materials handling	500,000	Number of moves
Product development	730,000	Number of engineering changes
Production	1,500,000	Machine hours

	Number of Purchase Orders	Number of Production Orders	Number of Moves	Number of Engineering Changes	Machine Hours	Number of Units
Disk drives	4,000	300	1,400	10	2,000	2,000
Tape drives	4,000	150	800	10	8,000	4,000
Wire drives	12,000	800	4,000	25	10,000	2,500

- The activity-based cost for each wire drive unit is $\frac{(12000 * \frac{370000}{4000+4000+12000}) + (800 * \frac{250000}{300+150+800}) + (4000 * \frac{500000}{1400+800+4000}) + (25 * \frac{730000}{10+10+25}) + (10000 * \frac{1500000}{2000+8000+10000})}{2500} = 744.06$
- The activity rate for the product development cost pool is $\frac{730000}{10+10+25} = 16222$
- The activity-based cost for each disk drive unit is $\frac{(4000 * \frac{370000}{4000+4000+12000}) + (300 * \frac{250000}{300+150+800}) + (1400 * \frac{500000}{1400+800+4000}) + (10 * \frac{730000}{10+10+25}) + (2000 * \frac{1500000}{2000+8000+10000})}{2000} = 279.57$
- The activity rate for the procurement activity cost pool is $\frac{370000}{4000+4000+12000} = 18.5$
- Adirondack Marketing Inc. manufactures two products, A and B. Presently, the company uses a single plantwide factory overhead rate for allocating overhead to products. However, management is considering moving to a multiple department rate system for allocating overhead.

	Overhead	Total Direct Labor Hours	DLH for Product A	DLH for Product B
Painting	250000	10000	16	4
Finishing	75000	12000	4	16
Totals	325000	22000	20	20

The single plantwide factory overhead rate for Adirondack Marketing Inc. is $\frac{325000}{22000} = 14.77$

6. Kaumajet Factory produces two products: table lamps and desk lamps. It has two separate departments: Fabrication and Assembly. The factory overhead budget for the Fabrication Department is \$550,000, using 500,000 direct labor hours. The factory overhead budget for the Assembly Department is \$400,000, using 80,000 direct labor hours.
 1. If a table lamp requires 2 hours of fabrication and 1 hour of assembly, the amount of factory overhead that Kaumajet Factory will allocate to each unit of table lamp using the multiple production department factory overhead rate method with an allocation base of direct labor hours is $(2 * \frac{550000}{500000}) + (1 * \frac{400000}{80000}) = 7.2$
 2. If a table lamp requires 2 hours of fabrication and 1 hour of assembly, the total amount of factory overhead that Kaumajet Factory will allocate to table lamps using the multiple production department factory overhead rate method with an allocation base of direct labor hours if 75,000 units are produced is $[(2 * \frac{550000}{500000}) + (1 * \frac{400000}{80000})] * 75000 = 540000$
7. Activity rates are determined by **dividing the cost budgeted for each activity pool by the estimated activity base for that pool.**
8. Which of the following is *not* a factory overhead allocation method?
 - **factory costing**
9. Product costs consist of only direct materials and direct labor.
 - **False**
10. Blue Ridge Marketing Inc. manufactures two products, A and B. Presently, the company uses a single plantwide factory overhead rate for allocating overhead to products. However, management is considering moving to a multiple department rate system for allocating overhead. The following table presents information about estimated overhead and direct labor hours.

	Overhead	Direct Labor Hours	Product A	Product B
Painting	248000	10000	16	4
Finishing	72000	10000	4	16
Totals	320000	20000	20	20

Using a single plantwide rate, the factory overhead allocated per unit of Product B is $\frac{320000}{20000} * 20 = 320$

11. Blackwelder Factory produces two similar products: small table lamps and desk lamps. The total factory overhead budget is \$640,000 with 400,000 estimated direct labor hours. It is further estimated that small table lamp production will require 275,000 direct labor hours, and desk lamp production will need 125,000 direct labor hours.

Using a single plantwide factory overhead rate with an allocation base of direct labor hours, the factory overhead that Blackwelder Factory will allocate to small table lamp production if actual direct labor hours for the period for small table lamp production is 285,000 would be $\frac{640000}{400000} * 285000 = 456000$

12. Ramapo Company produces two products, Blinks and Dinks. They are manufactured in two departments, Fabrication and Assembly. Data for the products and departments are listed below.

Product	Number of Units	Direct Labor Hours per Unit	Machine Hours per Unit
Blinks	1000	4	5
Dinks	2000	2	8

All of the machine hours take place in the Fabrication Department, which has an estimated overhead of \$84,000. All of the labor hours take place in the Assembly Department, which has an estimated total overhead of \$72,000.

Ramapo Company uses a single plantwide overhead rate to apply all factory overhead costs based on direct labor hours. The factory overhead allocated per unit of Dinks is $\frac{84000+72000}{(1000*4)+(2000*2)} * 2 = 39$

13. Skagit Company manufactures Hooks and Nooks. The following shows the activities per product and total activity information:

	Units	Setups	Inspections	Assembly
Hooks	4000	1	3	1
Nooks	8000	2	2	3

Activity	Total Activity-Based Usage	Budgeted Activity Cost
Setups	20000	60000
Inspections	24000	120000
Assembly	28000	420000

The total factory overhead to be allocated to Nooks is $[(\frac{60000}{20000} * 2) + (\frac{120000}{24000} * 2) + (\frac{420000}{28000} * 3)] * 8000 = 488000$

14. Beauty Beyond Words Salon uses an activity-based costing system to determine the cost of services. The salon has determined the costs of services by activity and activity usage as follows:

Activity	Activity Rate
Hair washing	4
Conditioning	3.5
Chemical treatment	25
Styling	10

	Hair Washing	Conditioning	Chemical Treatment	Styling
Haircut	1	1	0	0
Complete style	1	1	0	0
Perm	2	3	1	1
Highlights	3	4	2	1

Determine the cost of services for a highlight.

- Hair washing: $3 * 4 = 12$
- Conditioning: $4 * 3.5 = 14$
- Chemical treatment: $2 * 25 = 50$
- Styling: $1 * 10 = 10$
- Total: $12 + 14 + 50 + 10 = 86$

Chapter 20

Pre-Lecture Videos

1. Costs that do not change with the change in the level of production for some time is classified as **fixed costs**.
2. Under variable costing, the cost of goods manufactured consists of all except **fixed factory overhead**.
3. Costs that have characteristics of both a variable cost and a fixed cost are classified as **mixed costs**.
4. Cost-volume-profit analysis is used for **analyzing the effects of changes in costs on profits, analyzing the effects of changes in volume on profits, determining selling price**.
5. Contribution margin is the **difference between sales and variable costs**.
6. Which of the following formulas is used to calculate break-even units?
 - **Fixed Costs ÷ Unit Contribution Margin**
7. What effect does the increase in fixed costs have on the break-even units?
 - **Increase**
8. If a company decides to increase the selling price of its product, what is its effect on break-even point?
 - **Decrease**
9. Which of the following assumptions is false in a cost-volume-profit analysis?
 - **There are no changes in the inventory quantities during the period.**
10. Which of the following charts plot only a profit line rather than sales and cost lines?
 - **Profit-volume chart**
11. The difference between contribution margin and income from operations is **fixed costs**.
12. The relationship between a company's contribution margin and income from operations is measured by **operating leverage**.
13. The **sales mix** is the relative distribution of sales among the products sold by a company.
14. The unit selling price of the overall enterprise product equals the **sum of the unit selling prices of each product multiplied by its sales mix percentage**.

