

Chapter 3

Job-Order Costing

Solutions to Questions

3-1 By definition, manufacturing overhead consists of costs that cannot be practically traced to jobs. Therefore, if these costs are to be assigned to jobs, they must be allocated rather than traced.

3-2 The first step is to estimate the total amount of the allocation base (the denominator) that will be required for next period's estimated level of production. The second step is to estimate the total fixed manufacturing overhead cost for the coming period and the variable manufacturing overhead cost per unit of the allocation base. The third step is to use the cost formula $Y = a + bX$ to estimate the total manufacturing overhead cost (the numerator) for the coming period. The fourth step is to compute the predetermined overhead rate.

3-3 The job cost sheet is used to record all costs that are assigned to a particular job. These costs include direct materials costs traced to the job, direct labor costs traced to the job, and manufacturing overhead costs applied to the job. When a job is completed, the job cost sheet is used to compute the unit product cost.

3-4 Some production costs such as a factory manager's salary cannot be traced to a particular product or job, but rather are incurred as a result of overall production activities. In addition, some production costs such as indirect materials cannot be easily traced to jobs. If these costs are to be assigned to products, they must be allocated to the products.

3-5 If actual manufacturing overhead cost is applied to jobs, the company must wait until the end of the accounting period to apply overhead and to cost jobs. If the company computes actual overhead rates more frequently to get around this problem, the rates may fluctuate widely due to

seasonal factors or variations in output. For this reason, most companies use predetermined overhead rates to apply manufacturing overhead costs to jobs.

3-6 The measure of activity used as the allocation base should drive the overhead cost; that is, the allocation base should cause the overhead cost. If the allocation base does not really cause the overhead, then costs will be incorrectly attributed to products and jobs and product costs will be distorted.

3-7 Assigning manufacturing overhead costs to jobs does not ensure a profit. The units produced may not be sold and if they are sold, they may not be sold at prices sufficient to cover all costs. It is a myth that assigning costs to products or jobs ensures that those costs will be recovered. Costs are recovered only by selling to customers—not by allocating costs.

3-8 The Manufacturing Overhead account is credited when overhead cost is applied to Work in Process. Generally, the amount of overhead applied will not be the same as the amount of actual cost incurred because the predetermined overhead rate is based on estimates.

3-9 Underapplied overhead occurs when the actual overhead cost exceeds the amount of overhead cost applied to Work in Process inventory during the period. Overapplied overhead occurs when the actual overhead cost is less than the amount of overhead cost applied to Work in Process inventory during the period. Underapplied or overapplied overhead is disposed of by either closing out the amount to Cost of Goods Sold or by allocating the amount among Cost of Goods Sold and ending inventories in proportion to the applied overhead in each account. The adjustment for underapplied overhead increases Cost of

Goods Sold (and inventories) whereas the adjustment for overapplied overhead decreases Cost of Goods Sold (and inventories).

3-10 Manufacturing overhead may be underapplied for several reasons. Control over overhead spending may be poor. Or, some of the overhead may be fixed and the actual amount of the allocation base may be less than estimated at the beginning of the period. In this situation, the amount of overhead applied to inventory will be less than the actual overhead cost incurred.

3-11 Underapplied overhead implies that not enough overhead was assigned to jobs during the period and therefore cost of goods sold was understated. Therefore, underapplied overhead is added to cost of goods sold. On the other hand, overapplied overhead is deducted from cost of goods sold.

3-12 A plantwide overhead rate is a single overhead rate used throughout a plant. In a multiple overhead rate system, each production department may have its own predetermined overhead rate and its own allocation base. Some companies use multiple overhead rates rather than plantwide rates to more appropriately allocate overhead costs among products. Multiple overhead rates should be used, for example, in situations where one department is machine intensive and another department is labor intensive.

3-13 When automated equipment replaces direct labor, overhead increases and direct labor decreases. This results in an increase in the predetermined overhead rate—particularly if it is based on direct labor.

The Foundational 15

1. The estimated total manufacturing overhead cost is computed as follows:

$$Y = \$10,000 + (\$1.00 \text{ per DLH})(2,000 \text{ DLHs})$$

Estimated fixed manufacturing overhead	\$10,000
Estimated variable manufacturing overhead:	
\$1.00 per DLH × 2,000 DLHs	<u>2,000</u>
Estimated total manufacturing overhead cost.....	<u>\$12,000</u>

The predetermined overhead rate is computed as follows:

Estimated total manufacturing overhead (a)....	\$12,000	
Estimated total direct labor hours (DLHs) (b) .	2,000	DLHs
Predetermined overhead rate (a) ÷ (b)	\$6.00	per DLH

2. The manufacturing overhead applied to Jobs P and Q is computed as follows:

	<i>Job P</i>	<i>Job Q</i>
Actual direct labor hours worked (a)	1,400	500
Predetermined overhead rate per DLH (b)	\$6.00	\$6.00
Manufacturing overhead applied (a) × (b)	\$8,400	\$3,000

3. The direct labor hourly wage rate can be computed by focusing on either Job P or Job Q as follows:

	<i>Job P</i>	<i>Job Q</i>
Direct labor cost (a)	\$21,000	\$7,500
Actual direct labor hours worked (b)	1,400	500
Direct labor hourly wage rate (a) ÷ (b)	\$15.00	\$15.00

The Foundational 15

4. Job P's unit product cost and Job Q's assigned manufacturing costs are computed as follows:

Total manufacturing cost assigned to Job P:

Direct materials.....	\$13,000
Direct labor.....	21,000
Manufacturing overhead applied (\$6 per DLH × 1,400 DLHs)	<u>8,400</u>
Total manufacturing cost	<u>\$42,400</u>

Unit product cost for Job P:

Total manufacturing cost (a)	\$42,400
Number of units in the job (b).....	20
Unit product cost (a) ÷ (b).....	\$2,120

Total manufacturing cost assigned to Job Q:

Direct materials.....	\$ 8,000
Direct labor.....	7,500
Manufacturing overhead applied (\$6 per DLH × 500 DLHs)	<u>3,000</u>
Total manufacturing cost	<u>\$18,500</u>

5. The journal entries are recorded as follows:

Raw Materials	22,000
Accounts Payable.....	22,000

Work in Process	21,000
Raw Materials.....	21,000

6. The journal entry is recorded as follows:

Work in Process	28,500
Wages Payable	28,500

The Foundational 15

7. The journal entry is recorded as follows:

Work in Process	11,400	
Manufacturing Overhead		11,400

8. The Schedule of Cost of Goods Manufactured is as follows:

Direct materials:		
Raw materials inventory, beginning.....	\$	0
Add: Purchases of raw materials	<u>22,000</u>	
Total raw materials available	22,000	
Deduct: Raw materials inventory, ending.....	<u>1,000</u>	
Raw materials used in production.....		\$21,000
Direct labor		28,500
Manufacturing overhead applied to work in process inventory	<u>11,400</u>	
Total manufacturing costs.....	60,900	
Add: Beginning work in process inventory	<u>0</u>	
	60,900	
Deduct: Ending work in process inventory.....	<u>18,500</u>	
Cost of goods manufactured	<u>\$42,400</u>	

9. The journal entry is recorded as follows:

Finished Goods.....	42,400	
Work in Process.....		42,400

10. The completed T-account is as follows:

Work in Process	
Beg. Bal.	0
(a)	21,000
(b)	28,500
(c)	11,400
End. Bal.	18,500
(d)	42,400

- (a) Raw material used in production = \$21,000
- (b) Direct labor cost = \$28,500
- (c) Manufacturing overhead applied = \$11,400
- (d) Cost of goods manufactured = \$42,400

The Foundational 15

11. The Schedule of Cost of Goods Sold is as follows:

Finished goods inventory, beginning	\$ 0
Add: Cost of goods manufactured	<u>42,400</u>
Cost of goods available for sale	42,400
Deduct: Finished goods inventory, ending	<u>0</u>
Unadjusted cost of goods sold	<u><u>\$42,400</u></u>

12. The journal entry is recorded as follows:

Cost of Goods Sold	42,400
Finished Goods	42,400

13. The amount of underapplied overhead is computed as follows:

Actual direct labor-hours (a)	1,900
Predetermined overhead rate (b)	\$6.00
Manufacturing overhead applied (a) × (b) ..	\$11,400
Actual manufacturing overhead	\$12,500
Deduct: Manufacturing overhead applied	<u>11,400</u>
Underapplied overhead	<u><u>\$ 1,100</u></u>

14. The journal entry is recorded as follows:

Cost of Goods Sold	1,100
Manufacturing Overhead	1,100

15. The income statement is as follows:

Sales	\$60,000
Cost of goods sold (\$42,400 + \$1,100)	<u>43,500</u>
Gross margin	16,500
Selling and administrative expenses	<u>14,000</u>
Net operating income	<u><u>\$ 2,500</u></u>

Exercise 3-1 (10 minutes)

The estimated total manufacturing overhead cost is computed as follows:

$$Y = \$94,000 + (\$2.00 \text{ per DLH})(20,000 \text{ DLHs})$$

Estimated fixed manufacturing overhead	\$ 94,000
Estimated variable manufacturing overhead: \$2.00 per DLH × 20,000 DLHs	<u>40,000</u>
Estimated total manufacturing overhead cost	<u>\$134,000</u>

The predetermined overhead rate is computed as follows:

Estimated total manufacturing overhead	\$134,000
÷ Estimated total direct labor hours (DLHs)	<u>20,000</u> DLHs
= Predetermined overhead rate	<u>\$6.70</u> per DLH

Exercise 3-2 (10 minutes)

Actual direct labor-hours	10,800
× Predetermined overhead rate	<u>\$23.40</u>
= Manufacturing overhead applied.....	<u><u>\$252,720</u></u>

Exercise 3-3 (10 minutes)

1. Total direct labor-hours required for Job A-500:

Direct labor cost (a).....	\$108
Direct labor wage rate per hour (b)	\$12
Total direct labor hours (a) ÷ (b).....	9

Total manufacturing cost assigned to Job A-500:

Direct materials	\$230
Direct labor	108
Manufacturing overhead applied (\$14 per DLH × 9 DLHs).....	<u>126</u>
Total manufacturing cost	<u>\$464</u>

2. Unit product cost for Job A-500:

Total manufacturing cost (a)	\$464
Number of units in the job (b).....	40
Unit product cost (a) ÷ (b).....	\$11.60

Exercise 3-4 (15 minutes)

a.	Raw Materials	80,000	
	Accounts Payable		80,000
b.	Work in Process	62,000	
	Manufacturing Overhead.....	9,000	
	Raw Materials		71,000
c.	Work in Process	101,000	
	Manufacturing Overhead.....	11,000	
	Wages Payable		112,000
d.	Manufacturing Overhead.....	175,000	
	Various Accounts		175,000

Exercise 3-5 (20 minutes)

Parts 1 and 2.

Cash		Raw Materials	
	(a) 94,000	(a) 94,000	(b) 89,000
	(c) 132,000	Bal. 5,000	
	(d) 143,000		
Work in Process		Finished Goods	
(b) 78,000		(f) 342,000	(f) 342,000
(c) 112,000		Bal. 0	
(e) 152,000	(f) 342,000		
Bal. 0			
Manufacturing Overhead		Cost of Goods Sold	
(b) 11,000	(e) 152,000	(f) 342,000	
(c) 20,000		(g) 22,000	
(d) 143,000	(g) 22,000	Bal. 364,000	
Bal. 0			

Exercise 3-6 (20 minutes)

1. Cost of Goods Manufactured

Direct materials:

Raw materials inventory, beginning.....	\$12,000	
Add: Purchases of raw materials	<u>30,000</u>	
Total raw materials available	42,000	
Deduct: Raw materials inventory, ending	<u>18,000</u>	
Raw materials used in production	24,000	
Less indirect materials included in manufacturing overhead	<u>5,000</u>	\$ 19,000
Direct labor.....		58,000
Manufacturing overhead applied to work in process inventory.....		<u>87,000</u>
Total manufacturing costs.....		164,000
Add: Beginning work in process inventory.....		<u>56,000</u>
		220,000
Deduct: Ending work in process inventory		<u>65,000</u>
Cost of goods manufactured		<u>\$155,000</u>

2. Cost of Goods Sold

Finished goods inventory, beginning.....	\$ 35,000
Add: Cost of goods manufactured	<u>155,000</u>
Goods available for sale.....	190,000
Deduct: Finished goods inventory, ending.....	<u>42,000</u>
Unadjusted cost of goods sold	148,000
Add: Underapplied overhead.....	<u>4,000</u>
Adjusted cost of goods sold	<u>\$152,000</u>

Exercise 3-7 (10 minutes)

1. Manufacturing overhead incurred (a).....	\$215,000
Actual direct labor-hours.....	11,500
× Predetermined overhead rate	\$18.20
= Manufacturing overhead applied (b).....	\$209,300
Manufacturing overhead underapplied (a) – (b).....	<u>\$5,700</u>

2. Because manufacturing overhead is underapplied, the cost of goods sold would increase by \$5,700 and the gross margin would decrease by \$5,700.

