Chapter 3
Systems Design: Job-Order Costing

Solutions to Questions

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

3-2 Job-order costing is used in situations in which many different products or services are produced each period. Each product (or job) is different from all others and requires separate costing. Process costing is used in situations where a single, homogeneous product, such as cement, bricks, or gasoline, is produced for long periods.

3-3 The job cost sheet is used to record all costs that are assigned to a particular job. These costs include direct materials cost traced to the job, direct labor cost traced to the job, and manufacturing overhead cost applied to the job. When a job is completed, the job cost sheet is used to compute the cost per completed unit. The job cost sheet is also a control document for: (1) determining how many units have been sold and determining the cost of these units; and (2) determining how many units are still in inventory at the end of a period and determining the cost of these units on the balance sheet.

3-4 A predetermined overhead rate is used to apply overhead to jobs. It is determined before a period begins by dividing the estimated total manufacturing overhead for the period by the estimated total units in the allocation base. Thereafter, overhead is applied to jobs by multiplying the predetermined overhead rate by the actual amount of the allocation base that is incurred for each job. The most common allocation base is direct labor hours.

3-5 A sales order is issued after a firm agreement has been reached with a customer on matters relating to quantities, prices, and shipment dates for goods. This sales order then forms the basis for the production department to issue a production order. The production order specifies what is to be produced and forms the basis for the accounting department's preparation of a job cost sheet. The job cost sheet, in turn, is used to summarize the various production costs incurred in completing the job. These costs are entered on the job cost sheet by means of materials requisition forms, direct labor time tickets, and allocations of overhead via the predetermined overhead rate.

3-6 Many production costs cannot be traced to a particular product or job, but rather are incurred as a result of overall production activities. Therefore, to be assigned to products, such costs must be allocated to the products in some manner. Examples of such costs would include utilities, maintenance on machines, and depreciation of the factory building. These costs are indirect production costs.

3-7 If actual manufacturing overhead cost is applied to jobs, then either the firm must wait until the end of the period to apply overhead or it must compute actual overhead rates more frequently. If it waits to the end of the period to apply overhead, it will be unable to cost jobs until the end of the period. If the company computes the actual overhead rates more frequently, they may fluctuate widely. Overhead cost tends to be incurred somewhat evenly from month to month (due to the presence of fixed costs), whereas production activity often fluctuates. The result would be high overhead rates in periods with low activity and low overhead rates in periods with high activity. For these reasons, most firms use predetermined overhead rates to apply overhead cost to jobs.

3-8 The measure of activity that is used as the allocation base should drive the overhead cost; that is, the 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 their costs will be distorted.

3-9 Assigning overhead costs to jobs does not ensure that there will be a profit. The units produced may not be sold and if they are sold, they may not in fact 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.

3-10 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, since the predetermined overhead rate that is used in applying overhead is based on estimates.

3-11 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. Under- or overapplied overhead is disposed of by either closing out the amount to Cost of Goods Sold or 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).

3-12 Overhead may be underapplied for a number of reasons. One reason might be that there was not good control over overhead spending and as a result actual overhead costs exceeded estimated overhead costs. Another reason might be that some of the overhead is fixed and actual amount of the allocation base was less than estimated at the beginning of the period. The amount of overhead applied to Work in Process will decline in proportion to a decline in the allocation base. However, if there is any fixed cost in the overhead, it will not decline as much as the volume declines and hence overhead will be underapplied.

3-13 Underapplied overhead is added to cost of goods sold since underapplied overhead implies that not enough overhead was assigned to jobs during the period and therefore cost of goods sold is understated. Likewise, overapplied overhead is deducted from cost of goods sold.

3-14 Yes, overhead should be applied in order to properly value the Work in Process inventory at year-end. Since $6,000 of overhead was applied to Job A on the basis of $8,000 of direct labor cost, the company's predetermined overhead rate must be 75% of direct labor cost. Thus, $3,000 of overhead should be applied to Job B at year-end: $4,000 direct labor cost $\times$ 75% = $3,000 overhead costs applied.

3-15

Direct material	$10,000
Direct labor	12,000
Manufacturing overhead:	
$12,000 $\times$ 125%	15,000
Total manufacturing cost	$37,000
Unit product cost:	
$37,000 $\div$ 1,000 units	$37

3-16 A plantwide overhead rate is a single overhead rate used throughout all production departments in a plant. 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.

3-17 When direct labor is replaced by automated equipment, overhead increases and direct labor decreases. This results in an increase in the predetermined overhead rate if it is based on direct labor.

Exercise 3-1 (10 minutes)

a. Job-order costing
b. Job-order costing
c. Process costing
d. Job-order costing
e. Process costing*
f. Process costing*
g. Job-order costing
h. Job-order costing
i. Job-order costing
j. Job-order costing
k. Process costing
l. Process costing

** Some of the listed companies might use either a process costing or a job-order costing system, depending on how operations are carried out and how homogeneous the final product is. For example, a plywood manufacturer might use job-order costing if plywoods are constructed of different woods or come in markedly different sizes.

Exercise 3-~~3~~ 2 (20 minutes)

1. a.	Raw Materials Inventory	210,000	
	Accounts Payable		210,000
b.	Work in Process	152,000	
	Manufacturing Overhead	38,000	
	Raw Materials Inventory		190,000
c.	Work in Process	49,000	
	Manufacturing Overhead	21,000	
	Salaries and Wages Payable		70,000
d.	Manufacturing Overhead	105,000	
	Accumulated Depreciation		105,000
e.	Manufacturing Overhead	130,000	
	Accounts Payable		130,000
f.	Work in Process	300,000	
	Manufacturing Overhead		300,000

75,000 machine-hours × $4 per machine-hour = $300,000.

g.	Finished Goods	510,000	
	Work in Process		510,000
h.	Cost of Goods Sold	450,000	
	Finished Goods		450,000
	Accounts Receivable	675,000	
	Sales		675,000

$450,000 × 1.5 = $675,000

2.

Manufacturing Overhead				Work in Process			
(b)	38,000	300,000	(f)	Bal.	35,000	510,000	(g)
(c)	21,000			(b)	152,000		
(d)	105,000			(c)	49,000		
(e)	130,000			(f)	300,000		
		6,000 (Overapplied overhead)		Bal.	26,000		

Exercise 3-3 (15 minutes)

1. Predetermined overhead rates:

Company A:

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

$$= \frac{\$432{,}000}{60{,}000 \text{ DLHs}} = \$7.20 \text{ per DLH}$$

Company B:

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

$$= \frac{\$270{,}000}{90{,}000 \text{ MHs}} = \$3.00 \text{ per MH}$$

Company C:

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

$$= \frac{\$384{,}000}{\$240{,}000 \text{ materials cost}} = 160\% \text{ of materials cost}$$

2. Actual overhead costs incurred..... $420,000
   Overhead cost applied to Work in Process:
   58,000* actual hours × $7.20 per hour..... 417,600
   Underapplied overhead cost..... $ 2,400

   *7,000 hours + 30,000 hours + 21,000 hours = 58,000 hours

Exercise 3-4 (20 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 the appendix to the chapter.

1. The costing problem does, indeed, lie with manufacturing overhead cost, as suggested. Since manufacturing overhead is mostly fixed, the cost per unit increases as the level of production decreases. The problem can be "solved" by use of predetermined overhead rates, which should be based on expected activity for the entire year. Many students will use units of product in computing the predetermined overhead rate, as follows:

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

$$= \frac{\$840{,}000}{200{,}000 \text{ units}}$$

$$= \$4.20 \text{ per unit.}$$

The predetermined overhead rate could also be set on the basis of either direct labor cost or direct materials cost. The computations are:

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

$$= \frac{\$840{,}000}{\$240{,}000 \text{ direct labor cost}}$$

$$= 350\% \text{ of direct labor cost.}$$

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

$$= \frac{\$840{,}000}{\$600{,}000 \text{ direct materials cost}}$$

$$= 140\% \text{ of direct materials cost.}$$

Exercise 3-4 (continued)

2. Using a predetermined overhead rate, the unit costs would be:

	Quarter			
	First	*Second*	*Third*	*Fourth*
Direct materials	$240,000	$120,000	$ 60,000	$180,000
Direct labor	96,000	48,000	24,000	72,000
Manufacturing overhead:				
Applied at $4.20 per unit, 350% of direct labor cost, or 140% of direct materials cost	336,000	168,000	84,000	252,000
Total cost	$672,000	$336,000	$168,000	$504,000
Number of units produced	80,000	40,000	20,000	60,000
Estimated unit product cost	$8.40	$8.40	$8.40	$8.40

Exercise 3-5 (15 minutes)

1. Milling Department:

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

$$= \frac{\$510{,}000}{60{,}000 \text{ machine-hours}} = \$8.50 \text{ per machine-hour}$$

Assembly Department:

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

$$= \frac{\$800{,}000}{\$640{,}000 \text{ direct labor cost}} = 125\% \text{ of direct labor cost}$$

2.