Mini Quiz

1. Beachside Co. sells two products: Skis and Snorkels. Last year, Beachside sold 12,600 units of Skis and 23,400 units of Snorkels. Related data are as follows:

Product	Unit Selling Price	Unit Variable Cost	Unit Contribution Margin
Skis	\$120	\$80	\$40
Snorkels	80	60	20

What was Beachside Co.'s total unit selling price?

- o $\frac{(12600 \times 120) + (23400 \times 80)}{12600 + 23400} = 94$

2. **Operating leverage** is a measure of the relative mix of a business's variable costs and fixed costs, computed as contribution margin divided by operating income.
3. Which of the following conditions would cause the break-even point to decrease?
 - o **Total fixed costs decrease**
4. The equation for the break-even point in sales units is **fixed costs divided by unit contribution margin**.
5. Which of the following costs is an example of a cost that remains the same in total as the number of units produced changes?
 - o **Factory rent**
6. Total direct materials costs are \$127,500, fixed costs are \$75,000, and units produced are 15,000. What is the direct materials cost per unit?
 - o $\frac{127500}{15000} = 8.5$
7. Variable costs for Oswego Company were 35% of sales, and sales were \$425,000. Fixed costs were \$100,000. What was the operating income?
 - o $425000 - (425000 * 35\%) - 100000 = 176250$
8. Break-even analysis for a service company involves identifying the correct **unit of analysis**.
9. All of the following are assumptions of cost-volume-profit analysis except **within the relevant range of operating activity, the efficiency of operations can change**.
10. Contribution margin is **sales revenue minus variable costs**.
11. Contribution margin ratio is also referred to as **profit-volume ratio**.
12. Operating leverage can be used to measure **the impact of changes in sales on operating income**.
13. When direct materials costs per unit are plotted on the vertical axis of a graph and units produced are plotted on the horizontal axis, a unit variable cost appears as a **horizontal straight line**.
14. In a service company, the unit of analysis can influence whether costs are defined as **fixed or variable**.
15. In a cost-volume-profit chart, the **slope of the total costs line is dependent on the variable cost per unit**.
16. If fixed costs are \$400,000 and the unit contribution margin is \$20, how many units must be sold in order to realize an operating income of \$250,000?
 - o $\frac{400000 + 250000}{20} = 32500$
17. Unit variable costs may be affected by all of the following except changes in the **level of activity**.
18. Target profit **can be calculated by modifying the break-even equation**.

19. If fixed costs are \$300,000 and the unit contribution margin is \$20, how many units must be sold in order to have a zero profit?

- o $\frac{300000}{20} = 15000$

20. If sales are \$440,000, variable costs are 75% of sales, and operating income is \$40,000, what is the operating leverage?

- o $\frac{440000 - (440000 * 75\%)}{40000} = 2.75$

21. Operating leverage is determined as **contribution margin divided by operating income.**

22. Companies with high fixed costs will normally have **high operating leverage.**

23. Craig Co. sells two products: A and B. Last year, Craig sold 14,000 units of A and 21,000 units of B. Related data are as follows:

Product	Unit Selling Price	Unit Variable Cost	Unit Contribution Margin
A	\$110	\$70	\$40
B	70	50	20

- o Total Units: $14000 + 21000 = 35000$

- A's Proportion: $\frac{14000}{35000} = .4$

- B's Proportion: $\frac{21000}{35000} = .6$

- Unit selling price of A and B: $(110 * .4) + (70 * .6) = 86$

- Unit variable cost: $(70 * .4) + (50 * .6) = 58$

- Unit contribution margin: $(40 * .4) + (20 * .6) = 28$

24. Sales mix is **the relative distribution of sales among the products sold by a company.**

Practice Exercises

Break-Even Analysis

1. Media outlets such as ESPN and FOX Sports often have websites that provide in-depth coverage of news and events. Portions of these websites are restricted to members who pay a monthly subscription to gain access to exclusive news and commentary.

These websites typically offer a free trial period to introduce viewers to the websites. Assume that during a recent fiscal year, [ESPN.com](#) spent \$4,200,000 on a promotional campaign for the [ESPN.com](#) websites that offered two free months of service for new subscribers. In addition, assume the following information:

Number of months an average new customer stays with the service (including the two free months)	14 months
Revenue per month per customer subscription	10
Variable cost per month per customer subscription	5

Determine the number of new customer accounts needed to break even on the cost of the promotional campaign. In forming your answer, (1) treat the cost of the promotional campaign as a fixed cost, and (2) treat the revenue less variable cost per account for the subscription period as the unit contribution margin.

- o $\frac{4200000}{(10*12)-(5*14)} = 84000$ accounts

Break-Even Point

2. Freese Inc. sells a product for 650 per unit. The *variable cost* is 455 per unit, while *fixed costs* are 4,290,000.

Determine (a) the break-even point in sales units and (b) the break-even point if the selling price were increased to \$655 per unit.

1. Break-even point in sales units: $\frac{4290000}{650-455} = 22000$
2. Break-even point if the selling price were increased to \$655 per unit: $\frac{4290000}{655-455} = 21450$

Break-even sales and sales to realize operating income

3. For the current year ended March 31, Cosgrove Company expects *fixed costs* of \$27,600,000, a unit *variable cost* of \$805, and a unit selling price of \$1,150.

1. Compute the anticipated break-even sales (units)

- $\frac{27600000}{1150-805} = 80000$

2. Compute the sales (units) required to realize operating income of \$5,175,000.

- $\frac{27600+5175000}{1150-805} = 95000$

Break-Even Sales Under Present and Proposed Conditions

4. Portmann Company, operating at full capacity, sold 1,000,000 units at a price of \$188 per unit during the current year. Its income statement is as follows:

Item	Debit	Credit
Sales		188000000
Cost of goods sold		(100000000)
Gross profit		88000000
Expenses:		
Selling expenses	16000000	
Administrative expenses	<u>12000000</u>	
Total expenses		(28000000)
Operating income		<u>60000000</u>

The division of costs between *variable* and *fixed* is as follows:

	Variable	Fixed
Cost of goods sold	70%	30%
Selling expenses	75%	25%
Administrative expenses	50%	50%

Management is considering a plant expansion program for the following year that will permit an increase of \$11,280,000 in yearly sales. The expansion will increase fixed costs by \$5,000,000 but will not affect the relationship between sales and variable costs.