Exercise 3-8 (10 minutes)

Direct material.....	\$10,000
Direct labor	12,000
Manufacturing overhead:	
\$12,000 × 125%.....	<u>15,000</u>
Total manufacturing cost.....	<u>\$37,000</u>
Unit product cost:	
\$37,000 ÷ 1,000 units.....	\$37

Exercise 3-9 (30 minutes)

1. a.	Raw Materials Inventory.....	210,000	
	Accounts Payable		210,000
b.	Work in Process.....	178,000	
	Manufacturing Overhead	12,000	
	Raw Materials Inventory		190,000
c.	Work in Process.....	90,000	
	Manufacturing Overhead	110,000	
	Salaries and Wages Payable.....		200,000
d.	Manufacturing Overhead	40,000	
	Accumulated Depreciation		40,000
e.	Manufacturing Overhead	70,000	
	Accounts Payable		70,000
f.	Work in Process.....	240,000	
	Manufacturing Overhead		240,000
	30,000 MH × \$8 per MH = \$240,000.		
g.	Finished Goods.....	520,000	
	Work in Process		520,000
h.	Cost of Goods Sold	480,000	
	Finished Goods		480,000
	Accounts Receivable	600,000	
	Sales		600,000
	\$480,000 × 1.25 = \$600,000.		

2.

Manufacturing Overhead		Work in Process	
(b) 12,000	(f) 240,000	Bal. 42,000	(g) 520,000
(c) 110,000		(b) 178,000	
(d) 40,000		(c) 90,000	
(e) 70,000		(f) 240,000	
	8,000	Bal. 30,000	
	(Overapplied overhead)		

Exercise 3-10 (10 minutes)

Yes, overhead should be applied to value the Work in Process inventory at year-end.

Because \$6,000 of overhead was applied to Job V on the basis of \$8,000 of direct labor cost, the company's predetermined overhead rate must be 75% of direct labor cost.

Job W direct labor cost (a)	\$4,000
Predetermined overhead rate (b)	0.75
Manufacturing overhead applied to Job W (a) × (b)	\$3,000

Exercise 3-11 (30 minutes)

1. Mason Company's schedule of cost of goods manufactured is as follows:

Direct materials:		
Beginning raw materials inventory	\$ 7,000	
Add: Purchases of raw materials	<u>118,000</u>	
Raw materials available for use.....	125,000	
Deduct: Ending raw materials inventory	<u>15,000</u>	
Raw materials used in production		\$110,000
Direct labor		70,000
Manufacturing overhead		<u>90,000</u>
Total manufacturing costs.....		270,000
Add: Beginning work in process inventory		<u>10,000</u>
		280,000
Deduct: Ending work in process inventory.....		<u>5,000</u>
Cost of goods manufactured.....		<u>\$275,000</u>

2. Mason Company's schedule of cost of goods sold is as follows:

Beginning finished goods inventory.....	\$ 20,000
Add: Cost of goods manufactured.....	<u>275,000</u>
Goods available for sale	295,000
Deduct: Ending finished goods inventory	<u>35,000</u>
Unadjusted cost of goods sold.....	\$260,000
Deduct: Overapplied overhead	\$10,000
Adjusted cost of goods sold.....	\$250,000

- 3.

Mason Company
Income Statement

Sales		\$524,000
Cost of goods sold (\$260,000 – \$10,000).....		<u>250,000</u>
Gross margin.....		274,000
Selling and administrative expenses:		
Selling expenses	\$140,000	
Administrative expense	<u>63,000</u>	<u>203,000</u>
Net operating income		<u>\$ 71,000</u>

Exercise 3-12 (15 minutes)

1. Actual manufacturing overhead costs		\$473,000
Manufacturing overhead cost applied:		
19,400 MH × \$25 per MH.....		<u>485,000</u>
Overapplied overhead cost.....		<u>\$ 12,000</u>
2. Direct materials:		
Raw materials inventory, beginning	\$ 20,000	
Add purchases of raw materials	<u>400,000</u>	
Raw materials available for use	420,000	
Deduct raw materials inventory, ending ..	<u>30,000</u>	
Raw materials used in production	390,000	
Less indirect materials.....	<u>15,000</u>	\$375,000
Direct labor		60,000
Manufacturing overhead cost applied to		
work in process		<u>485,000</u>
Total manufacturing costs.....		920,000
Add: Work in process, beginning		<u>40,000</u>
		960,000
Deduct: Work in process, ending.....		<u>70,000</u>
Cost of goods manufactured		<u>\$890,000</u>

Exercise 3-13 (30 minutes)

Note to the instructor: This exercise is a good vehicle for introducing the concept of predetermined overhead rates. This exercise can also be used as a launching pad for a discussion of Appendix 3B.

1.	<i>Units Produced</i>	<i>Manufacturing Overhead</i>
High activity level (First quarter) ...	80,000	\$300,000
Low activity level (Third quarter)...	<u>20,000</u>	<u>180,000</u>
Change.....	<u>60,000</u>	<u>\$120,000</u>

Variable cost = Change in cost ÷ Change in activity
 = \$120,000 ÷ 60,000 units
 = \$2.00 per unit produced

Total overhead cost (First quarter)	\$300,000
Variable cost element (\$2.00 per unit × 80,000 units) .	<u>160,000</u>
Fixed cost element	<u>\$140,000</u>

These fixed and variable cost estimates can be used to estimate the total manufacturing overhead cost for the fourth quarter as follows:

$$Y = \$140,000 + (\$2.00 \text{ per unit})(60,000 \text{ units})$$

Estimated fixed manufacturing overhead	\$140,000
Estimated variable manufacturing overhead	
\$2.00 per unit × 60,000 units.....	<u>120,000</u>
Estimated total manufacturing overhead cost.....	<u>\$260,000</u>

Total manufacturing cost and unit product cost:

Direct materials.....	\$180,000
Direct labor	96,000
Manufacturing overhead	<u>260,000</u>
Total manufacturing costs.....	<u>\$536,000</u>
÷ Number of units to be produced	60,000
= Unit product cost (rounded)	<u>\$8.93</u>

Exercise 3-13 (continued)

2. The fixed portion of the manufacturing overhead cost is causing the unit product costs to fluctuate. The unit product cost increases as the level of production decreases because the fixed overhead is spread over fewer units.
3. The unit product cost can be stabilized by using a predetermined overhead rate that is based on expected activity for the entire year. The cost formula created in requirement 1 can be adapted to compute the annual predetermined overhead rate. The annual fixed manufacturing overhead is \$560,000 (\$140,000 per quarter × 4 quarters). The variable manufacturing overhead per unit is \$2.00. The cost formula is as follows:

$$Y = \$560,000 + \$2.00 \text{ per unit} \times 200,000 \text{ units}$$

Estimated fixed manufacturing overhead	\$560,000
Estimated variable manufacturing overhead	
\$2.00 per unit × 200,000 units	<u>400,000</u>
Estimated total manufacturing overhead cost	<u>\$960,000</u>

The annual predetermined overhead rate is computed as follows:

Estimated total manufacturing overhead	\$960,000
÷ Estimated total units produced	200,000
= Predetermined overhead rate	\$4.80 per unit

Using a predetermined overhead rate of \$4.80 per unit, the unit product costs would stabilize as shown below:

	<i>Quarter</i>			
	<i>First</i>	<i>Second</i>	<i>Third</i>	<i>Fourth</i>
Direct materials	\$240,000	\$120,000	\$ 60,000	\$180,000
Direct labor	128,000	64,000	32,000	96,000
Manufacturing overhead:				
at \$4.80 per unit,	<u>384,000</u>	<u>192,000</u>	<u>96,000</u>	<u>288,000</u>
Total cost	<u>\$752,000</u>	<u>\$376,000</u>	<u>\$188,000</u>	<u>\$564,000</u>
Number of units produced .	80,000	40,000	20,000	60,000
Unit product cost	<u>\$9.40</u>	<u>\$9.40</u>	<u>\$9.40</u>	<u>\$9.40</u>

Exercise 3-14 (20 minutes)

1. The estimated total manufacturing overhead cost is computed as follows:

$$Y = \$650,000 + (\$3.00 \text{ per MH})(100,000 \text{ MHs})$$

Estimated fixed manufacturing overhead	\$650,000
Estimated variable manufacturing overhead: \$3.00 per MH × 100,000 MHs	<u>300,000</u>
Estimated total manufacturing overhead cost	<u>\$950,000</u>

The predetermined overhead rate is computed as follows:

Estimated total manufacturing overhead	\$950,000	
÷ Estimated total machine-hours (MHs)	<u>100,000</u>	MHs
= Predetermined overhead rate	<u>\$9.50</u>	per MH

2. Total manufacturing cost assigned to Job 400:

Direct materials	\$ 450
Direct labor	210
Manufacturing overhead applied (\$9.50 per MH × 40 MHs)	<u>380</u>
Total manufacturing cost	<u>\$1,040</u>

3. Computing underapplied/overapplied overhead:

Actual manufacturing overhead (a)	<u>\$1,350,000</u>
Actual machine-hours	146,000
× Predetermined overhead rate	<u>\$9.50</u>
= Manufacturing overhead applied (b)	<u>\$1,387,000</u>
Overapplied overhead (a) – (b)	<u>\$ (37,000)</u>

The closing entry would decrease cost of goods sold by \$37,000 and increase net operating income by \$37,000.

Exercise 3-15 (15 minutes)

1. Cutting Department:

The estimated total manufacturing overhead cost in the Cutting Department is computed as follows:

$$Y = \$264,000 + (\$2.00 \text{ per MH})(48,000 \text{ MH})$$

Estimated fixed manufacturing overhead	\$264,000
Estimated variable manufacturing overhead	
\$2.00 per MH × 48,000 MHs	<u>96,000</u>
Estimated total manufacturing overhead cost	<u>\$360,000</u>

The predetermined overhead rate is computed as follows:

Estimated total manufacturing overhead	\$360,000
÷ Estimated total machine-hours	48,000 MHs
= Predetermined overhead rate	\$7.50 per MH

Finishing Department:

The estimated total manufacturing overhead cost in the Finishing Department is computed as follows:

$$Y = \$366,000 + (\$4.00 \text{ per DLH})(30,000 \text{ DLH})$$

Estimated fixed manufacturing overhead	\$366,000
Estimated variable manufacturing overhead	
\$4.00 per DLH × 30,000 DLHs	<u>120,000</u>
Estimated total manufacturing overhead cost	<u>\$486,000</u>

The predetermined overhead rate is computed as follows:

Estimated total manufacturing overhead	\$486,000
÷ Estimated total direct labor-hours	30,000 DLHs
= Predetermined overhead rate	\$16.20 per DLH

Exercise 3-15 (continued)

2. Total manufacturing cost assigned to Job 203:

Direct materials (\$500 + \$310).....		\$810
Direct labor (\$70 + \$150).....		220
Cutting Department (80 MHs × \$7.50 per MH) ..	\$600	
Finishing Department (20 DLH × \$16.20 per DLH).....	<u>324</u>	<u>924</u>
Total manufacturing cost.....		<u>\$1,954</u>

3. Yes; if some jobs require a large amount of machine time and a small amount of labor time, they would be charged substantially less overhead cost if a plantwide rate based on direct labor hours were used. It appears, for example, that this would be true of Job 203 which required considerable machine time to complete, but required a relatively small amount of labor hours.

Exercise 3-16 (15 minutes)

1. Item (a): Actual manufacturing overhead costs incurred for the year.
Item (b): Overhead cost applied to work in process for the year.
Item (c): Cost of goods manufactured for the year.
Item (d): Cost of goods sold for the year.