	Overhead Applied
Milling Department: 90 MHs × $8.50 per MH	$765
Assembly Department: $160 × 125%	200
Total overhead cost applied	$965

3. Yes; if some jobs required a large amount of machine time and little labor cost, they would be charged substantially less overhead cost if a plantwide rate based on direct labor cost were being used. It appears, for example, that this would be true of job 407 which required considerable machine time to complete, but required only a small amount of labor cost.

Exercise 3-6 (30 minutes)

1.

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

$$= \frac{\$170{,}000}{85{,}000 \text{ machine-hours}} = \$2.00 \text{ per machine-hour}$$

2. The amount of overhead cost applied to Work in Process for the year would be: 80,000 machine-hours × $2.00 per machine-hour = $160,000. This amount is shown in entry (a) below:

Manufacturing Overhead			
(Utilities)	14,000	160,000	(a)
(Insurance)	9,000		
(Maintenance)	33,000		
(Indirect materials)	7,000		
(Indirect labor)	65,000		
(Depreciation)	40,000		
Balance	8,000		

Work in Process			
(Direct materials)	530,000		
(Direct labor)	85,000		
(Overhead) (a)	160,000		

3. Overhead is underapplied by $8,000 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	8,000	
Manufacturing Overhead		8,000

Exercise 3-6 (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. So when the actual level of activity turns out to be 80,000 machine-hours, the costing system assumes that the overhead will be 80,000 machine-hours × $2.00 per machine-hour, or $160,000. This is a drop of $10,000 from the initial estimated total manufacturing overhead cost of $170,000. However, the actual total manufacturing overhead did not drop by this much. The actual total manufacturing overhead was $168,000—a drop of only $2,000 from the estimate. The manufacturing overhead did not decline by the full $10,000 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 3-7 (15 minutes)

1. Item (a): Actual manufacturing overhead costs 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. Manufacturing Overhead..... 30,000
   Cost of Goods Sold..... 30,000

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

Work in process.....	$ 32,800	8 %
Finished goods.....	41,000	10
Cost of goods sold	336,200	82
Total cost	$410,000	100 %

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

Manufacturing Overhead	30,000	
Work in Process (8% × $30,000).....		2,400
Finished Goods (10% × $30,000)		3,000
Cost of Goods Sold (82% × $30,000).....		24,600

Exercise 3-8 (15 minutes)

1. Actual manufacturing overhead costs		$ 48,000
Manufacturing overhead applied:		
10,000 MH × $5 per MH		50,000
Overapplied overhead cost		$ 2,000
2. Direct materials:		
Raw materials inventory, beginning	$ 8,000	
Add purchases of raw materials	32,000	
Raw materials available for use	40,000	
Deduct raw materials inventory, ending	7,000	
Raw materials used in production		$ 33,000
Direct labor		40,000
Manufacturing overhead cost applied to work in process		50,000
Total manufacturing cost		123,000
Add: Work in process, beginning		6,000
		129,000
Deduct: Work in process, ending		7,500
Cost of goods manufactured		$121,500

Exercise 3-9 (20 minutes)

1. Since $320,000 of studio overhead cost was applied to Work in Process on the basis of $200,000 of direct staff costs, the apparent predetermined overhead rate is 160%:

$$\frac{\text{Studio overhead applied}}{\text{Total amount of the allocation base}} = \frac{\$320{,}000}{\$200{,}000 \text{ direct staff costs}}$$

$$= 160\% \text{ of direct staff costs}$$

2. The Krimmer Corporation Headquarters project is the only job remaining in Work in Process at the end of the month; therefore, the entire $40,000 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 added to the Krimmer Corporation Headquarters project			$40,000
Less:	Direct staff costs	$13,500	
	Studio overhead cost ($13,500 × 160%).....	21,600	35,100
Costs of subcontracted work			$ 4,900

With this information, we can now complete the job cost sheet for the Krimmer Corporation Headquarters project:

Costs of subcontracted work	$ 4,900
Direct staff costs	13,500
Studio overhead	21,600
Total cost to January 31	$40,000

Exercise 3-10 (30 minutes)

1. a.	Raw Materials	315,000	
	Accounts Payable		315,000
b.	Work in Process	216,000	
	Manufacturing Overhead	54,000	
	Raw Materials		270,000
c.	Work in Process	80,000	
	Manufacturing Overhead	110,000	
	Salaries and Wages Payable		190,000
d.	Manufacturing Overhead	63,000	
	Accumulated Depreciation		63,000
e.	Manufacturing Overhead	85,000	
	Accounts Payable		85,000
f.	Work in Process	300,000	
	Manufacturing Overhead		300,000

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

$$= \frac{\$4{,}320{,}000}{576{,}000 \text{ machine-hours}} = \$7.50 \text{ per machine-hour}$$

40,000 MHs × $7.50 per MH = $300,000.

2.

Manufacturing Overhead				Work in Process			
(b)	54,000	300,000	(f)	(b)	216,000		
(c)	110,000			(c)	80,000		
(d)	63,000			(f)	300,000		
(e)	85,000						

Exercise 3-10 (continued)

3. The cost of the completed job would be $596,000 as shown in the Work in Process T-account above. The entry for item (g) would be:

Finished Goods.....	596,000	
Work in Process		596,000

The unit product cost on the job cost sheet would be:
$596,000 ÷ 8,000 units = $74.50 per unit.

Exercise 3-11 (30 minutes)

1.

	Williams	*Chandler*	*Nguyen*
Designer-hours	200	80	120
Predetermined overhead rate	× $45	× $45	× $45
Overhead applied	$9,000	$3,600	$5,400

2.

	Williams	*Chandler*
Direct materials cost	$ 4,800	$1,800
Direct labor cost	2,400	1,000
Overhead applied	9,000	3,600
Total cost	$16,200	$6,400

Completed Projects*	22,600	
Work in Process		22,600

* $16,200 + $6,400

3. The balance in the Work in Process account consists entirely of the costs associated with the Nguyen project:

Direct materials cost	$ 3,600
Direct labor cost	1,500
Overhead applied	5,400
Total cost in work in process	$10,500

4. The balance in the Overhead account is determined as follows:

Overhead			
Actual overhead costs	16,000	18,000	Applied overhead costs
		2,000	Overapplied overhead

As indicated above, the credit balance in the Overhead account is called overapplied overhead.

Exercise 3-12 (30 minutes)

1. The overhead applied to Ms. Miyami's account would be computed as follows:

	2002	*2001*
Estimated overhead cost (a)	$144,000	$144,000
Estimated professional staff hours (b)	2,250	2,400
Predetermined overhead rate (a) ÷ (b)	$64	$60
Professional staff hours charged to Ms. Miyami's account	× 5	× 5
Overhead applied to Ms. Miyami's account	$320	$300

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

	2002	*2001*
Predetermined overhead rate (see above)	$64	$60
Actual professional staff hours charged to clients' accounts (by assumption)	× 2,250	× 2,400
Overhead applied	$144,000	$144,000
Actual overhead cost incurred (by assumption)	144,000	144,000
Under- or overapplied overhead	$ 0	$ 0

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

Estimated overhead cost (a)	$144,000	$144,000
Professional staff hours available (b)	3,000	3,000
Predetermined overhead rate (a) ÷ (b)	$48	$48
Professional staff hours charged to Ms. Miyami's account	× 5	× 5
Overhead applied to Ms. Miyami's account	$240	$240

Problem 3-12 (continued)

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

	2002	*2001*
Predetermined overhead rate (see 3 above) (a).....	$48	$48
Actual professional staff hours charged to clients' accounts (by assumption) (b)	× 2,250	× 2,400
Overhead applied (a) × (b)	$108,000	$115,200
Actual overhead cost incurred (by assumption).....	144,000	144,000
Underapplied overhead	$ 36,000	$ 28,800

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 separately disclosed on the income statement as Cost of Unused Capacity.