1. Determine the total variable costs and the total fixed costs for the current year.
 - Total variable costs: $7000000 + 12000000 + 6000000 = 88000000$
 - Total fixed costs: $3000000 + 4000000 + 6000000 = 40000000$
 2. Determine (a) the unit variable cost and (b) the *unit contribution margin* for the current year.
 - Unit variable cost: $\frac{8800000}{100000} = 88$
 - Unit contribution margin: $\frac{188}{88} = 100$
 3. Compute the break-even sales (units) for the current year.
 - $\frac{40000000}{100} = 40000$
 4. Compute the break-even sales (units) under the proposed program for the following year.
 - $\frac{40000000+5000000}{100} = 45000$
 5. Determine the amount of sales (units) that would be necessary under the proposed program to realize the \$60,000,000 of operating income that was earned in the current year.
 - $\frac{45000000+6000000}{100} = 1050000$
 6. Determine the maximum operating income possible with the expanded plant.
 - $(188000000 + 11280000) - (88000000 + (\frac{11280000}{188} * 88)) - 45000000 = 61000000$
 7. If the proposal is accepted and sales remain at the current level, what will the operating income or loss be for the following year?
 - $188000000 - 88000000 - 45000000 = 55000000$ **Income**
 8. Based on the data given, would you recommend accepting the proposal?
 - **In favor of the proposal because of the possibility of increasing income from operations.**
5. Howard Industries Inc., operating at full capacity, sold 64,000 units at a price of \$45 per unit during the current year. Its income statement is as follows:

Item	Debit	Credit
Sales		2880000
Cost of goods sold		(1400000)
Gross profit		1480000
Expenses:		
Selling expenses	400000	
Administrative expenses	<u>387500</u>	
Total expenses		(787500)
Operating income		<u>692500</u>

The division of costs between *variable* and *fixed* is as follows:

	Variable	Fixed
Cost of goods sold	70%	25%
Selling expenses	60%	40%
Administrative expenses	80%	20%

Management is considering a plant expansion program for the following year that will permit an increase of \$900,000 in yearly sales. The expansion will increase *fixed costs* by \$212,500 but will not affect the relationship between sales and *variable costs*.

1. Determine the total variable costs and the total fixed costs for the current year.
 - Total variable costs: 1600000
 - Total fixed costs: 587500
2. Determine (a) the unit variable cost and (b) the *unit contribution margin* for the current year.
 - Unit variable cost: 25
 - Unit contribution margin: 20
3. Compute the break-even sales (units) for the current year.
 - 29375
4. Compute the break-even sales (units) under the proposed program for the following year.
 - 40000
5. Determine the amount of sales (units) that would be necessary under the proposed program to realize the \$60,000,000 of operating income that was earned in the current year.
 - 74625
6. Determine the maximum operating income possible with the expanded plant.
 - 880000
7. If the proposal is accepted and sales remain at the current level, what will the operating income or loss be for the following year?

- 480000 Income
8. Based on the data given, would you recommend accepting the proposal?
- In favor of the proposal because of the possibility of increasing income from operations.

Classify Costs

6. Following is a list of various costs incurred in producing replacement automobile parts. With respect to the production and sale of these auto parts, classify each cost as either *variable costs*, *fixed costs*, or *mixed costs*.

o

Item	Cost Type
Oil used in manufacturing equipment	Variable
Plastic	Variable
Property taxes, \$165,000 per year on factory building and equipment	Fixed
Salary of plant manager	Fixed
Cost of labor for hourly workers	Variable
Packaging	Variable
Factory cleaning costs, \$6,000 per month	Fixed
Metal	Variable
Rent on warehouse, \$10,000 per month plus \$25 per square foot of storage used	Mixed
Property insurance premiums, \$3,600 per month plus \$0.01 for each dollar of property over \$1,200,000	Mixed
Straight-line depreciation on the production equipment	Fixed
Hourly wages of machine operators	Variable
Electricity costs, \$0.20 per kilowatt-hour	Variable
Computer chip (purchased from a vendor)	Variable
Pension cost, \$1.00 per employee hour on the job	Variable

Contribution Margin

7. Waite Company sells 250,000 units at 120 per unit. *Variable costs* are 78 per unit, and *fixed costs* are 8,175,000.

Determine (a) the contribution margin ratio, (b) the unit contribution margin, and (c) operating income.

1. Contribution margin ratio $\frac{120 - 78}{120} = 35\%$
2. Unit contribution margin $120 - 78 = 42$ per unit
3. Operating income: $(250000 * (120 - 78)) - 8175000 = 2325000$

Contribution Margin Ratio

8. 1. Young Company budgets sales of \$112,900,000, fixed costs of \$25,000,000, and variable costs of \$66,611,000. What is the contribution margin ratio for Young Company?
- $\frac{112900000 - 66611000}{112900000} = 41\%$
2. If the contribution margin ratio for Martinez Company is 40%, sales were \$34,800,000, and fixed costs were \$1,500,000, what was the operating income?
- $(34800000 * 40\%) - 1500000 = 12420000$

High-Low Method

9. The manufacturing costs of Rosenthal Industries for the first three months of the year follow:

	Total Costs	Units Produced
January	1890000	22500
February	2800000	35000
March	4230000	55000

Using the high-low method, determine (a) the variable cost per unit and (b) the total fixed cost.

- 1. Variable cost per unit: $\frac{4230000 - 1890000}{55000 - 22500} = 72$
 - 2. Total fixed cost: $4230000 - (55000 * 72) = 270000$
10. Ziegler Inc. has decided to use the high-low method to estimate the total cost and the fixed and variable cost components of the total cost. The data for various levels of production are as follows:

Units Produced	Total Costs
80000	25100000
92000	27206000
120000	32120000

1. Determine the variable cost per unit and the total fixed cost.
 - Variable cost (Round to two decimal places): $\frac{32120000 - 25100000}{120000 - 80000} = 175.50$
Total fixed cost: $32120000 - (175.5 * 120000) = 11060000$
2. Based on part (a), estimate the total cost for 115,000 units of production.
 - $11060000 + (175.5 * 115000) = 31242500$

Margin of Safety

11. Jorgensen Company has sales of \$380,000,000, and the break-even point in sales dollars is \$323,000,000.

Determine Jorgensen Company's margin of safety as a percent of current sales.

- $\frac{380000000 - 323000000}{380000000} = 15\%$

Operating Leverage

12. Haywood Co. reports the following data:

Item	Value
Sales	6160000
Variable Costs	(4620000)
Contribution margin	1540000
Fixed costs	(440000)
Operating income	1100000

Determine Haywood Co.'s operating leverage. Round your answer to one decimal place.

o $\frac{1540000}{1100000} = 1.4$

Sales Mix and Break-Even Analysis

13. Conley Company has fixed costs of \$17,802,000. The unit selling price, variable cost per unit, and contribution margin per unit for the company's two products follow:

Product Model	Selling Price	Variable Cost per Unit	Contribution Margin per Unit
Yankee	180	99	81
Zoro	225	135	90

The sales mix for products Yankee and Zoro is 80% and 20%, respectively. Determine the break-even point in units of Yankee and Zoro.

1. Product Model Yankee: $\frac{17802000}{(81*80\%)+(90*20\%)} * 80\% = 172000$
2. Product Model Zero: $\frac{17802000}{(81*80\%)+(90*20\%)} * 20\% = 43000$

Target Profit

14. Beard Company sells a product for \$15 per unit. The variable cost is 10 per unit, and fixed costs are 1,750,000.

Determine (a) the break-even point in sales units and (b) the sales units required for the company to achieve a target profit of \$400,000.