2. Cost of Goods Sold	70,000	
Manufacturing Overhead		70,000

3. The underapplied overhead will be allocated to the other accounts on the basis of the amount of overhead applied during the year in the ending balance of each account:

Work in Process.....	\$ 19,500	5 %
Finished Goods.....	58,500	15
Cost of Goods Sold	<u>312,000</u>	<u>80</u>
Total cost.....	<u>\$390,000</u>	<u>100 %</u>

Using these percentages, the journal entry would be as follows:

Work in Process (5% × \$70,000)	3,500	
Finished Goods (15% × \$70,000).....	10,500	
Cost of Goods Sold (80% × \$70,000)	56,000	
Manufacturing Overhead.....		70,000

Exercise 3-17 (45 minutes)

- 1a. The estimated total manufacturing overhead cost is computed as follows:

$$Y = \$910,000 + (\$3.00 \text{ per MH})(50,000 \text{ MHs})$$

Estimated fixed manufacturing overhead.....	\$ 910,000
Estimated variable manufacturing overhead: \$3.00 per MH × 50,000 MHs	<u>150,000</u>
Estimated total manufacturing overhead cost	<u>\$1,060,000</u>

The predetermined overhead rate is computed as follows:

Estimated total manufacturing overhead	\$1,060,000
÷ Estimated total machine-hours (MHs).....	<u>50,000</u> MHs
= Predetermined overhead rate.....	<u>\$21.20</u> per MH

- 1b. Total manufacturing cost assigned to Jobs D-70 and C-200:

	<i>D-70</i>	<i>C-200</i>
Direct materials	\$700,000	\$550,000
Direct labor	360,000	400,000
Manufacturing overhead applied (\$21.20 per MH × 20,000 MHs; \$21.20 per MH × 30,000 MHs)	<u>424,000</u>	<u>636,000</u>
Total manufacturing cost	<u>\$1,484,000</u>	<u>\$1,586,000</u>

- 1c. Bid prices for Jobs D-70 and C-200:

	<i>D-75</i>	<i>C-200</i>
Total manufacturing cost	\$1,484,000	\$1,586,000
× Markup percentage (150%)	<u>150%</u>	<u>150%</u>
= Bid price	<u>\$2,226,000</u>	<u>\$2,379,000</u>

- 1d. Because the company has no beginning or ending inventories and only Jobs D-70 and C-200 were started, completed, and sold during the year, the cost of goods sold is equal to the sum of the manufacturing costs assigned to both jobs of \$3,070,000 (= \$1,484,000 + \$1,586,000).

Exercise 3-17 (continued)

2a. Molding Department:

The estimated total manufacturing overhead cost in the Molding Department is computed as follows:

$$Y = \$700,000 + (\$3.00 \text{ per MH})(20,000 \text{ MH})$$

Estimated fixed manufacturing overhead	\$700,000
Estimated variable manufacturing overhead: \$3.00 per MH × 20,000 MHs	<u>60,000</u>
Estimated total manufacturing overhead cost	<u>\$760,000</u>

The predetermined overhead rate is computed as follows:

Estimated total manufacturing overhead	\$760,000
÷ Estimated total machine-hours	<u>20,000</u> MHs
= Predetermined overhead rate	<u>\$38.00</u> per MH

Fabrication Department:

The estimated total manufacturing overhead cost in the Fabrication Department is computed as follows:

$$Y = \$210,000 + (\$3.00 \text{ per MH})(30,000 \text{ MH})$$

Estimated fixed manufacturing overhead	\$210,000
Estimated variable manufacturing overhead: \$3.00 per MH × 30,000 MHs	<u>90,000</u>
Estimated total manufacturing overhead cost	<u>\$300,000</u>

The predetermined overhead rate is computed as follows:

Estimated total manufacturing overhead	\$300,000
÷ Estimated total direct labor-hours	<u>30,000</u> MHs
= Predetermined overhead rate	<u>\$10.00</u> per MH

Exercise 3-17 (continued)

2b. Total manufacturing costs assigned to Jobs D-70 and C-200:

	<i>D-70</i>	<i>C-200</i>
Direct materials	\$700,000	\$550,000
Direct labor	360,000	400,000
Molding Department (14,000 MHs × \$38 per MH; 6,000 MHs × \$38 per MH)	532,000	228,000
Fabrication Department (6,000 MH × \$10 per MH; 24,000 MH × \$10 per MH)	<u>60,000</u>	<u>240,000</u>
Total manufacturing cost	<u>\$1,652,000</u>	<u>\$1,418,000</u>

2c. Bid prices for Jobs D-70 and C-200:

	<i>D-70</i>	<i>C-200</i>
Total manufacturing cost	\$1,652,000	\$1,418,000
× Markup percentage (150%)	<u>150%</u>	<u>150%</u>
= Bid price	<u>\$2,478,000</u>	<u>\$2,127,000</u>

2d. Because the company has no beginning or ending inventories and only Jobs D-70 and C-200 were started, completed, and sold during the year, the cost of goods sold is equal to the sum of the manufacturing costs assigned to both jobs of \$3,070,000 (= \$1,652,000 + \$1,418,000).

3. The plantwide and departmental approaches for applying manufacturing overhead costs to products produce identical cost of goods sold figures. However, these two approaches lead to different bid prices for Jobs D-70 and C-200. The bid price for Job D-70 using the departmental approach is \$252,000 higher than the bid price using the plantwide approach. This is because the departmental cost pools reflect the fact that Job D-70 is an intensive user of Molding machine-hours. The overhead rate in Molding (\$38) is much higher than the overhead rate in Fabrication (\$10). Conversely, Job C-200 is an intensive user of the less-expensive Fabrication machine-hours, so its departmental bid price is \$252,000 lower than the plantwide bid price.

Exercise 3-17 (continued)

Whether a job-order costing system has only one plantwide overhead cost pool or numerous departmental overhead cost pools does not usually have an important impact on the accuracy of the cost of goods sold reported for the company as a whole. However, it can have a huge impact on internal decisions with respect to individual jobs, such as establishing bid prices for those jobs. Job-order costing systems that rely on one plantwide overhead cost pool are commonly used to value ending inventories and cost of goods sold for external reporting purposes, but they can create costing inaccuracies for individual jobs that adversely influence internal decision making.

Exercise 3-18 (30 minutes)

1. The predetermined overhead rate is computed as follows:

$$Y = \$128,000 + \$0.80 \text{ per MH} \times 80,000 \text{ MHs}$$

Estimated fixed manufacturing overhead	\$128,000
Estimated variable manufacturing overhead	
\$0.80 per MH × 80,000 MHs	<u>64,000</u>
Estimated total manufacturing overhead cost	<u>\$192,000</u>

The predetermined overhead rate is computed as follows:

Estimated total manufacturing overhead	\$192,000
÷ Estimated total machine-hours	80,000 MHs
= Predetermined overhead rate	\$2.40 per MH

2. The amount of overhead cost applied to Work in Process for the year would be: 75,000 machine-hours × \$2.40 per machine-hour = \$180,000. This amount is shown in entry (a) below:

Manufacturing Overhead		
Maintenance	21,000	(a) 180,000
Indirect materials	8,000	
Indirect labor	60,000	
Utilities	32,000	
Insurance	7,000	
Depreciation	56,000	
Balance	4,000	

Work in Process		
Direct materials	710,000	
Direct labor	90,000	
Overhead (a)	180,000	

3. Overhead is underapplied by \$4,000 for the year, as shown in the Manufacturing Overhead account above. The entry to close out this balance to Cost of Goods Sold would be:

Cost of Goods Sold	4,000	
Manufacturing Overhead		4,000

Exercise 3-18 (continued)

4. When overhead is applied using a predetermined rate based on machine-hours, it is assumed that overhead cost is proportional to machine-hours. When the actual machine-hours turn out to be 75,000, the costing system assumes that the overhead will be 75,000 machine-hours \times \$2.40 per machine-hour, or \$180,000. This is a drop of \$12,000 from the initial estimated manufacturing overhead cost of \$192,000. However, the actual manufacturing overhead did not drop by this much. The actual manufacturing overhead was \$184,000—a drop of \$8,000 from the estimate. The manufacturing overhead did not decline by the full \$12,000 because of the existence of fixed costs and/or because overhead spending was not under control. These issues will be covered in more detail in later chapters.

Exercise 3-19 (20 minutes)

1. Because \$120,000 of studio overhead was applied to Work in Process on the basis of \$75,000 of direct staff costs, the predetermined overhead rate was 160%:

$$\frac{\text{Studio overhead applied}}{\text{Direct staff costs incurred}} = \frac{\$120,000}{\$75,000} = 160\% \text{ rate}$$

2. The Lexington Gardens Project is the only job remaining in Work in Process at the end of the month; therefore, the entire \$35,000 balance in the Work in Process account at that point must apply to it. Recognizing that the predetermined overhead rate is 160% of direct staff costs, the following computation can be made:

Total cost in the Lexington Gardens Project		\$35,000
Less: Direct staff costs.....	\$ 6,500	
Studio overhead cost (\$6,500 × 160%)..	<u>10,400</u>	<u>16,900</u>
Costs of subcontracted work		<u>\$18,100</u>

With this information, we can now complete the job cost sheet for the Lexington Gardens Project:

Costs of subcontracted work	\$18,100
Direct staff costs	6,500
Studio overhead	<u>10,400</u>
Total cost to January 31	<u>\$35,000</u>

Exercise 3-20 (30 minutes)

1. a.	Raw Materials.....	325,000	
	Accounts Payable.....		325,000
b.	Work in Process.....	232,000	
	Manufacturing Overhead	58,000	
	Raw Materials.....		290,000
c.	Work in Process.....	60,000	
	Manufacturing Overhead	120,000	
	Wages and Salaries Payable		180,000
d.	Manufacturing Overhead	75,000	
	Accumulated Depreciation		75,000
e.	Manufacturing Overhead	62,000	
	Accounts Payable.....		62,000
f.	Work in Process.....	300,000	
	Manufacturing Overhead		300,000

$$\begin{aligned} \text{Predetermined overhead rate} &= \frac{\text{Estimated total manufacturing overhead cost}}{\text{Estimated total amount of the allocation base}} \\ &= \frac{\$4,800,000}{240,000 \text{ MHs}} = \$20 \text{ per MH} \end{aligned}$$

$$15,000 \text{ MH} \times \$20 \text{ per MH} = \$300,000$$

Manufacturing Overhead		Work in Process	
(b)	58,000	(b)	232,000
(c)	120,000	(c)	60,000
(d)	75,000	(f)	300,000
(e)	62,000		
(f)	300,000		

3. The cost of the completed job is \$592,000 as shown in the Work in Process T-account above. The journal entry is:

Finished Goods.....	592,000	
Work in Process		592,000

4. The unit product cost on the job cost sheet would be:

$$\$592,000 \div 16,000 \text{ units} = \$37 \text{ per unit}$$

Problem 3-21 (45 minutes)

1. The cost of raw materials put into production was:

Raw materials inventory, 1/1.....	\$ 15,000
Debits (purchases of materials)	<u>120,000</u>
Materials available for use.....	135,000
Raw materials inventory, 12/31	<u>25,000</u>
Materials requisitioned for production	<u>\$110,000</u>

2. Of the \$110,000 in materials requisitioned for production, \$90,000 was debited to Work in Process as direct materials. Therefore, the difference of \$20,000 was debited to Manufacturing Overhead as indirect materials.

3. Total factory wages accrued during the year (credits to the Factory Wages Payable account)..... \$180,000
Less direct labor cost (from Work in Process)..... 150,000
Indirect labor cost \$ 30,000

4. The cost of goods manufactured was \$470,000—the credits to the Work in Process account.

5. The Cost of Goods Sold for the year was:

Finished goods inventory, 1/1	\$ 40,000
Add: Cost of goods manufactured (from Work in Process) ..	<u>470,000</u>
Goods available for sale	510,000
Finished goods inventory, 12/31	<u>60,000</u>
Cost of goods sold	<u>\$450,000</u>

6. The predetermined overhead rate was:

$$\begin{aligned}\text{Predetermined overhead rate} &= \frac{\text{Estimated total manufacturing overhead cost}}{\text{Estimated total amount of the allocation base}} \\ &= \frac{\$240,000}{\$150,000 \text{ direct labor cost}} = 160\% \text{ of direct labor cost}\end{aligned}$$

Problem 3-21 (continued)

7. Manufacturing overhead was overapplied by \$10,000, computed as follows:

Actual manufacturing overhead cost for the year (debits) .	\$230,000
Applied manufacturing overhead cost (see Work in Process—this would have been the credits to the Manufacturing Overhead account)	<u>240,000</u>
Overapplied overhead	<u><u>\$(10,000)</u></u>

8. The ending balance in Work in Process is \$30,000. Direct materials make up \$9,200 of this balance, and manufacturing overhead makes up \$12,800. The computations are:

Balance, Work in Process, 12/31	\$30,000
Less: Direct labor cost (given)	(8,000)
Manufacturing overhead cost ($\$8,000 \times 160\%$)	<u>(12,800)</u>
Direct materials cost (remainder)	<u><u>\$ 9,200</u></u>

Problem 3-22 (30 minutes)

1. The predetermined overhead rate was:

$$Y = \$795,000 + \$1.40 \text{ per hour} \times 75,000 \text{ hours}$$

Estimated fixed manufacturing overhead	\$795,000
Estimated variable manufacturing overhead	
\$1.40 per computer hour \times 75,000 hours.....	<u>105,000</u>
Estimated total manufacturing overhead cost.....	<u>\$900,000</u>

The predetermined overhead rate is computed as follows:

Estimated total manufacturing overhead.....	\$900,000
\div Estimated total computer hours.....	75,000 hours
= Predetermined overhead rate	\$12.00 per hour

2. Actual manufacturing overhead cost..... \$850,000
- Manufacturing overhead cost applied to Work in Process during the year: 60,000 actual MHs \times \$12 per MH
- | | |
|---------------------------------|------------------|
| | <u>720,000</u> |
| Underapplied overhead cost..... | <u>\$130,000</u> |
3. Cost of Goods Sold 130,000
- Manufacturing Overhead 130,000

4. The underapplied balance would be allocated using the following percentages:

Overhead applied during the year in:

Work in process.....	\$ 36,000	5 %
Finished goods.....	180,000	25 %
Cost of goods sold	<u>504,000</u>	<u>70 %</u>
Total.....	<u>\$720,000</u>	<u>100 %</u>

The entry to record the allocation of the underapplied overhead would be:

Work in Process (5% \times \$130,000).....	6,500	
Finished Goods (25% \times \$130,000).....	32,500	
Cost of Goods Sold (70% \times \$130,000)	91,000	
Manufacturing Overhead		130,000

Problem 3-22 (continued)

5. Comparing the two methods:

Cost of goods sold if the underapplied overhead is closed directly to cost of goods sold (\$1,400,000 + \$130,000)	\$1,530,000
Cost of goods sold if the underapplied overhead is allocated among the accounts (\$1,400,000 + \$91,000)	<u>1,491,000</u>
Difference in cost of goods sold	<u>\$ 39,000</u>

Thus, net operating income will be \$39,000 greater if the underapplied overhead is allocated rather than closed directly to cost of goods sold.