Problem 3-13 (45 minutes)

1. and 2.

Cash			
Bal.	15,000	225,000	(c)
(l)	445,000	150,000	(m)
Bal.	85,000		

Accounts Receivable			
Bal.	40,000	445,000	(l)
(k)	450,000		
Bal.	45,000		

Raw Materials			
Bal.	25,000	90,000	(b)
(a)	80,000		
Bal.	15,000		

Work in Process			
Bal.	30,000	310,000	(j)
(b)	85,000		
(c)	120,000		
(i)	96,000		
Bal.	21,000		

Finished Goods			
Bal.	45,000	300,000	(k)
(j)	310,000		
Bal.	55,000		

Prepaid Insurance			
Bal.	5,000	4,800	(f)
Bal.	200		

Buildings & Equipment			
Bal.	500,000		

Accumulated Depreciation			
		210,000	Bal.
		30,000	(e)
		240,000	Bal.

Manufacturing Overhead			
(b)	5,000	96,000	* (i)
(c)	30,000		
(d)	12,000		
(e)	25,000		
(f)	4,000		
(h)	17,000		
		3,000	Bal.

Accounts Payable			
(m)	150,000	75,000	Bal.
		80,000	(a)
		12,000	(d)
		40,000	(g)
		17,000	(h)
		74,000	Bal.

$* \frac{\$80,000}{\$100,000}$ = 80% of direct labor cost; $120,000 × 0.80 = $96,000.

Retained Earnings			
		125,000	Bal.

Capital Stock			
		250,000	Bal.

Problem 3-13 (continued)

Salaries Expense			
(c)	75,000		

Depreciation Expense			
(e)	5,000		

Insurance Expense			
(f)	800		

Shipping Expense			
(g)	40,000		

Cost of Goods Sold			
(k)	300,000		

Sales			
		450,000	(k)

Problem 3-13 (continued)

3. Manufacturing overhead was overapplied by $3,000 for the year. This balance would be allocated between Work in Process, Finished Goods, and Cost of Goods Sold in proportion to the ending balances in these accounts. The allocation would be:

Work in Process, 12/31	$ 21,000	5.6 %
Finished Goods, 12/31	55,000	14.6
Cost of Goods Sold, 12/31	300,000	79.8
	$376,000	100.0 %

Manufacturing Overhead	3,000	
Work in Process (5.6% × $3,000)		168
Finished Goods (14.6% × $3,000)		438
Cost of Goods Sold (79.8% × $3,000)		2,394

4.

Fantastic Props, Inc.
Income Statement
For the Year Ended December 31

Sales		$450,000
Less cost of goods sold ($300,000 – $2,394)		297,606
Gross margin		152,394
Less selling and administrative expenses:		
Salaries expense	$75,000	
Depreciation expense	5,000	
Insurance expense	800	
Shipping expense	40,000	120,800
Net operating income		$ 31,594

Problem 3-14 (45 minutes)

1. a.	Raw Materials	200,000	
	Accounts Payable		200,000
b.	Work in Process	152,000	
	Manufacturing Overhead	38,000	
	Raw Materials		190,000
c.	Work in Process	160,000	
	Manufacturing Overhead	27,000	
	Sales Commissions Expense	36,000	
	Administrative Salaries Expense	80,000	
	Salaries and Wages Payable		303,000
d.	Manufacturing Overhead	42,000	
	Accounts Payable		42,000
e.	Manufacturing Overhead	9,000	
	Insurance Expense	1,000	
	Prepaid Insurance		10,000
f.	Advertising Expense	50,000	
	Accounts Payable		50,000
g.	Manufacturing Overhead	51,000	
	Depreciation Expense	9,000	
	Accumulated Depreciation		60,000
h.	Work in Process	170,000	
	Manufacturing Overhead		170,000

$\frac{\$153,000}{36,000 \text{ MHs}} = \$4.25$ per MH; 40,000 MHs × \$4.25 per MH = \$170,000.

Problem 3-14 (continued)

i. Finished Goods 480,000
Work in Process 480,000

j. Accounts Receivable 700,000
Sales 700,000
Cost of Goods Sold 475,000
Finished Goods 475,000

2.

Raw Materials			
Bal.	16,000	190,000	(b)
(a)	200,000		
Bal.	26,000		

Manufacturing Overhead			
(b)	38,000	170,000	(h)
(c)	27,000		
(d)	42,000		
(e)	9,000		
(g)	51,000		
		3,000	Bal.

Work in Process			
Bal.	10,000	480,000	(i)
(b)	152,000		
(c)	160,000		
(h)	170,000		
Bal.	12,000		

Cost of Goods Sold			
(j)	475,000		

Finished Goods			
Bal.	30,000	475,000	(j)
(i)	480,000		
Bal.	35,000		

3. Manufacturing overhead is overapplied by $3,000. The journal entry to close this balance to Cost of Goods Sold is:

Manufacturing Overhead 3,000
Cost of Goods Sold 3,000

Problem 3-14 (continued)

4.

RAVSTEN COMPANY
Income Statement
For the Year Ended December 31

Sales		$700,000
Less cost of goods sold ($475,000 – $3,000)		472,000
Gross margin		228,000
Less selling and administrative expenses:		
Sales commissions	$36,000	
Administrative salaries	80,000	
Insurance	1,000	
Advertising	50,000	
Depreciation	9,000	176,000
Net operating income		$ 52,000

Problem 3-15 (45 minutes)

1. and 2.

Cash			
Bal.	8,000	190,000	(l)
(k)	197,000		
Bal.	15,000		

Accounts Receivable			
Bal.	13,000	197,000	(k)
(j)	200,000		
Bal.	16,000		

Raw Materials			
Bal.	7,000	40,000	(b)
(a)	45,000		
Bal.	12,000		

Work in Process			
Bal.	18,000	130,000	(i)
(b)	32,000		
(e)	40,000		
(h)	60,000		
Bal.	20,000		

Finished Goods			
Bal.	20,000	120,000	(j)
(i)	130,000		
Bal.	30,000		

Prepaid Insurance			
Bal.	4,000	3,000	(f)
Bal.	1,000		

Plant and Equipment			
Bal.	230,000		

Accumulated Depreciation			
		42,000	Bal.
		28,000	(d)
		70,000	Bal.

Manufacturing Overhead			
(b)	8,000	60,000 *	(h)
(c)	14,600		
(d)	21,000		
(e)	18,000		
(f)	2,400		
Bal.	4,000	4,000	(m)

Accounts Payable			
(l)	100,000	30,000	Bal.
		45,000	(a)
		14,600	(c)
		18,000	(g)
		7,600	Bal.

*$40,000 × 150% = $60,000.

Salaries & Wages Payable			
(l)	90,000	93,400	(e)
		3,400	Bal.

Retained Earnings			
		78,000	Bal.

Problem 3-15 (continued)

Capital Stock			Sales Commissions Expense		
	150,000	Bal.	(e) 10,400		

Administrative Salaries Expense			Depreciation Expense		
(e) 25,000			(d) 7,000		

Insurance Expense			Miscellaneous Expense		
(f) 600			(g) 18,000		

Cost of Goods Sold			Sales		
(j) 120,000				200,000	(j)
(m) 4,000					

3. Overhead is underapplied. Entry (m) above records the closing of this underapplied overhead balance to Cost of Goods Sold.

4.