1. Break-even point in sales units: $\frac{1750000}{15-10} = 350000$
2. Break-even point in sales units required for the company to achieve a target profit of \$400,000:
$$\frac{1750000+400000}{15-10} = 430000$$

Homework Exercises

1. If the property tax rates are increased, this change in fixed costs will result in a decrease in the break-even point.

- o **False**

2. If employees accept a wage contract that increases the unit contribution margin, the break-even point will decrease.
 - True**
3. If direct materials cost per unit increases, the break-even point will decrease.
 - False**
4. If direct materials cost per unit decreases, the amount of sales necessary to earn a desired amount of profit will decrease.
 - True**
5. If fixed costs are \$650,000 and the unit contribution margin is \$30, the sales necessary to earn an operating income of \$30,000 are 14,000 units.
 - False**
6. Only a single line, which represents the difference between total sales revenues and total costs, is plotted on the cost-volume-profit chart.
 - False**
7. The reliability of cost-volume-profit analysis does *not* depend on the assumption that costs can be accurately divided into fixed and variable components.
 - False**
8. If a business sells four products, it is not possible to estimate the break-even point.
 - False**
9. If the unit selling price is \$40, the volume of sales is \$3,000,000, sales at the break-even point amount to \$2,500,000, and the maximum possible sales are \$3,300,000, the margin of safety is 11,500 units.
 - False**
10. If the volume of sales is \$6,000,000 and sales at the break-even point amount to \$4,800,000, the margin of safety is 25%.
 - False**

Break-Even Point

11. Sheridan Inc. sells a product for \$107 per unit. The variable cost is \$54 per unit, while fixed costs are \$522,474. Determine (a) the break-even point in sales units and (b) the break-even point if the selling price were increased to \$116 per unit.
 1. Break-even point in sales units: $\frac{522474}{107-54} = 9858$
 2. Break-even point if the selling price were increased to \$116 per unit: $\frac{522474}{116-54} = 8427$

Break-even sales and sales to realize operating income

12. For the current year ended March 31, Cosgrove Company expects fixed costs of \$455,400, a unit variable cost of \$46, and a unit selling price of \$69.
 1. Compute the anticipated break-even sales (units): $\frac{455400}{69-46} = 19800$
 2. Compute the sales (units) required to realize operating income of \$105,800: $\frac{455400+105800}{69-46} = 24400$

Contribution Margin

13. Harry Company sells 21,000 units at \$19 per unit. Variable costs are \$14.06 per unit, and fixed costs are \$36,300.

Determine (a) the contribution margin ratio, (b) the unit contribution margin, and (c) operating income.

1. Contribution margin ratio (Enter as a whole number.): $\frac{19 - 14.06}{19} = 26\%$

2. Unit contribution margin (Round to nearest cent.): $19 - 14.06 = 4.94$

3. Operating income: $(21000 * 4.94) - 36300 = 67440$

Contribution Margin Ratio

14. 1. Young Company budgets sales of \$1,280,000, fixed costs of \$54,700, and variable costs of \$243,200. What is the contribution margin ratio for Young Company?

■ $\frac{1280000 - 243200}{1280000} = 81\%$

2. If the contribution margin ratio for Martinez Company is 51%, sales were \$556,000, and fixed costs were \$195,660, what was the operating income?

■ $(556000 * 51\%) - 195660 = 87900$

High-Low Method

15. The manufacturing costs of Rosenthal Industries for the first three months of the year follow:

	Total Costs	Production
January	181440	880
February	236480	1680
March	282240	2480

Using the high-low method, determine (a) the variable cost per unit and (b) the total fixed cost.

1. Variable cost per unit: $\frac{282240 - 181440}{2480 - 880} = 63$

2. Total fixed cost: $181440 - (880 * 63) = 126000$

16. Ziegler Inc. has decided to use the high-low method to estimate the total cost and the fixed and variable cost components of the total cost. The data for various levels of production are as follows:

Units Produced	Total Costs
3010	239940
5370	349510
7310	373240

1. Determine the variable cost per unit and the total fixed cost.

■ Variable cost (Round to nearest dollar.): $\frac{373240 - 239940}{7310 - 3010} = 31$

Total fixed cost: $373240 - (7310 * 31) = 146630$

2. Based on part (a), estimate the total cost for 3,720 units of production.

- Total cost for 3,720 units: $146630 + (31 * 3720) = 261950$

Margin of Safety

17. The Whitehead Company has sales of \$480,000, and the break-even point in sales dollars is \$379,200.

Determine the Whitehead company's margin of safety as a percent of current sales.

- $\frac{480000 - 379200}{480000} = 21\%$

Sales Mix and Break-Even Analysis

18. Jordan Company has fixed costs of \$557,040. The unit selling price, variable cost per unit, and contribution margin per unit for the company's two products follow:

Product Model	Selling Price	Variable Cost per Unit	Contribution Margin per Unit
Yankee	140	80	60
Zoro	220	140	80

The sales mix for products Yankee and Zoro is 70% and 30%, respectively. Determine the break-even point in units of Yankee and Zoro.

1. Product model Yankee: $\frac{557040}{(60*70\%) + (80*30\%)} * 70\% = 5908$

Product model Zoro: $\frac{557040}{(60*.70) + (80*.30)} * .3 = 2532$

Target Profit

19. Woodsman Company sells a product for \$235 per unit. The variable cost is \$125 per unit, and fixed costs are \$572,000.

Determine (a) the break-even point in sales units and (b) the sales units required for the company to achieve a target profit of \$188,760.

1. Break-even point in sales units: $\frac{572000}{235 - 125} = 5200$

2. Break-even point in sales units required for the company to achieve a target profit of \$188,760:

$$\frac{572000 + 188760}{235 - 125} = 6916$$

Quiz

- Cost behavior refers to the manner in which a cost **changes as the related activity changes**.
- If fixed costs are \$250,000, the unit selling price is \$125, and the unit variable costs are \$73, the break-even sales (units) is $\frac{250000}{125 - 73} = 4808$
- Cost behavior refers to the methods used to estimate costs for use in managerial decision making.
 - **False**
- Thompson Company manufactures and sells cookware. Because of current trends, it expects to increase sales by 15% next year. If this expected level of production and sales occurs and plant expansion is not needed, how should this increase affect next year's total amounts for the following costs?
 - Variable Costs: **increase**
 - Fixed Costs: **no change**

Mixed Costs: **increase**

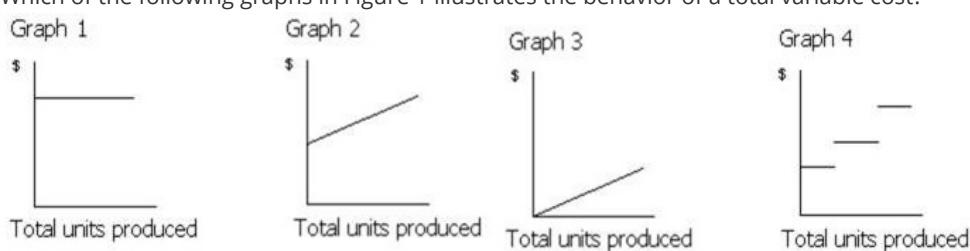
5. Spice Inc.'s unit selling price is \$60, the unit variable costs are \$35, fixed costs are \$125,000, and current sales are 10,000 units. How much will operating income change if sales increase by 8,000 units?
 - $8000 * (60 - 35) = 200000$
6. If sales are \$425,000, variable costs are 62% of sales, and operating income is \$50,000, the contribution margin ratio is $100\% - 62\% = 38\%$
7. A cost that has characteristics of both a variable cost and a fixed cost is called a **mixed cost**.
8. Which of the following types of cost is shown in the cost data below?