Problem 3-23 (30 minutes)

Schedule of cost of goods manufactured:

Direct materials:		
Raw materials inventory, beginning*	\$ 40,000	
Add: Purchases of raw materials*	<u>290,000</u>	
Raw materials available for use	330,000	
Deduct: Raw materials inventory, ending*	<u>10,000</u>	
Raw materials used in production		\$320,000
Direct labor		78,000
Manufacturing overhead applied*	<u>285,000</u>	
Total manufacturing costs*		683,000
Add: Work in process inventory, beginning		<u>42,000</u>
		725,000
Deduct: Work in process inventory, ending*		<u>35,000</u>
Cost of goods manufactured		<u>\$690,000</u>

Schedule of cost of goods sold:

Finished goods inventory, beginning*	\$ 50,000
Add: Cost of goods manufactured	<u>690,000</u>
Cost of goods available for sale*	740,000
Deduct: Finished goods inventory, ending	<u>80,000</u>
Unadjusted cost of goods sold*	660,000
Deduct: Overapplied overhead	<u>15,000</u>
Adjusted cost of goods sold	<u>\$645,000</u>

Income statement:

Sales	\$915,000
Cost of goods sold (\$660,000 – \$15,000)	<u>645,000</u>
Gross margin	270,000
Selling and administrative expenses:	
Selling expenses*	\$140,000
Administrative expense*	<u>100,000</u>
	240,000
Net operating income*	<u>\$ 30,000</u>

* Given in the problem

Problem 3-24 (30 minutes)

1. Molding Department:

The estimated total manufacturing overhead cost in the Molding Department is computed as follows:

$$Y = \$497,000 + \$1.50 \text{ per MH} \times 70,000 \text{ MH}$$

Estimated fixed manufacturing overhead	\$497,000
Estimated variable manufacturing overhead:	
\$1.50 per MH × 70,000 MHs	<u>105,000</u>
Estimated total manufacturing overhead cost	<u>\$602,000</u>

The predetermined overhead rate is computed as follows:

Estimated total manufacturing overhead	\$602,000
÷ Estimated total machine-hours	70,000 MHs
= Predetermined overhead rate	\$8.60 per MH

Painting Department:

The estimated total manufacturing overhead cost in the Painting Department is computed as follows:

$$Y = \$615,000 + \$2.00 \text{ per DLH} \times 60,000 \text{ DLH}$$

Estimated fixed manufacturing overhead	\$615,000
Estimated variable manufacturing overhead:	
\$2.00 per DLH × 60,000 DLHs	<u>120,000</u>
Estimated total manufacturing overhead cost	<u>\$735,000</u>

The predetermined overhead rate is computed as follows:

Estimated total manufacturing overhead	\$735,000
÷ Estimated total DLHs	60,000 DLHs
= Predetermined overhead rate	\$12.25 per DLH

Problem 3-24 (continued)

2. Molding Department overhead applied:

110 machine-hours × \$8.60 per machine-hour	\$ 946
Painting Department overhead applied:	
84 direct labor-hours × \$12.25 per DLH	<u>1,029</u>
Total overhead cost.....	<u>\$1,975</u>

3. Total cost of Job 205:

	<i>Molding Dept.</i>	<i>Painting Dept.</i>	<i>Total</i>
Direct materials	\$ 470	\$ 332	\$ 802
Direct labor	325	588	913
Manufacturing overhead applied..	<u>946</u>	<u>1,029</u>	<u>1,975</u>
Total cost.....	<u>\$1,741</u>	<u>\$1,949</u>	<u>\$3,690</u>

Unit product cost for Job 205:

Total manufacturing cost	\$3,690
÷ Number of units in the job.....	50 units
= Unit product cost	\$73.80 per unit

	<i>Molding Dept.</i>	<i>Painting Dept.</i>
Manufacturing overhead incurred	\$570,000	\$750,000
Manufacturing overhead applied:		
65,000 MHs × \$8.60 per MH	<u>559,000</u>	
62,000 direct labor-hours × \$12.25 per direct labor-hour		<u>759,500</u>
Underapplied (or overapplied) overhead ..	<u>\$ 11,000</u>	<u>\$ (9,500)</u>

Problem 3-25 (60 minutes)

1. a.

$$\begin{aligned}\text{Predetermined overhead rate} &= \frac{\text{Estimated total manufacturing overhead cost}}{\text{Estimated total amount of the allocation base}} \\ &= \frac{\$800,000}{\$500,000 \text{ direct materials cost}} = 160\%\end{aligned}$$

- b. Before the underapplied or overapplied overhead can be computed, we must determine the amount of direct materials used in production for the year.

Raw materials inventory, beginning	\$ 20,000
Add, Purchases of raw materials.....	<u>510,000</u>
Raw materials available.....	530,000
Deduct: Raw materials inventory, ending	<u>80,000</u>
Raw materials used in production	<u>\$450,000</u>

Actual manufacturing overhead costs:

Indirect labor.....	\$170,000
Property taxes	48,000
Depreciation of equipment.....	260,000
Maintenance.....	95,000
Insurance	7,000
Rent, building	<u>180,000</u>
Total actual costs	760,000

Applied manufacturing overhead costs:

\$450,000 × 160%.....	<u>720,000</u>
Underapplied overhead	<u>\$ 40,000</u>

Problem 3-25 (continued)

2. Gitano Products
Schedule of Cost of Goods Manufactured

Direct materials:		
Raw materials inventory, beginning	\$ 20,000	
Add purchases of raw materials.....	<u>510,000</u>	
Total raw materials available	530,000	
Deduct raw materials inventory, ending	<u>80,000</u>	
Raw materials used in production.....		\$ 450,000
Direct labor.....		90,000
Manufacturing overhead applied to work in process.....		<u>720,000</u>
Total manufacturing costs		1,260,000
Add: Work in process, beginning.....		<u>150,000</u>
		1,410,000
Deduct: Work in process, ending		<u>70,000</u>
Cost of goods manufactured		<u><u>\$1,340,000</u></u>

3. Unadjusted cost of goods sold:	
Finished goods inventory, beginning	\$ 260,000
Add: Cost of goods manufactured	<u>1,340,000</u>
Goods available for sale	1,600,000
Deduct: Finished goods inventory, ending	<u>400,000</u>
Unadjusted cost of goods sold	<u><u>\$1,200,000</u></u>

The underapplied overhead can either be closed out to Cost of Goods Sold or allocated between Work in Process, Finished Goods, and Cost of Goods Sold based on the overhead applied during the year in the ending balance in each of these accounts.

4. Direct materials.....	\$ 8,500
Direct labor.....	2,700
Overhead applied (\$8,500 × 160%)	<u>13,600</u>
Total manufacturing cost	<u><u>\$24,800</u></u>

$\$24,800 \times 125\% = \$31,000$ price to the customer

Problem 3-25 (continued)

5. The amount of overhead cost in Work in Process was:

$$\text{\$24,000 direct materials cost} \times 160\% = \text{\$38,400}$$

The amount of direct labor cost in Work in Process is:

Total ending work in process.....		\$70,000
Deduct: Direct materials	\$24,000	
Manufacturing overhead.....	<u>38,400</u>	<u>62,400</u>
Direct labor cost.....		<u>\$ 7,600</u>

The completed schedule of costs in Work in Process was:

Direct materials.....	\$24,000
Direct labor	7,600
Manufacturing overhead	<u>38,400</u>
Work in process inventory.....	<u>\$70,000</u>

Problem 3-26 (120 minutes)

1. a.	Raw Materials.....	200,000	
	Accounts Payable		200,000
b.	Work in Process.....	185,000	
	Raw Materials.....		185,000
c.	Manufacturing Overhead	63,000	
	Utilities Expense	7,000	
	Accounts Payable		70,000
d.	Work in Process.....	230,000	
	Manufacturing Overhead	90,000	
	Salaries Expense.....	110,000	
	Salaries and Wages Payable		430,000
e.	Manufacturing Overhead	54,000	
	Accounts Payable		54,000
f.	Advertising Expense.....	136,000	
	Accounts Payable		136,000
g.	Manufacturing Overhead	76,000	
	Depreciation Expense.....	19,000	
	Accumulated Depreciation.....		95,000
h.	Manufacturing Overhead	102,000	
	Rent Expense	18,000	
	Accounts Payable		120,000
i.	Work in Process.....	390,000	
	Manufacturing Overhead.....		390,000

$$\text{Predetermined overhead rate} = \frac{\text{Estimated total manufacturing overhead cost}}{\text{Estimated total amount of the allocation base}}$$

$$= \frac{\$360,000}{900 \text{ DLHs}} = \$400 \text{ per DLH}$$

$$975 \text{ actual DLH} \times \$400 \text{ per DLH} = \$390,000$$

Problem 3-26 (continued)

j. Finished Goods	770,000	
Work in Process		770,000
k. Accounts Receivable	1,200,000	
Sales		1,200,000
Cost of Goods Sold	800,000	
Finished Goods		800,000

Problem 3-26 (continued)

2.

Accounts Receivable		
(k)	1,200,000	
Raw Materials		
Bal.	30,000	185,000
(a)	200,000	(b)
Bal.	45,000	
Work in Process		
Bal.	21,000	(j) 770,000
(b)	185,000	
(d)	230,000	
(i)	390,000	
Bal.	56,000	
Finished Goods		
Bal.	60,000	(k) 800,000
(j)	770,000	
Bal.	30,000	
Accumulated Depreciation		
	(g)	95,000
Accounts Payable		
	(a)	200,000
	(c)	70,000
	(e)	54,000
	(f)	136,000
	(h)	120,000
Salaries & Wages Payable		
	(d)	430,000
Sales		
	(k)	1,200,000
Cost of Goods Sold		
(k)	800,000	
Manufacturing Overhead		
(c)	63,000	(i) 390,000
(d)	90,000	
(e)	54,000	
(g)	76,000	
(h)	102,000	
	Bal.	5,000
Advertising Expense		
(f)	136,000	
Utilities Expense		
(c)	7,000	
Salaries Expense		
(d)	110,000	
Depreciation Expense		
(g)	19,000	
Rent Expense		
(h)	18,000	

Problem 3-26 (continued)3. Froya Fabrikker A/S
Schedule of Cost of Goods Manufactured

Direct materials:

Raw materials inventory, beginning	\$ 30,000	
Purchases of raw materials.....	<u>200,000</u>	
Materials available for use	230,000	
Raw materials inventory, ending	<u>45,000</u>	
Materials used in production		\$185,000
Direct labor		230,000
Manufacturing overhead applied to work in process		<u>390,000</u>
Total manufacturing costs.....		805,000
Add: Work in process, beginning		<u>21,000</u>
		826,000
Deduct: Work in process, ending		<u>56,000</u>
Cost of goods manufactured		<u>\$770,000</u>

4. Manufacturing Overhead.....	5,000	
Cost of Goods Sold		5,000

Schedule of cost of goods sold:

Finished goods inventory, beginning	\$ 60,000
Add: Cost of goods manufactured	<u>770,000</u>
Goods available for sale	830,000
Deduct finished goods inventory, ending	<u>30,000</u>
Unadjusted cost of goods sold	800,000
Deduct: Overapplied overhead.....	<u>5,000</u>
Adjusted cost of goods sold	<u>\$795,000</u>

Problem 3-26 (continued)

5.	Froya Fabrikker A/S	
	Income Statement	
	Sales	\$1,200,000
	Cost of goods sold	<u>795,000</u>
	Gross margin	405,000
	Selling and administrative expenses:	
	Advertising expense	\$136,000
	Utilities expense	7,000
	Salaries expense	110,000
	Depreciation expense	19,000
	Rent expense	<u>18,000</u>
	Net operating income	<u>290,000</u>
		<u>\$ 115,000</u>
6.	Direct materials	\$ 8,000
	Direct labor	9,200
	Manufacturing overhead applied	
	(39 hours × \$400 per hour)	<u>15,600</u>
	Total manufacturing cost	32,800
	Add markup (60% × \$32,800)	<u>19,680</u>
	Total billed price of Job 412	<u>\$52,480</u>
	\$52,480 ÷ 4 units = \$13,120 per unit	

Problem 3-27 (60 minutes)

1. a. Raw Materials.....	275,000	
Cash		275,000
b. Work in Process.....	220,000	
Manufacturing Overhead	60,000	
Raw Materials.....		280,000
c. Work in Process.....	180,000	
Manufacturing Overhead	72,000	
Sales Commissions Expense	63,000	
Salaries Expense.....	90,000	
Cash		405,000
d. Manufacturing Overhead	13,000	
Rent Expense	5,000	
Cash		18,000
e. Manufacturing Overhead	57,000	
Cash		57,000
f. Advertising Expense.....	140,000	
Cash		140,000
g. Manufacturing Overhead	88,000	
Depreciation Expense.....	12,000	
Accumulated Depreciation.....		100,000
h. Work in Process.....	297,000	
Manufacturing Overhead		297,000

$$\text{Predetermined overhead rate} = \frac{\text{Estimated total manufacturing overhead cost}}{\text{Estimated total amount of the allocation base}}$$

$$= \frac{\$330,000}{\$200,000 \text{ direct labor cost}} = 165\% \text{ of direct labor cost}$$

$$\$180,000 \text{ actual direct labor cost} \times 165\% = \$297,000$$

Problem 3-27 (continued)

i. Finished Goods	675,000	
Work in Process		675,000
j. Cash.....	1,250,000	
Sales.....		1,250,000
Cost of Goods Sold.....	700,000	
Finished Goods		700,000

2.