DURHAM COMPANY
Income Statement
For the Year Ended December 31

Sales		$200,000
Less cost of goods sold ($120,000 + $4,000)		124,000
Gross margin		76,000
Less selling and administrative expenses:		
Depreciation expense	$ 7,000	
Sales commissions expense	10,400	
Administrative salaries expense	25,000	
Insurance expense	600	
Miscellaneous expense	18,000	61,000
Net operating income		$ 15,000

Problem 3-16 (45 minutes)

1. a.	Raw Materials	160,000	
	Accounts Payable		160,000
b.	Work in Process	120,000	
	Manufacturing Overhead	20,000	
	Raw Materials		140,000
c.	Work in Process	90,000	
	Manufacturing Overhead	60,000	
	Sales Commissions Expense	20,000	
	Salaries Expense	50,000	
	Salaries and Wages Payable		220,000
d.	Manufacturing Overhead	13,000	
	Insurance Expense	5,000	
	Prepaid Insurance		18,000
e.	Manufacturing Overhead	10,000	
	Accounts Payable		10,000
f.	Advertising Expense	15,000	
	Accounts Payable		15,000
g.	Manufacturing Overhead	20,000	
	Depreciation Expense	5,000	
	Accumulated Depreciation		25,000
h.	Work in Process	110,000	
	Manufacturing Overhead		110,000

$$\frac{\text{Estimated total manufacturing overhead cost}}{\text{Estimated total amount of the allocation base}} = \frac{£99,000}{45,000 \text{ MHs}} = £2.20 \text{ per MH}$$

50,000 actual MHs × £2.20 per MH = £110,000 overhead applied.

Problem 3-16 (continued)

i.	Finished Goods	310,000	
	Work in Process		310,000
j.	Accounts Receivable	498,000	
	Sales		498,000
	Cost of Goods Sold	308,000	
	Finished Goods		308,000

2.

Raw Materials			
Bal.	10,000	140,000	(b)
(a)	160,000		
Bal.	30,000		

Work in Process			
Bal.	4,000	310,000	(i)
(b)	120,000		
(c)	90,000		
(h)	110,000		
Bal.	14,000		

Finished Goods			
Bal.	8,000	308,000	(j)
(i)	310,000		
Bal.	10,000		

Manufacturing Overhead			
(b)	20,000	110,000	(h)
(c)	60,000		
(d)	13,000		
(e)	10,000		
(g)	20,000		
Bal.	13,000		

Cost of Goods Sold			
(j)	308,000		

3. Manufacturing overhead is underapplied by £13,000 for the year. The entry to close this balance to Cost of Goods Sold would be:

Cost of Goods Sold	13,000	
Manufacturing Overhead		13,000

Problem 3-16 (continued)

4.

Sovereign Millwork, Ltd.
Income Statement
For the Year Ended June 30

Sales		£498,000
Less cost of goods sold (£308,000 + £13,000)		321,000
Gross margin		177,000
Less selling and administrative expenses:		
Sales commissions	£20,000	
Administrative salaries	50,000	
Insurance expense	5,000	
Advertising expenses	15,000	
Depreciation expense	5,000	95,000
Net operating income		£ 82,000

Problem 3-17 (60 minutes)

1.

Raw Materials			
Bal.	40,000	33,500	(a)

Work in Process			
Bal.	77,800*	60,700	(e)
(a)	29,500		
(b)	20,000		
(d)	32,000		
Bal.	98,600		

Finished Goods			
Bal.	85,000		
(e)	60,700		

Manufacturing Overhead			
(a)	4,000	32,000	(d)
(b)	8,000		
(c)	19,000		

Salaries & Wages Payable			
		28,000	(b)

Accounts Payable			
		19,000	(c)

* Job 105 materials, labor, and overhead at November 30 .. $50,300
Job 106 materials, labor, and overhead at November 30 .. 27,500
Total Work in Process inventory at November 30 ..... $77,800

2. a. Work in Process 29,500*
Manufacturing Overhead 4,000
Raw Materials 33,500
*$8,200 + $21,300 = $29,500.

This entry is posted to the T-accounts as entry (a) above.

b. Work in Process ..... 20,000 *
Manufacturing Overhead 8,000
Salaries and Wages Payable 28,000
*$4,000 + $6,000 + $10,000 = $20,000.

This entry is posted to the T-accounts as entry (b) above.

c. Manufacturing Overhead 19,000
Accounts Payable 19,000

This entry is posted to the T-accounts as entry (c) above.

Problem 3-17 (continued)

3. Apparently, the company uses a predetermined overhead rate of 160% of direct labor cost. This figure can be determined by relating the November applied overhead cost on the job cost sheets to the November direct labor cost shown on these sheets. For example, in the case of job 105:

$$\frac{\text{November overhead cost}}{\text{November direct labor cost}} = \frac{\$20,800}{\$13,000} = 160\% \text{ of direct labor cost}$$

The overhead cost applied to each job during December would be:

Job 105: $4,000 × 160%	$ 6,400
Job 106: $6,000 × 160%	9,600
Job 107: $10,000 × 160%	16,000
Total applied overhead	$32,000

The entry to record the application of overhead cost to jobs would be as follows:

Work in Process	32,000	
Manufacturing Overhead		32,000

The entry is posted to the T-accounts as entry (d) above.

4. The total cost of job 105 would be:

Direct materials	$16,500
Direct labor ($13,000 + $4,000)	17,000
Manufacturing overhead applied ($17,000 × 160%)	27,200
Total cost	$60,700

The entry to record the transfer of the completed job would be as follows:

Finished Goods	60,700	
Work in Process		60,700

This entry is posted to the T-accounts as entry (e) above.

Problem 3-17 (continued)

5. As shown in the T-accounts above, the balance in Work in Process at December 31 was $98,600. The breakdown of this amount between jobs 106 and 107 would be as follows:

	Job 106	*Job 107*	*Total*
Direct materials	$17,500	$21,300	$38,800
Direct labor	13,000	10,000	23,000
Manufacturing overhead	20,800	16,000	36,800
Total cost	$51,300	$47,300	$98,600

Problem 3-18 (30 minutes)

1. The predetermined overhead rate would be:

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

$$= \frac{\$1{,}530{,}000}{85{,}000 \text{ computer hours}} = \$18 \text{ per computer hour}$$

2.

Actual manufacturing overhead cost	$1,350,000
Manufacturing overhead cost applied to Work in Process during the year: 60,000 actual computer hours × $18 per computer hour	1,080,000
Underapplied overhead cost	$ 270,000

3.

Cost of Goods Sold	270,000	
Manufacturing Overhead		270,000

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

Overhead applied during the year in:		
Work in process	$ 43,200	4 %
Finished goods	280,800	26
Cost of goods sold	756,000	70
Total	$1,080,000	100 %

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

Work in Process (4% × $270,000)	10,800	
Finished Goods (26% × $270,000)	70,200	
Cost of Goods Sold (70% × $270,000)	189,000	
Manufacturing Overhead		270,000

Problem 3-18 (continued)

5.

Cost of goods sold if the underapplied overhead is closed directly to cost of goods sold ($2,800,000 + $270,000)	$3,070,000
Cost of goods sold if the underapplied overhead is allocated among the accounts ($2,800,000 + $189,000)	2,989,000
Difference in cost of goods sold	$ 81,000

Thus, net operating income will be $81,000 greater if the underapplied overhead is allocated rather than closed directly to Cost of Goods Sold.

Problem 3-19 (45 minutes)

1. a.

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

$$= \frac{\$126{,}000}{\$84{,}000 \text{ direct labor cost}} = 150\% \text{ of direct labor cost}$$

b. Actual manufacturing overhead costs:

Insurance, factory	$ 7,000
Depreciation of equipment	18,000
Indirect labor	42,000
Property taxes	9,000
Maintenance	11,000
Rent, building	36,000
Total actual costs	123,000
Applied manufacturing overhead costs:	
$80,000 × 150%	120,000
Underapplied overhead	$ 3,000

Problem 3-19 (continued)

2.