Total Cost	Number of Units
\$20	1
40	2
60	3
80	4

◦ **variable cost**

9. If fixed costs are \$400,000 and the unit contribution margin is \$20, the amount of units that must be sold in order to have a zero profit is
 - $\frac{400000}{20} = 20000$
10. A firm operated at 80% of capacity for the past year, during which fixed costs were \$330,000, variable costs were 70% of sales, and sales were \$1,000,000. Operating income (loss) was

$$1000000 - (70\% * 1000000) - 330000 = -30000$$
11. If sales are \$820,000, variable costs are 55% of sales, and operating income is \$260,000, the contribution margin ratio is $100\% - 55\% = 45\%$
12. Which of the following graphs in Figure 1 illustrates the behavior of a total variable cost?



◦ **Graph 3**

13. If fixed costs are \$1,200,000, the unit selling price is \$240, and the unit variable costs are \$110, the amount of sales (units) required to realize an operating income of \$200,000 is $\frac{1200000+200000}{240-110} = 10769$
14. Understanding how costs behave is useful to management for all of the following reasons except **predicting customer demand**.
15. Given the following cost and activity observations for Bounty Company's utilities, use the high-low method to determine Bounty's variable utilities cost per machine hour. Round your answer to the nearest cent.

	Cost	Machine Hours
March	\$3,100	15,000
April	2,700	10,000
May	2,900	12,000
June	3,600	18,000

o $\frac{3600 - 2700}{18000 - 10000} = .11$

16. Given the following cost and activity observations for George Company's utilities, use the high-low method to determine George's variable utilities cost per machine hour.

	Cost	Machine Hours
May	\$16,500	105,000
June	18,000	120,000
July	16,000	100,000
August	17,500	117,000

o $\frac{18000 - 16000}{120000 - 100000} = .1$

17. If fixed costs are \$500,000, the unit selling price is \$55, and the unit variable costs are \$30, the break-even sales (units) if fixed costs are increased by \$80,000 is $\frac{500000 + 80000}{55 - 30} = 23200$
18. Which of the following is *not an example of a cost that varies in total as the number of units produced changes?
- o **straight-line depreciation on factory equipment**
19. The point where the sales line and the total costs line intersect on the cost-volume-profit chart represents the **break-even point**.
20. Which of the following activity bases would be the most appropriate for gasoline costs of a delivery service?
- o **total miles driven**

Chapter 21

Pre-Lecture Videos

1. Both fixed and variable factory costs are included as a part of factory overhead when accounting for absorption costing.
 - o **True**
2. Both fixed and variable factory costs are included as a part of factory overhead when accounting for variable costing.
 - o **False**
3. When units manufactured are less than the number of units sold, the variable costing operating income will be **greater than** that of absorption costing.
4. When the units manufactured are greater than the units sold, finished goods inventory **increases**.

5. Under absorption costing, increasing finished goods inventory causes **operating income to increase**.
6. **Controllable** costs are costs that can be influenced (increased or decreased) by management at a specific level.
7. Which of the following costs are controllable costs for operating management?
 - **Variable manufacturing costs**
8. Markets can be divided into market segments by **sales territories, product lines, salespersons**.
9. The contribution margin ratio is computed as **contribution margin divided by sales**.
10. Which of the following items does a service company not have on its financial statements?
 - **Cost of goods sold**
11. Common activity bases used by an airline are the number of **passengers** and the number of **miles flown**.

Mini Quiz

1. Jersey Company uses variable costing for internal decision-making purposes and has the following information for April:

Item	Value
Sales	810000
Variable cost of goods sold	340000
Fixed manufacturing costs	120000
Variable selling and administrative expenses	90000
Fixed selling and administrative expenses	50000

1. What is the manufacturing margin?
 - $810000 - 340000 = 470000$
2. What is the manufacturing margin for April?
 - $810000 - 340000 - 90000 = 380000$
2. Sonic Flights is preparing a contribution margin report segmented by route. The following information is available:

	Miami/LA	Atlanta/New York	New York/Chicago
Average ticket price per passenger	1200	800	700
Total passengers served	6400	10800	11300
Total miles flown	150000	105000	80000

The variable costs per unit are as follows:

Cost	Value	Unit
Fuel	17	per mile
Wages	21	per mile
Food/beverage service	12	per passenger
Selling	65	per passenger

What is the contribution margin ratio for the Atlanta/New York route (rounded to one decimal place)?

$$\circ \frac{[105000*(17+21)]+[10800*(12+65)]}{800*10800} = 44.2\%$$

3. Sales mix is sometimes referred to as the **product mix**.
4. Which of the following statements regarding service companies is not true?
 - **A contribution margin report cannot be used to analyze and evaluate market segments.**
5. Product A's contribution margin ratio (60%) is greater than Product B's contribution margin ratio (40%). Product A's contribution margin ratio can be contributed to its lower promotion and sales commissions costs. Thus, management should consider
 - **increasing the price of Product B.**
 - **reducing Product B's promotion and sales commissions costs.**
 - **emphasizing product A in its marketing plans.**
6. A company with a seasonal demand for its products may have an opportunity to obtain an off-season order. The relevant factors for such a short-run decision include the **additional revenues and variable costs**.
7. Operating income is often termed EBIT because it represents **earnings before interest and taxes**.
8. If the number of units manufactured is greater than the number of units sold, the operating income reported under the absorption costing concept **would be larger than the operating income reported under the variable costing concept**.
9. Given the following information for Smith Company's Northern Division, what is the division's EBITDA margin?

Item	Value
Revenue	44140
Operating income	18112
Depreciation	5000
Amortization	1422
Tax Rate	20%

$$\circ \frac{18112+5000+1422}{44140} = 56\%$$

10. Under absorption costing, managers may be encouraged to **produce inventory**.
11. EBITDA represents earnings before which of the following have been deducted?
 - **Income taxes, interest, depreciation and amortization**
12. All of the following are examples of market segments except **advertising**.

13. Variable manufacturing costs are \$70 per unit, and fixed costs are \$134,680. Sales are estimated to be 5,200 units. How much would absorption costing operating income differ between a plan to produce 5,200 units and a plan to produce 6,500 units?

$$\circ (6500 - 5200) * \frac{134680}{6500} = 26936$$

14. Which of the following is true under absorption costing?

- Decreases in operating income can be due to changes in inventory levels.**
- Increases in operating income can be due to changes in inventory levels.**
- A portion of a finished goods inventory increase is due to the allocation of fixed manufacturing overhead to ending inventory.**

15. A logical activity base for the fuel expense of a bus service would be the number of **miles travelled**.

16. Under variable costing, increases in ending inventory will **have no effect on operating income**.

17. The following information is available for Forever Fragrance Company's Southern Territory by salesperson:

	Garcia	Jones	Total
Sales	30000	40000	70000
Variable cost of goods sold	3600	4800	8400
Variable selling expenses:			
Promotion costs	5000	8000	13000
Sales commissions	4500	6000	10500

What is the contribution margin for Jones?

$$\circ 40000 - (4800 + 8000 + 6000) = 21200$$

18. Variable costing is sometimes called **direct** costing.

19. If the number of units manufactured is greater than the number of units sold, the operating income reported under the absorption costing concept **would be larger than the operating income reported under the variable costing concept**.