Raw Materials			Work in Process		
Bal.	25,000	(b) 280,000	Bal.	10,000	(i) 675,000
(a)	275,000		(b)	220,000	
Bal.	20,000		(c)	180,000	
			(h)	297,000	
			Bal.	32,000	
Finished Goods			Manufacturing Overhead		
Bal.	40,000	(j) 700,000	(b)	60,000	(h) 297,000
(i)	675,000		(c)	72,000	
Bal.	15,000		(d)	13,000	
			(e)	57,000	
			(g)	88,000	
					Bal. 7,000
Cost of Goods Sold					
(j)	700,000				

3. Manufacturing overhead is overapplied by \$7,000 for the year. The entry to close this balance to Cost of Goods Sold would be:

Manufacturing Overhead.....	7,000	
Cost of Goods Sold		7,000

Problem 3-27 (continued)

4.

Gold Nest Company
Income Statement

Sales		\$1,250,000
Cost of goods sold		
(\$700,000 - \$7,000)		<u>693,000</u>
Gross margin		557,000
Selling and administrative expenses:		
Sales commissions	\$63,000	
Administrative salaries	90,000	
Rent expense	5,000	
Advertising expense	140,000	
Depreciation expense	<u>12,000</u>	<u>310,000</u>
Net operating income		<u>\$ 247,000</u>

Problem 3-28 (60 minutes)

1. and 2.

Cash			
Bal.	63,000	(m)	785,000
(l)	850,000		
Bal.	128,000		

Accounts Receivable			
Bal.	102,000	(l)	850,000
(k)	925,000		
Bal.	177,000		

Raw Materials			
Bal.	30,000	(b)	200,000
(a)	185,000		
Bal.	15,000		

Prepaid Insurance			
Bal.	9,000	(g)	7,000
Bal.	2,000		

Videos in Process			
Bal.	45,000	(j)	550,000
(b)	170,000		
(f)	82,000		
(i)	290,000		
Bal.	37,000		

Finished Goods			
Bal.	81,000	(k)	600,000
(j)	550,000		
Bal.	31,000		

Studio and Equipment			
Bal.	730,000		

Accumulated Depreciation			
	Bal.	210,000	
	(d)	84,000	
	Bal.	294,000	

Studio Overhead			
(b)	30,000	* (i)	290,000
(c)	72,000		
(d)	63,000		
(f)	110,000		
(g)	5,600		
(n)	9,400	Bal.	9,400

Depreciation Expense			
(d)	21,000		

Insurance Expense			
(g)	1,400		

* $\$280,000 \div 7,000 \text{ hours} = \$40 \text{ per hour};$
 $7,250 \text{ hours} \times \$40 \text{ per hour} = \$290,000$

Advertising Expense			
(e)	130,000		

Miscellaneous Expense			
(h)	8,600		

Problem 3-28 (continued)

Administrative Salaries Expense		Sales	
(f)	95,000		(k) 925,000
Cost of Goods Sold		Accounts Payable	
(k)	600,000	(n)	9,400
Bal.	590,600	(m)	500,000
		Bal.	160,000
		(a)	185,000
		(c)	72,000
		(e)	130,000
		(h)	8,600
		Bal.	55,600
Salaries & Wages Payable			
(m)	285,000	(f)	287,000
	Bal.		2,000
Capital Stock		Retained Earnings	
	Bal.		420,000
		Bal.	270,000

3. Overhead is overapplied for the year by \$9,400. Entry (n) above records the closing of this overapplied overhead balance to Cost of Goods Sold.

4.

Supreme Videos, Inc.	
Income Statement	
For the Year Ended December 31	
Sales of videos	\$925,000
Cost of goods sold (\$600,000 – \$9,400).....	<u>590,600</u>
Gross margin.....	334,400
Selling and administrative expenses:	
Depreciation expense	\$ 21,000
Advertising expense	130,000
Administrative salaries.....	95,000
Insurance expense.....	1,400
Miscellaneous expense	<u>8,600</u>
Net operating income	<u>256,000</u>
	<u>\$ 78,400</u>

Case 3-29 (45 minutes)

1. Shaving 5% off the estimated direct labor-hours in the predetermined overhead rate will result in an artificially high overhead rate. The artificially high predetermined overhead rate is likely to result in overapplied overhead for the year. The cumulative effect of overapplying the overhead throughout the year is all recognized in December when the balance in the Manufacturing Overhead account is closed out to Cost of Goods Sold. If the balance were closed out every month or every quarter, this effect would be dissipated over the course of the year.
2. This question may generate lively debate. Where should Terri Ronsin's loyalties lie? Is she working for the general manager of the division or for the corporate controller? Is there anything wrong with the "Christmas bonus"? How far should Terri go in bucking her boss on a new job?

While individuals can certainly disagree about what Terri should do, some of the facts are indisputable. First, understating direct labor-hours artificially inflates the overhead rate. This has the effect of inflating the Cost of Goods Sold in all months prior to December and overstating the costs of inventories. In December, the huge adjustment for overapplied overhead provides a big boost to net operating income. Therefore, the practice results in distortions in the pattern of net operating income over the year. In addition, because all of the adjustment is taken to Cost of Goods Sold, inventories are still overstated at year-end. This means, of course, that the net operating income for the entire year is also overstated.

While Terri is in an extremely difficult position, her responsibilities under the IMA's Statement of Ethical Professional Practice seem to be clear. The Credibility Standard states that management accountants have a responsibility to "disclose all relevant information that could reasonably be expected to influence an intended user's understanding of the reports, analyses or recommendations." In our opinion, Terri should discuss this situation with her immediate supervisor in the controller's office at corporate headquarters. This step may bring her into direct conflict with the general manager of the division, so it would be a very difficult decision for her to make.

Case 3-29 (continued)

In the actual situation that this case is based on, the corporate controller's staff were aware of the general manager's accounting tricks, but top management of the company supported the general manager because "he comes through with the results" and could be relied on to hit the annual profit targets for his division. Personally, we would be very uncomfortable supporting a manager who will resort to deliberate distortions to achieve "results." If the manager will pull tricks in this area, what else might he be doing that is questionable or even perhaps illegal?

Case 3-30 (60 minutes)

1. a.
$$\text{Predetermined overhead rate} = \frac{\text{Estimated total manufacturing overhead cost}}{\text{Estimated total amount of the allocation base}}$$

$$= \frac{\$840,000}{\$600,000 \text{ direct labor cost}} = 140\% \text{ of direct labor cost}$$

b. $\$9,500 \times 140\% = \$13,300$

	<i>Fabricating Department</i>	<i>Machining Department</i>	<i>Assembly Department</i>
2. a. Estimated manufacturing overhead cost (a)	\$350,000	\$400,000	\$ 90,000
Estimated direct labor cost (b).....	\$200,000	\$100,000	\$300,000
Predetermined overhead rate (a) ÷ (b)	175%	400%	30%

b. Fabricating Department:

$\$2,800 \times 175\% \dots\dots\dots \$4,900$

Machining Department:

$\$500 \times 400\% \dots\dots\dots 2,000$

Assembly Department:

$\$6,200 \times 30\% \dots\dots\dots \underline{1,860}$

Total applied overhead

$$\underline{\underline{\$8,760}}$$

3. The bulk of the labor cost on the Koopers job is in the Assembly Department, which incurs very little overhead cost. The department has an overhead rate of only 30% of direct labor cost as compared to much higher rates in the other two departments. Therefore, as shown above, use of departmental overhead rates results in a relatively small amount of overhead cost being charged to the job.

Use of a plantwide overhead rate in effect redistributes overhead costs proportionately between the three departments (at 140% of direct labor cost) and results in a large amount of overhead cost being charged to the Koopers job, as shown in Part 1. This may explain why the company

Case 3-30 (continued)

bid too high and lost the job. Too much overhead cost was assigned to the job for the kind of work being done on the job in the plant.

On jobs that require a large amount of labor in the Fabricating or Machining Departments the opposite will be true, and the company will tend to charge too little overhead cost to the jobs if a plantwide overhead rate is being used. The reason is that the plantwide overhead rate (140%) is much lower than the rates would be if these departments were considered separately.

4. The company's bid was:

Direct materials	\$ 4,600
Direct labor	9,500
Manufacturing overhead applied (above)	<u>13,300</u>
Total manufacturing cost	\$27,400
Bidding rate	<u>× 1.5</u>
Total bid price	<u>\$41,100</u>

If departmental overhead rates had been used, the bid would have been:

Direct materials	\$ 4,600
Direct labor	9,500
Manufacturing overhead applied (above)	<u>8,760</u>
Total manufacturing cost	\$22,860
Bidding rate	<u>× 1.5</u>
Total bid price	<u>\$34,290</u>

Note that if departmental overhead rates had been used, Teledex Company would have been the low bidder on the Koopers job because the competitor underbid Teledex by only \$2,000.

5. a. Actual overhead cost	\$864,000
Applied overhead cost (\$580,000 × 140%)	<u>812,000</u>
Underapplied overhead cost	<u>\$ 52,000</u>

Case 3-30 (continued)

b.

	<i>Department</i>			
	<i>Fabricating</i>	<i>Machining</i>	<i>Assembly</i>	<i>Total Plant</i>
Actual overhead cost	\$360,000	\$420,000	\$84,000	\$864,000
Applied overhead cost:				
\$210,000 × 175% .	367,500			
\$108,000 × 400% .		432,000		
\$262,000 × 30% ...			78,600	878,100
Underapplied (over-applied) overhead cost	<u>\$ (7,500)</u>	<u>\$ (12,000)</u>	<u>\$ 5,400</u>	<u>\$ (14,100)</u>

Appendix 3A

Activity-Based Absorption Costing

Exercise 3A-1 (20 minutes)

1. Activity rates are computed as follows:

<i>Activity Cost Pool</i>	<i>(a) Estimated Overhead Cost</i>	<i>(b) Expected Activity</i>	<i>(a) ÷ (b) Activity Rate</i>
Machine setups	\$72,000	400 setups	\$180 per setup
Special processing ..	\$200,000	5,000 MHs	\$40 per MH
General factory	\$816,000	24,000 DLHs	\$34 per DLH

Exercise 3A-1 (continued)

2. Overhead is assigned to the two products as follows:

Hubs:

<i>Activity Cost Pool</i>	<i>(a) Activity Rate</i>	<i>(b) Activity</i>	<i>(a) × (b) ABC Cost</i>
Machine setups	\$180 per setup	100 setups	\$ 18,000
Special processing	\$40 per MH	5,000 MHs	200,000
General factory	\$34 per DLH	8,000 DLHs	<u>272,000</u>
Total.....			<u>\$490,000</u>

Sprockets:

<i>Activity Cost Pool</i>	<i>(a) Activity Rate</i>	<i>(b) Activity</i>	<i>(a) × (b) ABC Cost</i>
Machine setups	\$180 per setup	300 setups	\$ 54,000
Special processing	\$40 per MH	0 MHs	0
General factory	\$34 per DLH	16,000 DLHs	<u>544,000</u>
Total.....			<u>\$598,000</u>