PACIFIC MANUFACTURING COMPANY
Schedule of Cost of Goods Manufactured

Direct materials:		
Raw materials inventory, beginning	$ 21,000	
Add purchases of raw materials	133,000	
Total raw materials available	154,000	
Deduct raw materials inventory, ending	16,000	
Raw materials used in production		$138,000
Direct labor		80,000
Manufacturing overhead applied to work in process		120,000
Total manufacturing cost		338,000
Add: Work in process, beginning		44,000
		382,000
Deduct: Work in process, ending		40,000
Cost of goods manufactured		$342,000

3. Cost of goods sold:

Finished good inventory, beginning	$ 68,000
Add: Cost of goods manufactured	342,000
Goods available for sale	410,000
Deduct: Finished goods inventory, ending	60,000
Cost of goods sold	$350,000

Under- or overapplied overhead may either be (1) closed directly to the Cost of Goods Sold account, or (2) allocated between Work in Process, Finished Goods, and Cost of Goods Sold in proportion to the overhead applied during the year in the ending balance of each of these accounts.

Problem 3-19 (continued)

4. Direct materials ..... $ 3,200
   Direct labor 4,200
   Overhead applied (150% × 4,200) 6,300
   Total manufacturing cost $13,700

   $13,700 × 140% = $19,180 price to customer.

5. The amount of overhead cost in Work in Process would be:

   $8,000 direct labor cost × 150% =$12,000

   The amount of direct materials cost in Work in Process would be:

Total ending work in process		$40,000
Deduct:		
Direct labor	$ 8,000	
Manufacturing overhead	12,000	20,000
Direct materials		$20,000

   The completed schedule of costs in Work in Process would be:

Direct materials	$20,000
Direct labor	8,000
Manufacturing overhead	12,000
Work in process inventory	$40,000

Problem 3-20 (75 minutes)

1. a.	Raw Materials	820,000	
	Accounts Payable		820,000
b.	Work in Process	817,000	
	Manufacturing Overhead	13,000	
	Raw Materials		830,000
c.	Work in Process	140,000	
	Manufacturing Overhead	60,000	
	Salaries and Wages Payable		200,000
d.	Salaries Expense	150,000	
	Salaries and Wages Payable		150,000
e.	Prepaid Insurance	38,000	
	Cash		38,000
	Manufacturing Overhead	39,400	
	Insurance Expense	600	
	Prepaid Insurance		40,000
f.	Marketing Expense	100,000	
	Accounts Payable		100,000
g.	Manufacturing Overhead	28,000	
	Depreciation Expense	12,000	
	Accumulated Depreciation		40,000
h.	Manufacturing Overhead	12,600	
	Accounts Payable		12,600
i.	Work in Process	156,000	
	Manufacturing Overhead		156,000

$\frac{\$135,000}{18,000 \text{ DLH}}$ =$7.50 per DLH; 20,800 DLH × $7.50 per DLH = $156,000.

Problem 3-20 (continued)

j.	Finished Goods	1,106,000	
	Work in Process		1,106,000
k.	Accounts Receivable	1,420,000	
	Sales		1,420,000
	Cost of Goods Sold	1,120,000	
	Finished Goods		1,120,000
l.	Cash	1,415,000	
	Accounts Receivable		1,415,000
m.	Accounts Payable	970,000	
	Salaries and Wages Payable	348,000	
	Cash		1,318,000

Problem 3-20 (continued)

2.

Cash			
Bal.	9,000	38,000	(e)
(l)	1,415,000	1,318,000	(m)
Bal.	68,000		

Accounts Receivable			
Bal.	30,000	1,415,000	(l)
(k)	1,420,000		
Bal.	35,000		

Raw Materials			
Bal.	16,000	830,000	(b)
(a)	820,000		
Bal.	6,000		

Work in Process			
Bal.	21,000	1,106,000	(j)
(b)	817,000		
(c)	140,000		
(i)	156,000		
Bal.	28,000		

Finished Goods			
Bal.	38,000	1,120,000	(k)
(j)	1,106,000		
Bal.	24,000		

Prepaid Insurance			
Bal.	7,000	40,000	(e)
(e)	38,000		
Bal.	5,000		

Buildings and Equipment			
Bal.	300,000		

Accumulated Depreciation			
		128,000	Bal.
		40,000	(g)
		168,000	Bal.

Manufacturing Overhead			
(b)	13,000	156,000	(i)
(c)	60,000		
(e)	39,400		
(g)	28,000		
(h)	12,600		
		3,000	Bal.

Salaries & Wages Payable			
(m)	348,000	3,000	Bal.
		200,000	(c)
		150,000	(d)
		5,000	Bal.

Accounts Payable			
(m)	970,000	60,000	Bal.
		820,000	(a)
		100,000	(f)
		12,600	(h)
		22,600	Bal.

Problem 3-20 (continued)

Retained Earnings			Capital Stock		
	30,000	Bal.		200,000	Bal.

Marketing Expense			Depreciation Expense		
(f)	100,000		(g)	12,000	

Insurance Expense			Salaries Expense		
(e)	600		(d)	150,000	

Cost of Goods Sold			Sales		
(k)	1,120,000			1,420,000	(k)

Problem 3-20 (continued)

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

Manufacturing Overhead	3,000	
Cost of Goods Sold		3,000

4.

Celestial Displays, Inc.
Income Statement
For the Year Ended December 31

Sales		$1,420,000
Less cost of goods sold ($1,120,000 – $3,000)		1,117,000
Gross margin		303,000
Less selling and administrative expenses:		
Salaries expense	$150,000	
Insurance expense	600	
Marketing expense	100,000	
Depreciation expense	12,000	262,600
Net operating income		$ 40,400

Problem 3-21 (30 minutes)

1. Preparation Department predetermined overhead rate:

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

$$= \frac{\$416{,}000}{80{,}000 \text{ machine-hours}} = \$5.20 \text{ per machine-hour}$$

Fabrication Department predetermined overhead rate:

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

$$= \frac{\$720{,}000}{\$400{,}000 \text{ materials cost}} = 180\% \text{ of materials cost}$$

2. Preparation Department overhead applied:
   350 machine-hours × $5.20 per machine-hour $1,820
   Fabrication Department overhead applied:
   $1,200 direct materials cost × 180% 2,160
   Total overhead cost $3,980

3. Total cost of job 127:

	Preparation	*Fabrication*	*Total*
Direct materials.....	$ 940	$1,200	$2,140
Direct labor.....	710	980	1,690
Manufacturing overhead...	1,820	2,160	3,980
Total cost	$3,470	$4,340	$7,810

Unit product cost for job 127:

$$\text{Average cost per unit} = \frac{\$7{,}810}{25 \text{ units}} = \$312.40 \text{ per unit}$$

Problem 3-21 (continued)

4.

	Preparation	*Fabrication*
Manufacturing overhead cost incurred.....	$390,000	$740,000
Manufacturing overhead cost applied:		
73,000 machine-hours × $5.20 per machine-hour	379,600	
$420,000 direct materials cost × 180%.....		756,000
Underapplied (or overapplied) overhead...	$ 10,400	$(16,000)

Problem 3-22 (30 minutes)

1. Research & Documents predetermined overhead rate:

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

$$= \frac{\$700{,}000}{20{,}000 \text{ hours}} = \$35 \text{ per hour}$$

Litigation predetermined overhead rate:

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

$$= \frac{\$320{,}000}{\$800{,}000 \text{ direct attorney cost}} = 40\% \text{ of direct attorney cost}$$

2.

Research & Documents overhead applied:	
18 hours × $35 per hour	$ 630
Litigation overhead applied: $2,100 × 40%	840
Total overhead cost	$1,470

3. Total cost of case 618–3:

	Departments		
	Research & Documents	*Litigation*	*Total*
Materials and supplies	$ 50	$ 30	$ 80
Direct attorney cost	410	2,100	2,510
Overhead cost applied	630	840	1,470
Total cost	$1,090	$2,970	$4,060

Problem 3-22 (continued)

4.