20. Sales less variable cost of goods sold equals **manufacturing margin**.

21. Ormand Company uses variable costing for internal decision-making purposes and has the following information for June:

Item	Value
Sales	900000
Variable cost of goods sold	440000
Fixed manufacturing costs	160000
Variable selling and administrative expenses	100000
Fixed selling and administrative expenses	70000

What is the operating income for June?

$$\circ \quad 900000 - 440000 - 160000 - (100000 + 70000) = 130000$$

22. Operating income can be determined using **absorption and variable costing**.

Practice Exercises

1. In determining cost of goods sold, two alternate costing concepts can be used: absorption costing and variable costing.
 - **True**
2. In determining cost of goods sold, two alternate costing concepts can be used: direct costing and variable costing.
 - **False**
3. Fixed factory overhead costs are included as part of the cost of products manufactured under the absorption costing concept.
 - **True**
4. Under absorption costing, the cost of finished goods includes direct materials, direct labor, and all factory overhead.
 - **True**
5. Under absorption costing, the cost of finished goods includes only direct materials, direct labor, and variable factory overhead.
 - **False**
6. In variable costing, the cost of products manufactured is composed of only those manufacturing costs that increase or decrease as the volume of production rises or falls.
 - **True**
7. In variable costing, fixed costs do *not* become part of the cost of goods manufactured, but they are considered an expense of the period.
 - **True**
8. Variable costing is also known as direct costing.
 - **True**
9. For short-run production planning, information in the absorption costing format is more useful to management than is information in the variable costing format.
 - **False**
10. Sales mix is generally defined as the relative distribution of sales among the various products sold.
 - **True**
11. If the ability to sell and the amount of production facilities devoted to each of two products are equal, it is profitable to increase the sales of that product with the lowest contribution margin.
 - **False**
12. If the ability to sell and the amount of production facilities devoted to each of two products are equal, it is profitable to increase the sales of that product with the highest contribution margin.
 - **True**
13. The contribution margin ratio is computed as contribution margin divided by sales.
 - **True**
14. In evaluating the performance of salespersons, the salesperson with the highest level of sales dollars should be evaluated as the best performer.
 - **False**

Absorption and Variable Costing Income Statements

15. During the first month of operations ended July 31, YoSan Inc. manufactured 2,400 flat panel televisions, of which 2,000 were sold. Operating data for the month are summarized as follows:

Item		
Sales		2150000
Manufacturing costs:		
Direct materials	960000	
Direct labor	420000	
Variable manufacturing cost	156000	
Fixed manufacturing cost	<u>288000</u>	1824000
Selling and administrative expenses:		
Variable	204000	
Fixed	<u>96000</u>	300000

1. Prepare an income statement based on the absorption costing concept.

Absorption Costing Income Statement For the Month Ended July 31		
Sales		2150000
Cost of goods sold:		
Cost of goods manufactured	1824000	
Inventory, July 31	$(2400 - 2000) * \frac{1824000}{2400} = (304000)$	
Total cost of goods sold		$1824000 - 304000 = (1520000)$
Gross profit		630000
Selling and administrative expenses		<u>(300000)</u>
Operating income		<u>330000</u>

2. Prepare an income statement based on the variable costing concept.

Variable Costing income Statement For the Month Ended July 31		
Sales		2150000
Variable cost of goods sold:		
Variable cost of goods manufactured	1536000	
Inventory, July 31	(2400 – 2000) * $\frac{1536000}{2400} =$ <u>(256000)</u>	
Total variable cost of goods sold		<u>(1280000)</u>
Manufacturing margin		870000
Variable selling and administrative expenses		<u>(204000)</u>
Contribution margin		666000
Fixed costs:		
Fixed manufacturing costs	288000	
Fixed selling and administrative expenses	<u>96000</u>	
Total fixed costs		<u>(384000)</u>
Operating income		<u>282000</u>

3. Explain the reason for the difference in the amount of operating income reported in (1) and (2).
- The operating income reported under **absorption** costing exceeds the operating income reported under **variable** costing, due to **fixed** manufacturing costs that are deferred to a future month under **absorption** costing.

Analyzing Income under Absorption and Variable Costing

16. Variable manufacturing costs are \$126 per unit, and fixed manufacturing costs are \$157,500. Sales are estimated to be 10,000 units.

If an amount is zero, enter "0".

1. How much would absorption costing operating income differ between a plan to produce 10,000 units and a plan to produce 15,000 units?
 - $10000 * \left(\frac{157500}{10000} - \frac{157500}{15000} \right) = 52500$
2. How much would variable costing operating income differ between the two production plans?
 - 0 because there would be no difference in variable costing operating income.

Contribution Margin by Segment

17. The following information is for LaPlanche Industries Inc.:

	East	West
Sales volume (units):		
Product XX	45000	38000
Product YY	60000	50000
Sales price:		
Product XX	700	660
Product YY	728	720
Variable cost per unit:		
Product XX	336	336
Product YY	360	360

- Determine the contribution margin for the Product YY.
 - $[60000 * (728 - 360)] + [50000 * (720 - 360)] = 40080000$
- Determine the contribution margin for the West Region.
 - $[38000 * (660 - 336)] + [50000 * (720 - 360)] = 30312000$

Inventory Valuation under Absorption Costing and Variable Costing

18. At the end of the first year of operations, 21,500 units remained in the finished goods inventory. The unit manufacturing costs during the year were as follows:

Item	Value
Direct materials	30
Direct labor	18
Fixed factory overhead	22
Variable factory overhead	14

Determine the cost of the finished goods inventory reported on the balance sheet under (a) the absorption costing concept and (b) the variable costing concept.

- Absorption costing: $21500 * (30 + 18 + 22 + 14) = 1806000$
- Variable costing: $21500 * (30 + 18 + 14) = 1333000$

Variable and Absorption Costing-Three Products

19. Winslow Inc. manufactures and sells three types of shoes. The income statements prepared under the absorption costing method for the three shoes are as follows:

Product Income Statements-Absorption Costing For the Year Ended December 31, 20Y1	Cross Training Shoes	Golf Shoes	Running Shoes
Revenues	5800000	6900000	4200000
Cost of goods sold	(3016000)	(3381000)	(2814000)
Gross profit	2784000	3519000	1386000
Selling and administrative expenses	(2436000)	(2484000)	(2142000)
Operating Income	<u>348000</u>	<u>1035000</u>	<u>(756000)</u>

In addition, you have determined the following information with respect to allocated fixed costs:

	Cross Training Shoes	Golf Shoes	Running Shoes
Fixed costs:			
Cost of goods sold	928000	897000	798000
Selling and administrative expenses	696000	828000	588000

These fixed costs are used to support all three product lines and will not change with the elimination of any one product. In addition, you have determined that the effects of inventory may be ignored.