Exercise 3A-1 (continued)

2. Each product's unit product cost is computed as follows:

	<i>Hubs</i>	<i>Sprockets</i>
Direct materials.....	\$32.00	\$18.00
Direct labor:		
\$15 per DLH × 0.80 DLHs per unit.....	12.00	
\$15 per DLH × 0.40 DLHs per unit.....		6.00
Overhead:		
\$490,000 ÷ 10,000 units.....	<u>49.00</u>	
\$598,000 ÷ 40,000 units.....		<u>14.95</u>
Unit product cost.....	<u>\$93.00</u>	<u>\$38.95</u>

Exercise 3A-2 (45 minutes)

1. The unit product costs under the company's conventional costing system would be computed as follows:

	<i>Rascon</i>	<i>Parcel</i>	<i>Total</i>
Number of units produced (a)	20,000	80,000	
Direct labor-hours per unit (b).....	<u>0.40</u>	<u>0.20</u>	
Total direct labor-hours (a) × (b)	<u>8,000</u>	<u>16,000</u>	24,000
Total manufacturing overhead (a)	\$576,000		
Total direct labor-hours (b)	24,000 DLHs		
Predetermined overhead rate (a) ÷ (b)	\$24.00 per DLH		
	<i>Rascon</i>	<i>Parcel</i>	
Direct materials	\$13.00	\$22.00	
Direct labor	6.00	3.00	
Manufacturing overhead applied:			
0.40 DLH per unit × \$24.00 per DLH.....	9.60		
0.20 DLH per unit × \$24.00 per DLH.....		<u>4.80</u>	
Unit product cost.....	<u>\$28.60</u>	<u>\$29.80</u>	

Exercise 3A-2 (continued)

2. The unit product costs using activity-based absorption costing can be computed as follows:

<i>Activity Cost Pool</i>	<i>Estimated Overhead Cost*</i>	<i>(b) Expected Activity</i>	<i>(a) ÷ (b) Activity Rate</i>
Labor related	\$288,000	24,000 direct labor-hours	\$12.00 per direct labor-hour
Engineering design...	<u>\$288,000</u>	6,000 engineering-hours	\$48.00 per engineering-hour
	<u>\$576,000</u>		

*The total estimated manufacturing overhead cost of \$576,000 is split evenly between the two activity cost pools.

Manufacturing overhead is assigned to the two products as follows:

Rascon:

<i>Activity Cost Pool</i>	<i>(a) Activity Rate</i>	<i>(b) Activity</i>	<i>(a) × (b) ABC Cost</i>
Labor related	\$12 per DLH	8,000 DLHs	\$ 96,000
Engineering design .	\$48 per engineering-hour	3,000 engineering-hours	<u>144,000</u>
Total.....			<u>\$240,000</u>

Parcel:

<i>Activity Cost Pool</i>	<i>(a) Activity Rate</i>	<i>(b) Activity</i>	<i>(a) × (b) ABC Cost</i>
Labor related	\$12 per DLH	16,000 DLHs	\$192,000
Engineering design .	\$48 per engineering-hour	3,000 engineering-hours	<u>144,000</u>
Total.....			<u>\$336,000</u>

Exercise 3A-2 (continued)

The unit product costs combine direct materials, direct labor, and overhead costs:

	<i>Rascon</i>	<i>Parcel</i>
Direct materials	\$13.00	\$22.00
Direct labor	6.00	3.00
Manufacturing overhead ($\$240,000 \div 20,000$ units; $\$336,000 \div 80,000$ units)	<u>12.00</u>	<u>4.20</u>
Unit product cost	<u>\$31.00</u>	<u>\$29.20</u>

3. The unit product cost of the high-volume product, Parcel, declines under the activity-based approach, whereas the unit product cost of the low-volume product, Rascon, increases. This occurs because half of the overhead is applied on the basis of engineering design hours instead of direct labor-hours. When the overhead was applied on the basis of direct labor-hours, most of the overhead was applied to the high-volume product. However, when the overhead is applied on the basis of engineering-hours, more of the overhead cost is shifted over to the low-volume product. Engineering-hours is a product-level activity, so the higher the volume, the lower the unit cost and the lower the volume, the higher the unit cost.

Exercise 3A-3 (45 minutes)

1. The predetermined overhead rate is computed as follows:

$$\text{Predetermined overhead rate} = \frac{\$325,000}{50,000 \text{ DLHs}} = \$6.50 \text{ per DLH}$$

The unit product costs under the company's traditional costing system are computed as follows:

	<i>Deluxe</i>	<i>Standard</i>
Direct materials	\$72.00	\$53.00
Direct labor	12.00	9.60
Manufacturing overhead (1.0 DLH × \$6.50 per DLH; 0.8 DLH × \$6.50 per DLH)	<u>6.50</u>	<u>5.20</u>
Unit product cost	<u>\$90.50</u>	<u>\$67.80</u>

Exercise 3A-3 (continued)

2. The activity rates are computed as follows:

<i>Activity Cost Pool</i>	<i>(a) Estimated Overhead Cost</i>	<i>(b) Total Expected Activity</i>	<i>(a) ÷ (b) Activity Rate</i>
Supporting direct labor...	\$200,000	50,000 DLHs	\$4 per DLH
Batch setups.....	\$75,000	300 setups	\$250 per setup
Safety testing	\$50,000	100 tests	\$500 per test

Manufacturing overhead is assigned to the two products as follows:

Deluxe Product:

<i>Activity Cost Pool</i>	<i>(a) Activity Rate</i>	<i>(b) Activity</i>	<i>(a) × (b) ABC Cost</i>
Supporting direct labor	\$4 per DLH	10,000 DLHs	\$ 40,000
Batch setups	\$250 per setup	200 setups	50,000
Safety testing.....	\$500 per test	30 tests	<u>15,000</u>
Total.....			<u>\$105,000</u>

Standard Product:

<i>Activity Cost Pool</i>	<i>(a) Activity Rate</i>	<i>(b) Activity</i>	<i>(a) × (b) ABC Cost</i>
Supporting direct labor	\$4 per DLH	40,000 DLHs	\$160,000
Batch setups	\$250 per setup	100 setups	25,000
Safety testing.....	\$500 per test	70 tests	<u>35,000</u>
Total.....			<u>\$220,000</u>

Exercise 3A-3 (continued)

Activity-based absorption costing unit product costs are computed as follows:

	<i>Deluxe</i>	<i>Standard</i>
Direct materials.....	\$72.00	\$53.00
Direct labor.....	12.00	9.60
Manufacturing overhead (\$105,000 ÷ 10,000 units; \$220,000 ÷ 50,000 units).....	<u>10.50</u>	<u>4.40</u>
Unit product cost.....	<u>\$94.50</u>	<u>\$67.00</u>

Problem 3A-4 (60 minutes)

1. a. When direct labor-hours are used to apply overhead cost to products, the company's predetermined overhead rate would be:

$$\begin{aligned} \text{Predetermined overhead rate} &= \frac{\text{Manufacturing overhead cost}}{\text{Direct labor-hours}} \\ &= \frac{\$1,800,000}{36,000 \text{ DLHs}} = \$50 \text{ per DLH} \end{aligned}$$

b.

	<i>Model</i>	
	<i>X200</i>	<i>X99</i>
Direct materials	\$ 72	\$ 50
Direct labor:		
\$10 per hour × 1.8 hours and 0.9 hours....	18	9
Manufacturing overhead:		
\$50 per hour × 1.8 hours and 0.9 hours....	<u>90</u>	<u>45</u>
Total unit product cost.....	<u>\$180</u>	<u>\$104</u>

2. a. Predetermined overhead rates for the activity cost pools:

	(a)	(b)	(a) ÷ (b)
<i>Activity Cost Pool</i>	<i>Estimated Total Cost</i>	<i>Estimated Total Activity</i>	<i>Activity Rate</i>
Machine setups	\$360,000	150 setups	\$2,400 per setup
Special processing..	\$180,000	12,000 MHs	\$15 per MH
General factory	\$1,260,000	36,000 DLHs	\$35 per DLH

Problem 3A-4 (continued)

The overhead applied to each product can be determined as follows:

Model X200

<i>Activity Cost Pool</i>	<i>(a) Activity Rate</i>	<i>(b) Activity</i>	<i>(a) × (b) ABC Cost</i>
Machine setups	\$2,400 per setup	50 setups	\$120,000
Special processing	\$15 per MH	12,000 MHs	180,000
General factory	\$35 per DLH	9,000 DLHs	<u>315,000</u>
Total manufacturing overhead cost (a) ..			<u>\$615,000</u>
Number of units produced (b)			5,000
Overhead cost per unit (a) ÷ (b)			<u>\$123.00</u>

Model X99

<i>Activity Cost Pool</i>	<i>(a) Activity Rate</i>	<i>(b) Activity</i>	<i>(a) × (b) ABC Cost</i>
Machine setups	\$2,400 per setup	100 setups	\$ 240,000
Special processing	\$15 per MH	0 MHs	0
General factory	\$35 per DLH	27,000 DLHs	<u>945,000</u>
Total manufacturing overhead cost (a) ..			<u>\$1,185,000</u>
Number of units produced (b)			30,000
Overhead cost per unit (a) ÷ (b)			<u>\$39.50</u>

Problem 3A-4 (continued)

- b. The unit product cost of each model under the activity-based approach would be computed as follows:

	<i>Model</i>	
	<i>X200</i>	<i>X99</i>
Direct materials	\$ 72.00	\$50.00
Direct labor:		
\$10 per DLH × 1.8 DLHs, 0.9 DLHs	18.00	9.00
Manufacturing overhead (above)	<u>123.00</u>	<u>39.50</u>
Total unit product cost	<u>\$213.00</u>	<u>\$98.50</u>

Comparing these unit cost figures with the unit costs in Part 1(b), we find that the unit product cost for Model X200 has increased from \$180 to \$213, and the unit product cost for Model X99 has decreased from \$104 to \$98.50.

3. It is especially important to note that, even under activity-based costing, 70% of the company's overhead costs continue to be applied to products on the basis of direct labor-hours:

Machine setups (number of setups) ...	\$ 360,000	20%
Special processing (machine-hours) ...	180,000	10
General factory (direct labor-hours) ...	<u>1,260,000</u>	<u>70</u>
Total overhead cost	<u>\$1,800,000</u>	<u>100%</u>

Thus, the shift in overhead cost from the high-volume product (Model X99) to the low-volume product (Model X200) occurred as a result of reassigning only 30% of the company's overhead costs.

The increase in unit product cost for Model X200 can be explained as follows: First, where possible, overhead costs have been traced to the products rather than being lumped together and spread uniformly over production. Therefore, the special processing costs, which are traceable to Model X200, have all been assigned to Model X200 and none assigned to Model X99 under the activity-based approach. It is common in industry to have some products that require special handling or special processing of some type. This is especially true in modern factories that produce a variety of products. Activity-based costing provides a vehicle for assigning these costs to the appropriate products.

Problem 3A-4 (continued)

Second, the costs associated with the batch-level activity (machine set-ups) have also been assigned to the specific products to which they relate. These costs have been assigned according to the number of setups completed for each product. However, because a batch-level activity is involved, another factor affecting unit costs comes into play. That factor is batch size. Some products are produced in large batches and some are produced in small batches. *The smaller the batch, the higher the per unit cost of the batch activity.* In the case at hand, the data can be analyzed as follows:

Model X200:

Cost to complete one setup [see 2(a)]	\$2,400 (a)
Number of units processed per setup (5,000 units per setup ÷ 50 setups = 100 units)	100 units (b)
Setup cost per unit (a) ÷ (b)	\$24

Model X99:

Cost to complete one setup (above)	\$2,400 (a)
Number of units processed per setup (30,000 units per setup ÷ 100 setups = 300 units) ...	300 units (b)
Setup cost per unit (a) ÷ (b)	\$8

Thus, the cost per unit for setups is three times as great for Model X200, the low-volume product, as it is for Model X99, the high-volume product. Such differences in cost are obscured when direct labor-hours (or any other volume measure) is used as a basis for applying overhead cost to products.

In sum, overhead cost has shifted from the high-volume product to the low-volume product as a result of more appropriately assigning some costs to the products on the basis of the activities involved, rather than on the basis of direct labor-hours.