	Department	
	Research & Documents	*Litigation*
Departmental overhead cost incurred	$770,000	$300,000
Departmental overhead cost applied:		
23,000 hours × $35 per hour	805,000	
$725,000 × 40%		290,000
Underapplied (or overapplied) overhead	$ (35,000)	$ 10,000

Problem 3-23 (60 minutes)

1. The overhead applied to the Slug Fest job would be computed as follows:

	2002	*2001*
Estimated studio overhead cost (a)	$90,000	$90,000
Estimated hours of studio service (b)	750	1,000
Predetermined overhead rate (a) ÷ (b)	$120	$90
Slug Fest job's studio hours	× 30	× 30
Overhead applied to the Slug Fest job	$3,600	$2,700

   Overhead is underapplied for both years as computed below:

	2002	*2001*
Predetermined overhead rate (see above) (a)	$120	$90
Actual hours of studio service provided (b)	600	900
Overhead applied (a) × (b)	$72,000	$81,000
Actual studio cost incurred	90,000	90,000
Underapplied overhead	$18,000	$ 9,000

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

	2002	*2001*
Estimated studio overhead cost (a)	$90,000	$90,000
Hours of studio service at capacity (b)	1,800	1,800
Predetermined overhead rate (a) ÷ (b)	$50	$50
Slug Fest job's studio hours	× 30	× 30
Overhead applied to the Slug Fest job	$1,500	$1,500

Problem 3-23 (continued)

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

	2002	*2001*
Predetermined overhead rate (see above) (a)	$50	$50
Actual hours of studio service provided (b)	600	900
Overhead applied (a) × (b)	$30,000	$45,000
Actual studio cost incurred	90,000	90,000
Underapplied overhead	$60,000	$45,000

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 be treated as a period expense that would be separately disclosed on the income statement as Cost of Unused Capacity.

4. Skid Road Recording'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 Slug Fest job has increased between 2001 and 2002. 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, Skid Road Recording'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.

Problem 3-23 (continued)

Under the alternative approach, the overhead cost of the Slug Fest job is stable at $1,500 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 Slug Fest 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 $1,500 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 will be less likely to send managers misleading signals.

Problem 3-24 (45 minutes)

1. The cost of raw materials put into production would be:

Raw materials inventory, 1/1	$ 30,000
Debits (purchases of materials)	420,000
Materials available for use	450,000
Raw materials inventory, 12/31	60,000
Materials requisitioned for production	$390,000

2. Of the $390,000 in materials requisitioned for production, $320,000 was debited to Work in Process as direct materials. Therefore, the difference of $70,000 ($390,000 – $320,000 = $70,000) would have been debited to Manufacturing Overhead as indirect materials.

3. Total factory wages accrued during the year

(credits to the Factory Wages Payable account)	$175,000
Less direct labor cost (from Work in Process)	110,000
Indirect labor cost	$ 65,000

4. The cost of goods manufactured for the year would have been $810,000—the credits to Work in Process.

5. The Cost of Goods Sold for the year would have been:

Finished goods inventory, 1/1	$ 40,000
Add: Cost of goods manufactured (from Work in Process)	810,000
Goods available for sale	850,000
Finished goods inventory, 12/31	130,000
Cost of goods sold	$720,000

Problem 3-24 (continued)

6. The predetermined overhead rate would have been:

$$\text{Predetermined overhead rate} = \frac{\text{Manufacturing overhead cost applied}}{\text{Direct materials cost}}$$

$$= \frac{\$400,000}{\$320,000} = 125\% \text{ of direct materials cost}$$

7. Manufacturing overhead would have been overapplied by $15,000, computed as follows:

Actual manufacturing overhead cost for the year (debits)	$385,000
Applied manufacturing overhead cost (from Work in Process—this would be the credits to the Manufacturing Overhead account)	400,000
Overapplied overhead	$(15,000)

8. The ending balance in Work in Process is $90,000. Direct labor makes up $18,000 of this balance, and manufacturing overhead makes up $40,000. The computations are:

Balance, Work in Process, 12/31	$90,000
Less: Direct materials cost (given)	(32,000)
Manufacturing overhead cost ($32,000 × 125%)	(40,000)
Direct labor cost (remainder)	$18,000

Problem 3-25 (60 minutes)

1. a.

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

$$= \frac{\$1{,}440{,}000}{\$900{,}000 \text{ direct labor cost}} = 160\% \text{ of direct labor cost}$$

b. $21,200 × 160% = $33,920.

2. a.

	Cutting Department	*Machining Department*	*Assembly Department*
Estimated manufacturing overhead cost (a)	$540,000	$800,000	$100,000
Estimated direct labor cost (b)	$300,000	$200,000	$400,000
Predetermined overhead rate (a) ÷ (b)	180%	400%	25%

b.

Cutting Department:	
$6,500 × 180%	$11,700
Machining Department:	
$1,700 × 400%	6,800
Assembly Department:	
$13,000 × 25%	3,250
Total applied overhead	$21,750

3. The bulk of the labor cost on the Hastings job is in the Assembly Department, which incurs very little overhead cost. The department has an overhead rate of only 25% 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.

Problem 3-25 (continued)

Use of a plantwide overhead rate, however, in effect redistributes overhead costs proportionately between the three departments (at 160% of direct labor cost) and results in a large amount of overhead cost being charged to the Hastings job, as shown in Part 1. This may explain why the company 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 Cutting or Machining Departments the opposite will be true, and the company will tend to charge too little overhead cost to these jobs if a plantwide overhead rate is being used. The reason is that the plantwide overhead rate (160%) is much lower than the rates would be if these departments were considered separately.

4. The company's bid price was:

Direct materials	$ 18,500
Direct labor	21,200
Manufacturing overhead applied (above)	33,920
Total manufacturing cost	73,620
Bidding rate	× 1.5
Total bid price	$110,430

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

Direct materials	$ 18,500
Direct labor	21,200
Manufacturing overhead applied (above)	21,750
Total manufacturing cost	61,450
Bidding rate	× 1.5
Total bid price	$ 92,175

Problem 3-25 (continued)

Note that if departmental overhead rates had been used, Lenko Products would have been the low bidder on the Hastings job since the competitor underbid Lenko by only $10,000.

5. a.

Actual overhead cost	$1,482,000
Applied overhead cost ($870,000 × 160%)	1,392,000
Underapplied overhead cost	$ 90,000

b.

	Department			
	Cutting	*Machining*	*Assembly*	*Total Plant*
Actual overhead cost	$560,000	$830,000	$92,000	$1,482,000
Applied overhead cost:				
$320,000 × 180%	576,000			
$210,000 × 400%		840,000		
$340,000 × 25%			85,000	1,501,000
Underapplied (overapplied) overhead cost	$(16,000)	$(10,000)	$ 7,000	$ (19,000)

Problem 3-26 (120 minutes)

1.

Cash			
Bal.	18,000	890,000	(n)
(m)	950,000		
Bal.	78,000		

Accounts Receivable			
Bal.	40,000	950,000	(m)
(l)	1,000,000		
Bal.	90,000		

Raw Materials			
Bal.	25,000	190,000	(b)
(a)	180,000		
Bal.	15,000		

Work in Process			
Bal.	32,000	635,000	(k)
(b)	190,000		
(d)	200,000		
(j)	240,000		
Bal.	27,000		

Finished Goods			
Bal.	60,000	650,000	(l)
(k)	635,000		
Bal.	45,000		

Prepaid Insurance			
Bal.	5,000	4,000	(e)
Bal.	1,000		

Plant & Equipment			
Bal.	400,000		

Accumulated Depreciation			
		148,000	Bal.
		50,000	(h)
		198,000	Bal.

Manufacturing Overhead			
(c)	57,000	240,000	* (j)
(d)	90,000		
(e)	3,000		
(f)	16,000		
(h)	40,000		
(i)	30,000		
		4,000	Bal.

Accounts Payable			
(n)	478,000	90,000	Bal.
		180,000	(a)
		57,000	(c)
		16,000	(f)
		150,000	(g)
		48,000	(i)
		63,000	Bal.

$$* \frac{\text{Estimated total manuf. overhead cost}}{\text{Estimated direct labor cost}} = \frac{\$228,000}{\$190,000}$$

$$= 120\% \text{ of direct labor cost}$$

$\$200,000$ direct labor cost $\times$ 120% = $\$240,000$

Problem 3-26 (continued)

Salaries & Wages Payable			
(n)	412,000	3,000	Bal.
		410,000	(d)
		1,000	Bal.