The management of the company has deemed the profit performance of the running shoe line as unacceptable. As a result, it has decided to eliminate the running shoe line. Management does not expect to be able to increase sales in the other two lines. However, as a result of eliminating the running shoe line, management expects the profits of the company to increase by \$756,000.

1. Are management's decision and conclusions correct?
 - Management's decision and conclusion are **incorrect**. The profit **will not** be improved because the fixed costs used in manufacturing and selling running shoes **will not** be avoided if the line is eliminated.
2. Prepare a variable costing income statement for the three products. Enter a net loss as a negative number using a minus sign.
 -

Variable Costing Income Statements-Three Product Lines For the Year Ended December 31, 20Y1	Cross Training Shoes	Golf Shoes	Running Shoes
Revenues	5800000	6900000	4200000
Variable cost of goods sold	-2088000	-2484000	-2016000
Manufacturing margin	3712000	4416000	2184000
Variable selling and administrative expenses	-1740000	-1656000	-1554000
Contribution margin	1972000	2760000	630000
Fixed costs:			
Fixed manufacturing costs	-928000	-897000	-798000
Fixed selling and administrative expenses	-696000	-828000	-588000
Total fixed costs	-1624000	-1725000	1386000
Operating income (loss)	348000	1035000	-756000

3. Use the report in (b) to determine the profit impact of eliminating the running shoe line, assuming no other changes.
- If the running shoe line were eliminated, then the contribution margin of the product line would **be eliminated** and the fixed costs **would not** be eliminated. Thus, the profit of the company would actually **decline** by **630000**. Management should keep the line and attempt to improve the profitability of the product by **increasing** prices, **increasing** volume, or **reducing** costs.

Variable Costing

20. Marley Company has the following information for March:

Item	Value
Sales	912000
Variable cost of goods sold	474000
Fixed manufacturing costs	82000
Variable selling and administrative expenses	238100
Fixed selling and administrative expenses	54700

Determine the following for Marley Company for the month of March:

- Manufacturing margin: $912000 - 474000 = 438000$
- Contribution margin: $438000 - 238100 = 199900$
- Operating income: $199900 - 82000 - 54700 = 63200$

Variable Costing—Production Exceeds Sales

21. Fixed manufacturing costs are \$44 per unit, and variable manufacturing costs are \$100 per unit. Production was 67,200 units, while sales were 50,400 units.
 1. Determine whether variable costing operating income is less than or greater than absorption costing operating income.
 - **Variable costing operating income is less than absorption costing.**
 2. Determine the difference in variable costing and absorption costing operating income.
 - $16800 * 44 = 739200$

Variable Costing—Sales Exceed Production

22. The beginning inventory is 52,800 units. All of the units that were manufactured during the period and 52,800 units of the beginning inventory were sold. The beginning inventory fixed manufacturing costs are \$14.70 per unit, and variable manufacturing costs are \$30 per unit.
 1. Determine whether variable costing operating income is less than or greater than absorption costing operating income.
 - **Variable costing operating income is greater than absorption costing.**
 2. Determine the difference in variable costing and absorption costing operating income.
 - $52800 * 14.7 = 776160$

Homework Exercises

1. Which of the following terms is commonly used to describe the concept whereby the cost of manufactured products is composed of direct materials cost, direct labor cost, and variable factory overhead cost?
 - **variable costing**
2. Under variable costing, which of the following costs would *not* be included in finished goods inventory?
 - **fixed factory overhead cost**
3. In the variable costing income statement, deduction of variable selling and administrative expenses from manufacturing margin yields **contribution margin**.
4. The amount of income under absorption costing will be more than the amount of income under variable costing when units manufactured **exceed units sold**.
5. A business operated at 100% of capacity during its first month and incurred the following costs:

Item	Value	Value
Production costs (20000 units):		
Direct materials	180000	
Direct labor	240000	
Variable factory overhead	280000	
Operating expenses:		
Variable operating expenses	130000	
Fixed operating expenses	<u>50000</u>	180000

If 1,600 units remain unsold at the end of the month, the amount of inventory that would be reported on the variable costing balance sheet is

- o $1600 * \frac{180000 + 240000 + 280000}{20000} = 56000$

6. A business operated at 100% of capacity during its first month and incurred the following costs:

Item	Value	Value
Production costs (10000 units):		
Direct materials	80000	
Direct labor	120000	
Variable factory overhead	140000	
Fixed factory overhead	<u>40000</u>	380000
Operating expenses:		
Variable operating expenses	65000	
Fixed operating expenses	<u>25000</u>	90000

If 600 units remain unsold at the end of the month, the amount of inventory that would be reported on the absorption costing balance sheet is:

- o

7. A business operated at 100% of capacity during its first month and incurred the following costs:

Item	Value	Value
Production costs (5000 units):		
Direct materials	70000	
Direct labor	20000	
Variable factory overhead	10000	
Fixed factory overhead	<u>2000</u>	102000
Operating expenses:		
Variable operating expenses	17000	
Fixed operating expenses	<u>1000</u>	18000

If 1,000 units remain unsold at the end of the month and sales total \$150,000 for the month, the amount of contribution margin that would be reported on the variable costing income statement is

-
- 8. A business operated at 100% of capacity during its first month and incurred the following costs:

Item	Value	Value
Sales (103 units)		484100
Production costs (129 units):		
Direct materials	65541	
Direct labor	16734	
Variable factory overhead	29284	
Fixed factory overhead	<u>27890</u>	139449
Operating expenses:		
Variable operating expenses	6053	
Fixed operating expenses	<u>3513</u>	9566

The amount of operating income that would be reported on the absorption costing income statement is

- 9. Under which inventory costing method could increases or decreases in operating income be misinterpreted to be the result of operating efficiencies or inefficiencies?
 - **only absorption costing**
- 10. Jake Entertainment Corporation has three segments with revenue, operating income, and depreciation and amortization information (in millions) as follows:

Segment	Revenue	Operating Income	Depreciation and Amortization
Film	5000	1500	525
Theme Park	1000	320	112
Video Game	<u>500</u>	<u>175</u>	<u>53</u>
Totals	<u>6500</u>	<u>1995</u>	<u>690</u>

Absorption and Variable Costing Income Statements

11. During the first month of operations ended July 31, YoSan Inc. manufactured 10,100 flat panel televisions, of which 9,500 were sold. Operating data for the month are summarized as follows:

Item		
Sales		1662500
Manufacturing costs:		
Direct materials	828200	
Direct labor	252500	
Variable manufacturing cost	212100	
Fixed manufacturing cost	<u>111100</u>	1403900
Selling and administrative expenses:		
Variable	113000	
Fixed	<u>61200</u>	194200

1. Prepare an income statement based on the absorption costing concept.

Absorption Costing Income Statement For the Month Ended July 31		
Sales		1662500
Cost of goods sold:		
Cost of goods manufactured	1403900	
Inventory, July 31	$(10100 - 9500) * \frac{1403900}{10100}$ (83400)	
Total cost of goods sold		$1403900 - 83400 = \underline{1320500}$
Gross profit		$1662500 - 1320500 = 342000$
Selling and administrative expenses		<u>(194200)</u>
Operating income		$342000 - 194200 = \underline{147800}$