Problem 3A-5 (60 minutes)

- The company's estimated direct labor-hours can be computed as follows:

Deluxe model: 5,000 units × 2 DLHs per unit.....	10,000 DLHs
Regular model: 40,000 units × 1 DLH per unit ...	<u>40,000</u> DLHs
Total direct labor hours	<u>50,000</u> DLHs

Using just direct labor-hours as the base, the predetermined overhead rate would be:

$$\frac{\text{Estimated overhead cost}}{\text{Estimated direct labor-hours}} = \frac{\$900,000}{50,000 \text{ DLHs}} = \$18 \text{ per DLH}$$

The unit product cost of each model using the company's traditional costing system would be:

	<i>Deluxe</i>	<i>Regular</i>
Direct materials.....	\$40	\$25
Direct labor.....	14	7
Manufacturing overhead:		
\$18 per DLH × 2 DLHs.....	36	
\$18 per DLH × 1 DLH		<u>18</u>
Total unit product cost.....	<u>\$90</u>	<u>\$50</u>

- Predetermined overhead rates are computed below:

<i>Activity Cost Pool</i>	<i>(a) Estimated Overhead Cost</i>	<i>(b) Expected Activity</i>	<i>(a) ÷ (b) Activity Rate</i>
Purchasing.....	\$204,000	600 purchase orders	\$340 per purchase order
Processing	\$182,000	35,000 machine-hours	\$5.20 per machine-hour
Scrap/rework	\$379,000	2,000 orders	\$189.50 per order
Shipping	\$135,000	900 shipments	\$150 per shipment

Problem 3A-5 (continued)

3. a. The overhead applied to each product can be determined as follows:

The Deluxe Model

<i>Activity Cost Pool</i>	<i>(a) Activity Rate</i>	<i>(b) Activity</i>	<i>(a) × (b) ABC Cost</i>
Purchasing.....	\$340 per PO	200 POs	\$ 68,000
Processing	\$5.20 per MH	20,000 MHs	104,000
Scrap/rework	\$189.50 per order	1,000 tests	189,500
Shipping	\$150 per shipment	250 shipments	<u>37,500</u>
Total overhead cost (a)			<u>\$399,000</u>
Number of units produced (b).....			5,000
Overhead cost per unit (a) ÷ (b).			<u>\$79.80</u>

The Regular Model

<i>Activity Cost Pool</i>	<i>(a) Activity Rate</i>	<i>(b) Activity</i>	<i>(a) × (b) ABC Cost</i>
Purchasing.....	\$340 per PO	400 POs	\$136,000
Processing	\$5.20 per MH	15,000 MHs	78,000
Scrap/rework	\$189.50 per order	1,000 orders	189,500
Shipping	\$150 per shipment	650 shipments	<u>97,500</u>
Total overhead cost (a)			<u>\$501,000</u>
Number of units produced (b).....			40,000
Overhead cost per unit (a) ÷ (b).			<u>\$12.53</u>

Problem 3A-5 (continued)

- b. Using activity-based absorption costing, the unit product cost of each model would be:

	<i>Deluxe</i>	<i>Regular</i>
Direct materials	\$ 40.00	\$25.00
Direct labor	14.00	7.00
Manufacturing overhead (above) ..	<u>79.80</u>	<u>12.53</u>
Total unit product cost	<u><u>\$133.80</u></u>	<u><u>\$44.53</u></u>

4. Unit costs appear to be distorted as a result of using direct labor-hours as the base for assigning overhead cost to products. Although the deluxe model requires twice as much labor time as the regular model, it still is not being assigned enough overhead cost, as shown in the analysis in part 3(a).

When the company's overhead costs are analyzed on an activities basis, it appears that the deluxe model is more expensive to manufacture than the company realizes. Note that the deluxe model accounts for a majority of the machine-hours worked, even though it accounts for only 20% of the company's direct labor-hours. Also, it requires just as many scrap/rework orders as the regular model, and scrap/rework orders are very costly to the company.

When activity-based absorption costing is used and the company's transactions are analyzed by product, the overhead cost increases for the deluxe model from \$36.00 per unit to \$79.80 per unit. This suggests that less than half the overhead cost is being assigned to the deluxe model that ought to be assigned, and unit costs for the deluxe model are understated. If these costs are being used as a basis for pricing, then the selling price for the deluxe model may be too low. This may be the reason why profits have been steadily declining over the last several years. It may also be the reason why sales of the deluxe model have been increasing rapidly.

Case 3A-6 (90 minutes)

1. a. The predetermined overhead rate would be computed as follows:

$$\frac{\text{Expected manufacturing overhead cost}}{\text{Estimated direct labor-hours}} = \frac{\$2,200,000}{50,000 \text{ DLHs}} = \$44 \text{ per DLH}$$

- b. The unit product cost per pound, using the company's present costing system, would be:

	<i>Kenya Dark</i>	<i>Viet Select</i>
Direct materials (given)	\$4.50	\$2.90
Direct labor (given)	0.24	0.24
Manufacturing overhead:		
0.02 DLH × \$44 per DLH.....	<u>0.88</u>	<u>0.88</u>
Total unit product cost.....	<u>\$5.62</u>	<u>\$4.02</u>

2. a. Overhead rates for each activity cost pool:

<i>Activity Cost Pools</i>	<i>(a) Estimated Overhead Costs</i>	<i>(b) Expected Activity</i>	<i>(a) ÷ (b) Activity Rate</i>
Purchasing	\$560,000	2,000 orders	\$280 per order
Material handling ..	\$193,000	1,000 setups	\$193 per setup
Quality control	\$90,000	500 batches	\$180 per batch
Roasting.....	\$1,045,000	95,000 hours	\$11 per hour
Blending.....	\$192,000	32,000 hours	\$6 per hour
Packaging.....	\$120,000	24,000 hours	\$5 per hour

Case 3A-6 (continued)

Before we can determine the amount of overhead cost to assign to the products we must first determine the activity for each of the products in the six activity centers. The necessary computations follow:

Number of purchase orders:

Kenya Dark: $80,000 \text{ pounds} \div 20,000 \text{ pounds per order} = 4 \text{ orders}$

Viet Select: $4,000 \text{ pounds} \div 500 \text{ pounds per order} = 8 \text{ orders}$

Number of setups:

Kenya Dark: $16 \text{ batches} \times 2 \text{ setups per batch} = 32 \text{ setups}$

Viet Select: $8 \text{ batches} \times 2 \text{ setups per batch} = 16 \text{ setups}$

Number of batches:

Kenya Dark: $80,000 \text{ pounds} \div 5,000 \text{ pounds per batch} = 16 \text{ batches}$

Viet Select: $4,000 \text{ pounds} \div 500 \text{ pounds per batch} = 8 \text{ batches}$

Roasting hours:

Kenya Dark: $1.5 \text{ hours} \times (80,000 \text{ pounds} \div 100 \text{ pounds}) = 1,200 \text{ hours}$

Viet Select: $1.5 \text{ hours} \times (4,000 \text{ pounds} \div 100 \text{ pounds}) = 60 \text{ hours}$

Blending hours:

Kenya Dark: $0.5 \text{ hour} \times (80,000 \text{ pounds} \div 100 \text{ pounds}) = 400 \text{ hours}$

Viet Select: $0.5 \text{ hour} \times (4,000 \text{ pounds} \div 100 \text{ pounds}) = 20 \text{ hours}$

Packaging hours:

Kenya Dark: $0.3 \text{ hour} \times (80,000 \text{ pounds} \div 100 \text{ pounds}) = 240 \text{ hours}$

Viet Select: $0.3 \text{ hour} \times (4,000 \text{ pounds} \div 100 \text{ pounds}) = 12 \text{ hours}$

Case 3A-6 (continued)

The overhead applied to each product can be determined as follows:

Kenya Dark

<i>Activity Cost Pool</i>	<i>Activity Rate</i>	<i>Expected Activity</i>	<i>Amount</i>
Purchasing.....	\$280 per order	4 orders	\$ 1,120
Material handling	\$193 per setup	32 setups	6,176
Quality control	\$180 per batch	16 batches	2,880
Roasting.....	\$11 per roasting hour	1,200 roasting hours	13,200
Blending.....	\$6 per blending hour	400 blending hours	2,400
Packaging.....	\$5 per packaging hour	240 packaging hours	<u>1,200</u>
Total			<u>\$26,976</u>

Viet Select

<i>Activity Cost Pool</i>	<i>Activity Rate</i>	<i>Expected Activity</i>	<i>Amount</i>
Purchasing.....	\$280 per order	8 orders	\$2,240
Material handling	\$193 per setup	16 setups	3,088
Quality control	\$180 per batch	8 batches	1,440
Roasting.....	\$11 per roasting hour	60 roasting hours	660
Blending.....	\$6 per blending hour	20 blending hours	120
Packaging.....	\$5 per packaging hour	12 packaging hours	<u>60</u>
Total			<u>\$7,608</u>

Case 3A-6 (continued)

- b. According to the activity-based absorption costing system, the manufacturing overhead cost per pound is:

	<i>Kenya Dark</i>	<i>Viet Select</i>
Total overhead cost assigned (above) (a) ...	\$26,976	\$7,608
Number of pounds manufactured (b).....	80,000	4,000
Cost per pound (a) ÷ (b)	\$0.34	\$1.90

- c. The unit product costs according to the activity-based absorption costing system are:

	<i>Kenya Dark</i>	<i>Viet Select</i>
Direct materials (given)	\$4.50	\$2.90
Direct labor (given)	0.24	0.24
Manufacturing overhead	<u>0.34</u>	<u>1.90</u>
Total unit product cost.....	<u>\$5.08</u>	<u>\$5.04</u>

3. MEMO TO THE PRESIDENT: Analysis of JSI's data shows that several activities other than direct labor drive the company's manufacturing overhead costs. These activities include purchase orders issued, number of setups for material processing, and number of batches processed. The company's present costing system, which relies on direct labor time as the sole basis for assigning overhead cost to products, significantly undercosts low-volume products, such as the Viet Select coffee, and significantly overcosts high-volume products, such as our Kenya Dark coffee.

An implication of the activity-based approach is that our low-volume products may not be covering the costs of the manufacturing resources they use. For example, Viet Select coffee is currently priced at \$5.03 per pound (\$4.02 plus 25% markup), but this price is below its activity-based cost of \$5.04 per pound. Under our present costing and pricing system, our high-volume products, such as our Kenya Dark coffee, may be subsidizing our low-volume products. Some adjustments in prices may be required.

Case 3A-6 (continued)

ALTERNATIVE SOLUTION:

Most students will compute the manufacturing overhead cost per pound of the two coffees as shown above. However, the per pound cost can also be computed as shown below. *This alternative approach provides additional insight into the data and facilitates emphasis of some points made in the chapter.*

	<u>Kenya Dark</u>		<u>Viet Select</u>	
	<i>Total</i>	<i>Per Pound (÷ 80,000)</i>	<i>Total</i>	<i>Per Pound (÷ 4,000)</i>
Purchasing	\$ 1,120	\$0.014	\$2,240	\$0.560
Material handling..	6,176	0.077	3,088	0.772
Quality control.....	2,880	0.036	1,440	0.360
Roasting	13,200	0.165	660	0.165
Blending	2,400	0.030	120	0.030
Packaging	<u>1,200</u>	<u>0.015</u>	<u>60</u>	<u>0.015</u>
Total.....	<u>\$26,976</u>	<u>\$0.337</u>	<u>\$7,608</u>	<u>\$1.902</u>

Note particularly how batch size impacts unit cost data. For example, the cost to the company to process a purchase order is \$280, regardless of how many pounds of coffee are contained in the order. Twenty thousand pounds of the Kenya Dark coffee are purchased per order (with four orders per year), and just 500 pounds of the Viet Select coffee are purchased per order (with eight orders per year). Thus, the purchase order cost *per pound* for the Kenya Dark coffee is just 1.4 cents, whereas the purchase order cost *per pound* for the Viet Select coffee is 40 times as much, or 56 cents. As stated in the text, this is one reason why unit costs of low-volume products, such as the Viet Select coffee, increase so dramatically when activity-based costing is used.

Appendix 3B

The Predetermined Overhead Rate and Capacity

Exercise 3B-1 (20 minutes)

1. There were no beginning or ending inventories, so all of the jobs were started, finished, and sold during the month. Therefore cost of goods sold equals the total manufacturing cost. We can verify that by computing the cost of goods sold as shown below:

Manufacturing costs charged to jobs:	
Direct materials	\$ 5,350
Direct labor (all variable)	8,860
Manufacturing overhead applied (150 hours × \$82 hour)	<u>12,300</u>
Total manufacturing cost charged to jobs	26,510
Add: Beginning work in process inventory	<u>0</u>
	26,510
Deduct: Ending work in process inventory	<u>0</u>
Cost of goods manufactured	<u>\$26,510</u>
Beginning finished goods inventory	\$ 0
Add: Cost of goods manufactured	<u>26,510</u>
Goods available for sale	26,510
Deduct: Ending finished goods inventory	<u>0</u>
Cost of goods sold	<u>\$26,510</u>

At the end of the month, overhead was underapplied by \$1,920 as shown below:

Manufacturing overhead incurred	\$14,220
Manufacturing overhead applied (150 hours × \$82 hour)	<u>12,300</u>
Overhead underapplied	<u>\$ 1,920</u>

Exercise 3B-1 (continued)

Consequently, the income statement would appear as follows:

Wixis Cabinets Income Statement		
Sales		\$43,740
Cost of goods sold (see above)		<u>26,510</u>
Gross margin		17,230
Cost of unused capacity	\$1,920	
Selling and administrative expenses	<u>8,180</u>	<u>10,100</u>
Net operating income		<u>\$ 7,130</u>

2. When the predetermined overhead rate is based on capacity, overhead is ordinarily underapplied because manufacturing overhead ordinarily contains significant amounts of fixed costs. Suppose, for example, that manufacturing overhead includes \$10,000 of fixed costs and the capacity is 100 hours. Then the portion of the predetermined overhead rate that represents fixed costs is \$10,000 divided by 100 hours or \$100 per hour. Because the plant is seldom (if ever) operated beyond capacity, less than \$10,000 will ordinarily be applied to jobs. In other words, \$100 per hour multiplied by something less than 100 hours always yields less than \$10,000. Therefore, overhead will ordinarily be underapplied.