Retained Earnings		
	89,000	Bal.

Capital Stock		
	250,000	Bal.

Salaries Expense		
(d)	120,000	

Insurance Expense		
(e)	1,000	

Advertising Expense		
(g)	150,000	

Depreciation Expense		
(h)	10,000	

Miscellaneous Expense		
(i)	18,000	

Cost of Goods Sold		
(l)	650,000	

Sales		
	1,000,000	(l)

Problem 3-26 (continued)

2.

TOP-PRODUCTS, INC.
Schedule of Cost of Goods Manufactured
For the Year Ended December 31

Direct materials:		
Raw materials inventory, Jan. 1	$ 25,000	
Add: Purchases of raw materials	180,000	
Materials available for use	205,000	
Raw materials inventory, Dec. 31	15,000	
Raw materials used in production		$190,000
Direct labor		200,000
Manufacturing overhead applied to work in process		240,000
Total manufacturing costs		630,000
Add: Work in process, Jan. 1		32,000
		662,000
Deduct: Work in process, Dec. 31		27,000
Cost of goods manufactured		$635,000

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

Schedule of cost of goods sold:		
Finished goods inventory, Jan. 1	$ 60,000	
Add: Cost of goods manufactured	635,000	
Goods available for sale	695,000	
Finished goods inventory, Dec. 31	45,000	
Unadjusted cost of goods sold	650,000	
Deduct: Overapplied overhead	4,000	
Adjusted cost of goods sold	$646,000	

Problem 3-26 (continued)

4.

TOP-PRODUCTS, INC.
Income Statement
For the Year Ended December 31

Sales		$1,000,000
Less cost of goods sold		646,000
Gross margin		354,000
Less selling and administrative expenses:		
Salaries expense	$120,000	
Insurance expense	1,000	
Advertising expense	150,000	
Depreciation expense	10,000	
Miscellaneous expense	18,000	299,000
Net operating income		$ 55,000

5.

Direct materials	$ 2,400
Direct labor	3,000
Manufacturing overhead applied ($3,000 × 120%)	3,600
Total manufacturing cost of job 316	9,000
Billing rate	× 1.40
Total amount billed	$12,600

$12,600 ÷ 300 units = $42 per unit.

Problem 3-27 (120 minutes)

1. a.	Raw Materials	142,000	
	Accounts Payable		142,000
b.	Work in Process	150,000	
	Raw Materials		150,000
c.	Manufacturing Overhead	21,000	
	Accounts Payable		21,000
d.	Work in Process	216,000	
	Manufacturing Overhead	90,000	
	Salaries Expense	145,000	
	Salaries and Wages Payable		451,000
e.	Manufacturing Overhead	15,000	
	Accounts Payable		15,000
f.	Advertising Expense	130,000	
	Accounts Payable		130,000
g.	Manufacturing Overhead	45,000	
	Depreciation Expense	5,000	
	Accumulated Depreciation		50,000
h.	Manufacturing Overhead	72,000	
	Rent Expense	18,000	
	Accounts Payable		90,000
i.	Miscellaneous Expense	17,000	
	Accounts Payable		17,000

Problem 3-27 (continued)

j.	Work in Process	240,000	
	Manufacturing Overhead		240,000

$$\frac{\text{Estimated total manufacturing overhead cost}}{\text{Estimated direct materials cost}} = \frac{\$248,000}{\$155,000}$$

$$= 160\% \text{ of direct materials cost.}$$

$150,000 direct materials cost × 160% = $240,000 applied.

k.	Finished Goods	590,000	
	Work in Process		590,000
l.	Accounts Receivable	1,000,000	
	Sales		1,000,000
	Cost of Goods Sold	600,000	
	Finished Goods		600,000

Problem 3-27 (continued)

2.

Accounts Receivable			
(l)	1,000,000		

Raw Materials			
Bal.	18,000	150,000	(b)
(a)	142,000		
Bal.	10,000		

Work in Process			
Bal.	24,000	590,000	(k)
(b)	150,000		
(d)	216,000		
(j)	240,000		
Bal.	40,000		

Finished Goods			
Bal.	35,000	600,000	(l)
(k)	590,000		
Bal.	25,000		

Manufacturing Overhead			
(c)	21,000	240,000	(j)
(d)	90,000		
(e)	15,000		
(g)	45,000		
(h)	72,000		
Bal.	3,000		

Accounts Payable		
	142,000	(a)
	21,000	(c)
	15,000	(e)
	130,000	(f)
	90,000	(h)
	17,000	(i)

Accumulated Depreciation		
	50,000	(g)

Depreciation Expense		
(g)	5,000	

Salaries & Wages Payable		
	451,000	(d)

Salaries Expense		
(d)	145,000	

Miscellaneous Expense		
(i)	17,000	

Advertising Expense		
(f)	130,000	

Rent Expense		
(h)	18,000	

Cost of Goods Sold		
(l)	600,000	

Sales		
	1,000,000	(l)

Problem 3-27 (continued)

3.

SOUTHWORTH COMPANY
Schedule of Cost of Goods Manufactured

Direct materials:		
Raw materials inventory, beginning	$ 18,000	
Purchases of raw materials	142,000	
Materials available for use	160,000	
Raw materials inventory, ending	10,000	
Materials used in production		$150,000
Direct labor		216,000
Manufacturing overhead applied to work in process		240,000
Total manufacturing cost		606,000
Add: Work in process, beginning		24,000
		630,000
Deduct: Work in process, ending		40,000
Cost of goods manufactured		$590,000

4.

Cost of Goods Sold	3,000	
Manufacturing Overhead		3,000

Schedule of cost of goods sold:

Finished goods inventory, beginning	$ 35,000
Add: Cost of goods manufactured	590,000
Goods available for sale	625,000
Finished goods inventory, ending	25,000
Unadjusted cost of goods sold	600,000
Add underapplied overhead	3,000
Adjusted cost of goods sold	$603,000

Problem 3-27 (continued)

5.

SOUTHWORTH COMPANY
Income Statement

Sales		$1,000,000
Less cost of goods sold		603,000
Gross margin		397,000
Less selling and administrative expenses:		
Salaries expense	$145,000	
Advertising expense	130,000	
Depreciation expense	5,000	
Rent expense	18,000	
Miscellaneous expense	17,000	315,000
Net operating income		$ 82,000

6.

Direct materials	$ 3,600
Direct labor (400 hours × $11 per hour)	4,400
Manufacturing overhead cost applied (160% × $3,600)	5,760
Total manufacturing cost	13,760
Add markup (75% × $13,760)	10,320
Total billed price of job 218	$24,080

$24,080 ÷ 500 units = $48.16 per unit.

Case 3-28 (60 minutes)

This case is difficult; allow ample time for classroom discussion.

1. Work in process inventory, April 30 ..... $5,300
2. Raw materials purchased during April $42,000
3. Overhead applied to work in process $15,600
4. Cost of goods sold for April $84,000
5. Overapplied overhead $800
6. Raw materials usage during April $43,000
7. Raw materials inventory, April 30 ..... $11,000

Entries given in the T-accounts are derived from the information given in the problem, and are keyed according to source (a, b, etc.).

a. Predetermined overhead rate: $180,000 ÷ 60,000 DLHs = $3 per DLH.

b. Work in process balance at April 30 consists of:

Materials	$2,600
Direct labor (300 hours × $6 per hour)	1,800
Overhead applied (300 hours × $3 per hour)	900
Total	$5,300

Case 3-28 (continued)

Raw Materials

(Given)	Bal. 4/1	12,000	(g)	Direct materials	43,000
(c)		42,000			
(h)	Bal. 4/30	11,000			

Work in Process

(Given)	Bal. 4/1	4,500	(f)	Cost of Goods Manufactured	89,000
(b,d)	Direct labor	31,200			
(a,d)	Overhead applied	15,600			
(g)	Direct materials	43,000			
(b)	Bal. 4/30	5,300			

Finished Goods

(e)	Bal. 4/1	11,000	(i)	Cost of Goods Sold	84,000
(f)	Cost of Goods Manufactured	89,000			
(Given)	Bal. 4/30	16,000			

Manufacturing Overhead

(Given)		14,800	(a,d)	Overhead applied	15,600
				Overapplied overhead	800

Accounts Payable

(c)	Payments	40,000	(c)	Bal. 4/1	6,000
			(c)	Purchases must be	42,000
			(Given)	Bal. 4/30	8,000

Cost of Goods Sold

(i)		84,000			

Case 3-28 (continued)

Entries for which no information was provided:

g. The direct materials can be computed from what is already known about the Work in Process account.

h. The April 30 balance in Raw Materials can be determined after entry (g) is entered into the account.

i. The cost of goods sold can be computed from the amounts already determined in the Finished Goods Inventory account.