2. Prepare an income statement based on the variable costing concept.

Variable Costing income Statement For the Month Ended July 31		
Sales		1662500
Variable cost of goods sold:		
Variable cost of goods manufactured	$828200 + 252500 + 212100 = 1292800$	
Inventory, July 31	$(10100 - 9500) * \frac{1292800}{10100} = (76800)$	
Total variable cost of goods sold		$1292800 - 76800 = (1216000)$
Manufacturing margin		$1662500 - 1216000 = 446500$
Variable selling and administrative expenses		<u>(113000)</u>
Contribution margin		$446500 - 133000 = 313500$
Fixed costs:		
Fixed manufacturing costs	111100	
Fixed selling and administrative expenses	<u>61200</u>	
Total fixed costs		<u>(172300)</u>
Operating income		$313500 - 172300 = \underline{\underline{141200}}$

3. Explain the reason for the difference in the amount of operating income reported in (1) and (2).

- The operating income reported under **absorption** costing exceeds the operating income reported under **variable** costing, due to **fixed** manufacturing costs that are deferred to a future month under **absorption** costing.

Analyzing Income under Absorption and Variable Costing

12. Variable manufacturing costs are \$90 per unit, and fixed manufacturing costs are \$69,300. Sales are estimated to be 6,300 units.

If an amount is zero, enter "0". Round intermediate calculations to the nearest cent and your final answers to the nearest dollar.

1. How much would absorption costing operating income differ between a plan to produce 6,300 units and a plan to produce 7,700 units?

- $6300 * \left(\frac{69300}{6300} - \frac{69300}{7700} \right) = 12600$

2. How much would variable costing operating income differ between the two production plans?

- 0

Contribution Margin by Segment

13. The following data are for Flat Bed Apparel:

	East	West
Sales volume (units):		
Product XX	6300	7100
Product YY	4200	6300
Sales price:		
Product XX	11	9
Product YY	15	17
Variable cost per unit:		
Product XX	7	7
Product YY	9	9

1. Determine the contribution margin for Product YY.
 - $[4200 * (15 - 9)] + [6300 * (17 - 9)] = 75600$
2. Determine the contribution margin for the West Region.
 - $[7100 * (9 - 7)] + [6300 * (17 - 9)] = 64600$

Inventory Valuation under Absorption Costing and Variable Costing

14. At the end of the first year of operations, 6,100 units remained in the finished goods inventory. The unit manufacturing costs during the year were as follows:

Item	Value
Direct materials	29.4
Direct labor	16.9
Fixed factory overhead	6.8
Variable factory overhead	6

Determine the cost of the finished goods inventory reported on the balance sheet under (a) the absorption costing concept and (b) the variable costing concept.

- Absorption costing: $6100 * (29.4 + 16.9 + 6.8 + 6) = 360510$
- Variable costing: $6100 * (29.4 + 16.9 + 6) = 319030$

Variable and Absorption Costing—Three Products

15. Winslow Inc. manufactures and sells three types of shoes. The income statements prepared under the absorption costing method for the three shoes are as follows:

Product Income Statements-Absorption Costing For the Year Ended December 31, 20Y1	Cross Training Shoes	Golf Shoes	Running Shoes
Revenues	447100	268300	228100
Cost of goods sold	(232500)	(131500)	(152800)
Gross profit	214600	136800	75300
Selling and administrative expenses	(184600)	(98500)	(125800)
Operating Income	<u>30000</u>	<u>38300</u>	<u>(50500)</u>

In addition, you have determined the following information with respect to allocated fixed costs:

	Cross Training Shoes	Golf Shoes	Running Shoes
Fixed costs:			
Cost of goods sold	71500	34900	31900
Selling and administrative expenses	53700	32200	31900

These fixed costs are used to support all three product lines and will not change with the elimination of any one product. In addition, you have determined that the effects of inventory may be ignored.

The management of the company has deemed the profit performance of the running shoe line as unacceptable. As a result, it has decided to eliminate the running shoe line. Management does not expect to be able to increase sales in the other two lines. However, as a result of eliminating the running shoe line, management expects the profits of the company to increase by \$50,500.

1. Are management's decision and conclusions correct?
■
2. Prepare a variable costing income statement for the three products. Enter a net loss as a negative number using a minus sign.
■

Variable Costing Income Statements-Three Product Lines For the Year Ended December 31, 20Y1	Cross Training Shoes	Golf Shoes	Running Shoes
Revenues	447100	268300	228100
Variable cost of goods sold	$232500 - 71500 = 161000$	$131500 - 34900 = 96600$	$152800 - 31900 = 120900$
Manufacturing margin	$447100 - 161000 = 286100$	$268300 - 96600 = 171700$	$228100 - 120900 = 107200$
Variable selling and administrative expenses	$184600 - 53700 = 130900$	$98500 - 32200 = 66300$	$125800 - 31900 = 93900$
Contribution margin	$286100 - 130900 = 155200$	$171700 - 66300 = 105400$	$107200 - 93900 = 13300$
Fixed costs:			
Fixed manufacturing costs	71500	34900	31900
Fixed selling and administrative expenses	53700	32200	31900
Total fixed costs	$71500 + 53700 = 125200$	$34900 + 32200 = 67100$	$31900 + 31900 = 63800$
Operating income (loss)	$155200 - 125200 = 30000$	$105400 - 67100 = 38300$	$13300 - 63800 = -50500$

3. Use the report in (b) to determine the profit impact of eliminating the running shoe line, assuming no other changes.

- If the running shoes line were eliminated, then the contribution margin of the product line would **be eliminated** and the fixed costs **would not** be eliminated. Thus, the profit of the company would actually **decline** by 13300. Management should keep the line and attempt to improve the profitability of the product by **increasing** prices, **increasing** volume, or **reducing** costs.

Variable Costing

16. Marsich Company has the following information for July:

Item	Value
Sales	710000
Variable cost of goods sold	326600
Fixed manufacturing costs	106500
Variable selling and administrative expenses	78100
Fixed selling and administrative expenses	49700

Determine the following for Marsich Company for the month of July:

- Manufacturing margin: $710000 - 326600 = 383400$
- Contribution margin: $383400 - 78100 = 305300$
- Operating income: $305300 - 106500 - 49700 = 149100$

Variable Costing-Production Exceeds Sales

17. Fixed manufacturing costs are \$55 per unit, and variable manufacturing costs are \$165 per unit. Production was 132,000 units, while sales were 124,080 units.
 1. Determine whether variable costing operating income is less than or greater than absorption costing operating income.
 - **Variable costing operating income is less than absorption costing.**
 2. Determine the difference in variable costing and absorption costing operating income.
 - $(132000 - 124080) * 55 = 435600$

Variable Costing-Sales Exceed Production

18. The beginning inventory is 13,300 units. All of the units that were manufactured during the period and 13,300 units of the beginning inventory were sold. The beginning inventory fixed manufacturing costs are \$47 per unit, and variable manufacturing costs are \$96 per unit.
 1. Determine whether variable costing operating income is less than or greater than absorption costing operating income.
 - **Variable costing operating income is greater than absorption costing.**
 2. Determine the difference in variable costing and absorption costing operating income.
 - $13300 * 47 = 625100$

Quiz