Exercise 3B-2 (30 minutes)

1. The overhead applied to Mrs. Brinksi's account would be computed as follows:

	<i>2012</i>	<i>2013</i>
Estimated overhead cost (a)	\$310,500	\$310,500
Estimated professional staff hours (b)	4,500	4,600
Predetermined overhead rate (a) ÷ (b).....	\$69.00	\$67.50
Professional staff hours charged to Ms. Brinksi's account.....	<u>× 2.5</u>	<u>× 2.5</u>
Overhead applied to Ms. Brinksi's account.....	<u>\$172.50</u>	<u>\$168.75</u>

2. If the actual overhead cost and the actual professional hours charged turn out to be exactly as estimated there would be no underapplied or overapplied overhead.

	<i>2012</i>	<i>2013</i>
Predetermined overhead rate (see above)	\$69.00	\$67.50
Actual professional staff hours charged to clients' accounts (by assumption)	<u>× 4,500</u>	<u>× 4,600</u>
Overhead applied	\$310,500	\$310,500
Actual overhead cost incurred (by assumption) ..	<u>310,500</u>	<u>310,500</u>
Underapplied or overapplied overhead.....	<u>\$ 0</u>	<u>\$ 0</u>

3. If the predetermined overhead rate is based on the professional staff hours available, the computations would be:

	<i>2012</i>	<i>2013</i>
Estimated overhead cost (a).....	\$310,500	\$310,500
Professional staff hours available (b).....	6,000	6,000
Predetermined overhead rate (a) ÷ (b)	\$51.75	\$51.75
Professional staff hours charged to Ms. Brinksi's account	<u>× 2.5</u>	<u>× 2.5</u>
Overhead applied to Ms. Brinksi's account	<u>\$129.38</u>	<u>\$129.38</u>

Exercise 3B-2 (continued)

4. If the actual overhead cost and the actual professional staff hours charged to clients' accounts turn out to be exactly as estimated, overhead would be underapplied as shown below.

	<i>2012</i>	<i>2013</i>
Predetermined overhead rate (see above) (a)	\$51.75	\$51.75
Actual professional staff hours charged to clients' accounts (by assumption) (b)	<u>× 4,500</u>	<u>× 4,600</u>
Overhead applied (a) × (b)	\$232,875	\$238,050
Actual overhead cost incurred (by assumption)....	<u>310,500</u>	<u>310,500</u>
Underapplied overhead	<u>\$ 77,625</u>	<u>\$ 72,450</u>

The underapplied overhead is best interpreted in this situation as the cost of idle capacity. Proponents of this method of computing predetermined overhead rates suggest that the underapplied overhead be treated as a period expense that would be disclosed separately on the income statement as Cost of Unused Capacity.

Problem 3B-3 (60 minutes)

1. The overhead applied to the Verde Baja job is computed as follows:

	<i>2012</i>	<i>2013</i>
Estimated studio overhead cost (a)	\$160,000	\$160,000
Estimated hours of studio service (b).....	1,000	800
Predetermined overhead rate (a) ÷ (b).....	\$160	\$200
Verde Baja job's studio hours	<u>× 40</u>	<u>× 40</u>
Overhead applied to the Verde Baja job	<u>\$6,400</u>	<u>\$8,000</u>

Overhead is underapplied for both years as computed below:

	<i>2012</i>	<i>2013</i>
Predetermined overhead rate (see above) (a) ..	\$160	\$200
Actual hours of studio service provided (b)	750	500
Overhead applied (a) × (b).....	\$120,000	\$100,000
Actual studio cost incurred.....	<u>160,000</u>	<u>160,000</u>
Underapplied overhead.....	<u>\$ 40,000</u>	<u>\$ 60,000</u>

2. If the predetermined overhead rate is based on the hours of studio service at capacity, the computations would be:

	<i>2012</i>	<i>2013</i>
Estimated studio overhead cost at capacity (a)	\$160,000	\$160,000
Hours of studio service at capacity (b).....	1,600	1,600
Predetermined overhead rate (a) ÷ (b).....	\$100	\$100
Verde Baja job's studio hours	<u>× 40</u>	<u>× 40</u>
Overhead applied to the Verde Baja job	<u>\$4,000</u>	<u>\$4,000</u>

Overhead is underapplied for both years under this method as well:

	<i>2012</i>	<i>2013</i>
Predetermined overhead rate (see above) (a) ..	\$100	\$100
Actual hours of studio service provided (b)	750	500
Overhead applied (a) × (b).....	\$ 75,000	\$ 50,000
Actual studio cost incurred.....	<u>160,000</u>	<u>160,000</u>
Underapplied overhead.....	<u>\$ 85,000</u>	<u>\$110,000</u>

Problem 3B-3 (continued)

3. When the predetermined overhead rate is based on capacity, the underapplied overhead is interpreted as the cost of idle capacity. Indeed, proponents of this method suggest that the underapplied overhead should be treated as a period expense that would be disclosed separately on the income statement as Cost of Unused Capacity.
4. Platinum Track's fundamental problem is the competition that is drawing customers away. The competition is able to offer the latest equipment, excellent service, and attractive prices. The company must do something to counter this threat or it will ultimately face failure.

Under the conventional approach in which the predetermined overhead rate is based on the estimated studio hours, the apparent cost of the Verde Baja job has increased between 2012 and 2013. That happens because the company is losing business to competitors and therefore the company's fixed overhead costs are being spread over a smaller base. This results in costs that seem to increase as the volume declines. Under this method, Platinum Track's managers may be misled into thinking that the problem is rising costs and they may be tempted to raise prices to recover their apparently increasing costs. This would almost surely accelerate the company's decline.

Under the alternative approach, the overhead cost of the Verde Baja job is stable at \$4,000 and lower than the costs reported under the conventional method. Under the conventional method, managers may be misled into thinking that they are actually losing money on the Verde Baja job and they might refuse such jobs in the future—another sure road to disaster. This is much less likely to happen if the lower cost of \$4,000 is reported. It is true that the underapplied overhead under the alternative approach is much larger than under the conventional approach and is growing. However, if it is properly labeled as the cost of idle capacity, management is much more likely to draw the appropriate conclusion that the real problem is the loss of business (and therefore more idle capacity) rather than an increase in costs.

While basing the predetermined rate on capacity rather than on estimated activity will not solve the company's basic problems, at least this method is less likely to send managers misleading signals.

Case 3B-4 (120 minutes)

1. Traditional approach:

Actual total manufacturing overhead cost incurred (assumed to equal the original estimate).....	\$4,000,000
Manufacturing overhead applied (160,000 units × \$25 per unit)	<u>4,000,000</u>
Overhead underapplied or overapplied.....	<u>\$ 0</u>

Vault Hard Drives, Inc. Income Statement: Traditional Approach

Sales (150,000 units × \$60 per unit).....	\$9,000,000
Cost of goods sold:	
Variable manufacturing (150,000 units × \$15 per unit)	\$2,250,000
Manufacturing overhead applied (150,000 units × \$25 per unit)	<u>3,750,000</u>
	<u>6,000,000</u>
Gross margin.....	3,000,000
Selling and administrative expenses.....	<u>2,700,000</u>
Net operating income.....	<u>\$ 300,000</u>

New approach:

Vault Hard Drives, Inc. Income Statement: New Approach

Sales (150,000 units × \$60 per unit).....	\$9,000,000
Cost of goods sold:	
Variable manufacturing (150,000 units × \$15 per unit)	\$2,250,000
Manufacturing overhead applied (150,000 units × \$20 per unit)	<u>3,000,000</u>
	<u>5,250,000</u>
Gross margin.....	3,750,000
Cost of unused capacity [(200,000 units – 160,000 units) × \$20 per unit].....	800,000
Selling and administrative expenses.....	<u>2,700,000</u>
Net operating income.....	<u>\$ 250,000</u>

Case 3B-4 (continued)

2. Traditional approach:

Under the traditional approach, the reported net operating income can be increased by increasing the production level which then results in overapplied overhead which is deducted from Cost of Goods Sold.

Additional net operating income required to attain target net operating income (\$500,000 – \$300,000) (a) ...	\$200,000
Overhead applied per unit of output (b)	\$25 per unit
Additional output required to attain target net operating income (a) ÷ (b)	8,000 units
Actual total manufacturing overhead cost incurred.....	\$4,000,000
Manufacturing overhead applied [(160,000 units + 8,000 units) × \$25 per unit]	<u>4,200,000</u>
Overhead overapplied	<u>\$ 200,000</u>

Vault Hard Drives, Inc. Income Statement: Traditional Approach

Sales (150,000 units × \$60 per unit).....	\$9,000,000
Cost of goods sold:	
Variable manufacturing (150,000 units × \$15 per unit)	\$2,250,000
Manufacturing overhead applied (150,000 units × \$25 per unit)	3,750,000
Less: Manufacturing overhead overapplied ...	<u>200,000</u>
Gross margin	<u>5,800,000</u>
Selling and administrative expenses	3,200,000
Net operating income	<u>2,700,000</u>
	<u>\$ 500,000</u>

Note: If the overapplied manufacturing overhead were prorated between ending inventories and Cost of Goods Sold, more units would have to be produced to attain the target net profit of \$500,000. In fact, it can be shown that the total production level would have to be 169,014 units rather than 168,000 units.

Case 3B-4 (continued)

New approach:

Under the new approach, the reported net operating income can be increased by increasing the production level. This results in less of a deduction on the income statement for the Cost of Unused Capacity.

Additional net operating income required to attain target net operating income (\$500,000 – \$250,000) (a)	\$250,000
Overhead applied per unit of output (b)	\$20 per unit
Additional output required to attain target net operating income (a) ÷ (b)	12,500 units
Estimated number of units produced	<u>160,000</u> units
Actual number of units to be produced	<u>172,500</u> units

Vault Hard Drives, Inc. Income Statement: New Approach

Sales (150,000 units × \$60 per unit)		\$9,000,000
Cost of goods sold:		
Variable manufacturing		
(150,000 units × \$15 per unit)	\$2,250,000	
Manufacturing overhead applied		
(150,000 units × \$20 per unit)	<u>3,000,000</u>	<u>5,250,000</u>
Gross margin		3,750,000
Cost of unused capacity [(200,000 units – 172,500 units) × \$20 per unit]		550,000
Selling and administrative expenses		<u>2,700,000</u>
Net operating income		<u>\$ 500,000</u>

Case 3B-4 (continued)

3. Net operating income is more volatile under the new method than under the old method. The reason for this is that the reported profit per unit sold is higher under the new method by \$5, the difference in the predetermined overhead rates. As a consequence, swings in sales in either direction will have a more dramatic impact on reported profits under the new method.
4. As the computations in part (2) above show, the “hat trick” is a bit harder to perform under the new method. Under the old method, the target net operating income can be attained by producing an additional 8,000 units. Under the new method, the production would have to be increased by 12,500 units. Again, this is a consequence of the difference in predetermined overhead rates. The drop in sales has had a more dramatic effect on net operating income under the new method as noted above in part (3). In addition, because the predetermined overhead rate is lower under the new method, producing excess inventories has less of an effect per unit on net operating income than under the traditional method and hence more excess production is required.
5. One can argue that whether the “hat trick” is unethical depends on the level of sophistication of the owners of the company and others who read the financial statements. If they understand the effects of excess production on net operating income and are not misled, it can be argued that the hat trick is not unethical. However, if that were the case, there does not seem to be any reason to use the hat trick. Why would the owners want to tie up working capital in inventories just to artificially attain a target net operating income for the period? And increasing the rate of production toward the end of the year is likely to increase overhead costs due to overtime and other costs. Building up inventories all at once is very likely to be much more expensive than increasing the rate of production uniformly throughout the year. In this case, we assumed that there would not be an increase in overhead costs due to the additional production, but that is likely not to be true.

In our opinion, the hat trick is unethical unless there is a good reason for increasing production other than to artificially boost the current period's net operating income. It is certainly unethical if the purpose is to fool users of financial reports such as owners and creditors or if the purpose is to meet targets so that bonuses will be paid to top managers.