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 Cristin Madsen'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 Cristin go in bucking her boss on a new job?

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

   While Cristin is in an extremely difficult position, her responsibilities under the IMA's Standards of Ethical Conduct for Management Accountants seem to be clear. The Objectivity Standard states that "management accountants have a responsibility to disclose fully all relevant information that could reasonably be expected to influence an intended user's understanding of the reports, comments, and recommendations presented." Cristin 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 (120 minutes)

1. **Traditional approach:**

Actual total manufacturing overhead cost incurred (assumed to equal the original estimate)	$2,000,000
Manufacturing overhead applied (80,000 units × $25 per unit)	2,000,000
Overhead under- or overapplied	$ 0

TurboDrives, Inc.
Income Statement: Traditional Approach

Revenue (75,000 units × $70 per unit)		$5,250,000
Cost of Goods Sold:		
Variable manufacturing (75,000 units × $18 per unit)	$1,350,000	
Manufacturing overhead applied (75,000 units × $25 per unit)	1,875,000	3,225,000
Gross margin		2,025,000
Administrative and selling expenses		1,950,000
Net operating income		$ 75,000

New approach:

TurboDrives, Inc.
Income Statement: New Approach

Revenue (75,000 units × $70 per unit)		$5,250,000
Cost of Goods Sold:		
Variable manufacturing (75,000 units × $18 per unit)	$1,350,000	
Manufacturing overhead applied (75,000 units × $20 per unit)	1,500,000	2,850,000
Gross margin		2,400,000
Cost of Unused Capacity [(100,000 units – 80,000 units) × $20 per unit]		400,000
Administrative and selling expenses		1,950,000
Net operating income		$ 50,000

Case 3-30 (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 that is deducted from Cost of Goods Sold.

Additional net operating income required to attain target net operating income ($210,000 - $75,000) (a)	$135,000
Overhead applied per unit of output (b)	$25 per unit
Additional output required to attain target net operating income (a) ÷ (b)	5,400 units
Actual total manufacturing overhead cost incurred	$2,000,000
Manufacturing overhead applied [(80,000 units + 5,400 units) × $25 per unit]	2,135,000
Overhead overapplied	$ 135,000

TurboDrives, Inc.
Income Statement: Traditional Approach

Revenue (75,000 units × $70 per unit)		$5,250,000
Cost of Goods Sold:		
Variable manufacturing (75,000 units × $18 per unit)	$1,350,000	
Manufacturing overhead applied (75,000 units × $25 per unit)	1,875,000	
Less: Manufacturing overhead overapplied	135,000	3,090,000
Gross margin		2,160,000
Administrative and selling expenses		1,950,000
Net operating income		$ 210,000

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 $210,000.

Case 3-30 (continued)

New approach:
Under the new approach, the reported net operating income can be increased by increasing the production level which then 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 ($210,000 - $50,000) (a)	$160,000
Overhead applied per unit of output (b)	$20 per unit
Additional output required to attain target net operating income (a) ÷ (b)	8,000 units
Estimated number of units produced	80,000 units
Actual number of units to be produced	88,000 units

TurboDrives, Inc.
Income Statement: New Approach

Revenue (75,000 units × $70 per unit)		$5,250,000
Cost of Goods Sold:		
Variable manufacturing (75,000 units × $18 per unit)	$1,350,000	
Manufacturing overhead applied (75,000 units × $20 per unit)	1,500,000	2,850,000
Gross margin		2,400,000
Cost of Unused Capacity [(100,000 units - 88,000 units) × $20 per unit]		240,000
Administrative and selling expenses		1,950,000
Net operating income		$ 210,000

Case 3-30 (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 5,400 units. Under the new method, the production would have to be increased by 8,000 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, since 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 ethical. 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 the 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.

Case 3-31 (45 minutes)

1. The revised predetermined overhead rate is determined as follows:

Original estimated total manufacturing overhead....	$2,475,000
Plus: Lease cost of the new machine	300,000
Plus: Cost of new technician/programmer	45,000
Estimated total manufacturing overhead.....	$2,820,000

Original estimated total direct labor-hours	52,000
Less: Estimated reduction in direct labor-hours	6,000
Estimated total direct labor-hours.....	46,000

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

$$= \frac{\$2{,}820{,}000}{46{,}000 \text{ DLHs}}$$

$$= \$61.30 \text{ per DLH}$$

The revised predetermined overhead rate is higher than the original rate because the automated milling machine will increase the overhead for the year (the numerator in the rate) and will decrease the direct labor-hours (the denominator in the rate). This double-whammy effect increases the predetermined overhead rate.

2. Acquisition of the automated milling machine will increase the apparent costs of all jobs—not just those that use the new facility. This is because the company uses a plantwide overhead rate. If there were a different overhead rate for each department, this would not happen.

3. The predetermined overhead rate is now considerably higher than it was. This will penalize products that continue to use the same amount of direct labor-hours. Such products will now appear to be less profitable and the managers of these products will appear to be doing a poorer job. There may be pressure to increase the prices of these products even though there has in fact been no increase in their real costs.

Case 3-31 (continued)

4. While it may have been a good idea to acquire the new equipment because of its greater capabilities, the calculations of the cost savings were in error. The original calculations implicitly assumed that overhead would decrease because of the reduction in direct labor-hours. In reality, the overhead increased because of the additional costs of the new equipment. A differential cost analysis would reveal that the automated equipment would *increase* total cost by about $285,000 a year if the labor reduction is only 2,000 hours.

   Cost consequences of leasing the automated equipment:

Increase in manufacturing overhead cost:	
Lease cost of the new machine	$300,000
Cost of new technician/programmer	45,000
	345,000
Less: labor cost savings (2,000 hours × $30 per hour)	60,000
Net increase in annual costs	$285,000

   Even if the entire 6,000-hour reduction in direct labor-hours occurred, that would have added only $120,000 (4,000 hours × $30 per hour) in cost savings. The net increase in annual costs would have been $165,000 and the machine would still be an unattractive proposal. The entire 6,000-hour reduction may ultimately be realized as workers retire or quit. However, this is by no means automatic.

   There are two morals to this tale. First, predetermined overhead rates should not be misinterpreted as variable costs. They are not. Second, a reduction in direct labor *requirements* does not necessarily lead to a reduction in direct labor hours *paid*. It is often very difficult to actually reduce the direct labor force and may be virtually impossible in some countries except through natural attrition.

Group Exercise 3-32

Student answers will depend on who they contact. For illustration purposes, we contacted the chief financial officer of Avianne Healthcare Products, a manufacturer of scented soaps and lotions, who provided us with the following information.

1. According to the CFO, the company uses process costing.

2. Overhead is assigned on the basis of direct labor-hours. The overhead rate is roughly $5 per direct labor-hour.

3. Products costs are used in making decisions. The costs of raw materials affect how much of each product is manufactured and each product's selling price. According to the CFO, costs much be watched closely to maintain a successful business.

4. Production volume and costs should be carefully monitored to avoid wasteful excess inventory. Changes in sales should be monitored to determine the quantity of each product that needs to be produced.

5. The company has maintained the same cost system since it was started in 1979.