Chapter 2
Job-Order Costing: Calculating Unit Product Costs

Questions

2-1 Job-order costing is used in situations where many different products, each with individual and unique features, are produced each period.

2-2 In absorption costing, all manufacturing costs, both fixed and variable, are assigned to units of product—units are said to *fully absorb manufacturing costs*. Conversely, all nonmanufacturing costs are treated as period costs and they are not assigned to units of product.

2-3 Normal costing systems apply overhead costs to jobs by multiplying a predetermined overhead rate by the actual amount of the allocation incurred by the job.

2-4 Unit product cost is computed by taking the total manufacturing costs assigned to a job and dividing it by the number of units contained in the job.

2-5 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.

2-6 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.

2-7 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.

2-8 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.

2-9 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.

2-10 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.

2-11 No, you would not expect the total applied overhead for a period to equal the actual overhead for that period. This is because the applied overhead relies on a predetermined overhead rate that is based on estimates in the numerator and denominator.

2-12 When a company applied less overhead to production than it actually incurs, it creates what is known as underapplied overhead. When it applies more overhead to production than it actually incurs, it results in overapplied overhead.

2-13 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.

Chapter 2: Applying Excel

The completed worksheet is shown below.

	A	B	C	D	E
1	**Chapter 2: Applying Excel**				
2					
3	**Data**				
4	Markup on job cost	75%			
5					
6		Department			
7		Milling	Assembly		
8	Machine-hours	60,000	3,000		
9	Direct labor-hours	8,000	80,000		
10	Total fixed manufacturing overhead cost	$390,000	$500,000		
11	Variable manufacturing overhead per machine-hour	$2.00			
12	Variable manufacturing overhead per direct labor-hour		$3.75		
13					
14	Cost summary for Job 407	Department			
15		Milling	Assembly		
16	Machine-hours	90	4		
17	Direct labor-hours	5	20		
18	Direct materials	$800	$370		
19	Direct labor cost	$70	$280		
20					
21	*Enter a formula into each of the cells marked with a ? below*				
22					
23	**Step 1: Calculate the estimated total manufacturing overhead cost for each department**				
24		Milling	Assembly		
25	Total fixed manufacturing overhead cost	$390,000	$500,000		
26	Variable manufacturing overhead per machine-hour or direct labor-hour	$2.00	$3.75		
27	Total machine-hours or direct labor-hours	60,000	80,000		
28	Total variable manufacturing overhead	$120,000	$300,000		
29	Total manufacturing overhead	$510,000	$800,000		
30					
31	**Step 2: Calculate the predetermined overhead rate in each department**				
32		Milling	Assembly		
33	Total manufacturing overhead	$510,000	$800,000		
34	Total machine-hours or direct labor-hours	60,000	80,000		
35	Predetermined overhead rate per machine-hour or direct labor-hour	$8.50	$10.00		
36					
37	**Step 3: Calculate the amount of overhead applied from both departments to Job 407**				
38		Milling	Assembly		
39	Predetermined overhead rate per machine-hour or direct labor-hour	$8.50	$10.00		
40	Machine-hours or direct labor-hours for the job	90	20		
41	Manufacturing overhead applied	$765.00	$200.00		
42					
43	**Step 4: Calculate the total job cost for Job 407**				
44		Milling	Assembly	Total	
45	Direct materials	$800.00	$370.00	$1,170.00	
46	Direct labor cost	$70.00	$280.00	$350.00	
47	Manufacturing overhead applied	$765.00	$200.00	$965.00	
48	Total cost of Job 407			$2,485.00	
49					
50	**Step 5: Calculate the selling price for Job 407**				
51	Total cost of Job 407			$2,485.00	
52	Markup			$1,863.75	
53	Selling price of Job 407			$4,348.75	
54					

Chapter 2 Form | **Filled in Chapter 2 Form** | ...

Chapter 2: Applying Excel (continued)

The completed worksheet, with formulas displayed, is shown below.

	A	B	C	D
1	Chapter 2: Applying Excel			
2				
3	**Data**			
4	Markup on job cost	0.75		
5				
6			Department	
7		Milling	Assembly	
8	Machine-hours	60000	3000	
9	Direct labor-hours	8000	80000	
10	Total fixed manufacturing overhead cost	390000	500000	
11	Variable manufacturing overhead per machine-hour	2		
12	Variable manufacturing overhead per direct labor-hour		3.75	
13				
14	Cost summary for Job 407		Department	
15		Milling	Assembly	
16	Machine-hours	90	4	
17	Direct labor-hours	5	20	
18	Direct materials	800	370	
19	Direct labor cost	70	280	
20				
21	*Enter a formula into each of the cells marked with a ? below*			
22				
23	**Step 1: Calculate the estimated total manufacturing overhead cos**			
24		Milling	Assembly	
25	Total fixed manufacturing overhead cost	=B10	=C10	
26	Variable manufacturing overhead per machine-hour or direct labor-hour	=B11	=C12	
27	Total machine-hours or direct labor-hours	=B8	=C9	
28	Total variable manufacturing overhead	=B26*B27	=C26*C27	
29	Total manufacturing overhead	=B25+B28	=C25+C28	
30				
31	**Step 2: Calculate the predetermined overhead rate in each depa**			
32		Milling	Assembly	
33	Total manufacturing overhead	=B29	=C29	
34	Total machine-hours or direct labor-hours	=B8	=C9	
35	Predetermined overhead rate per machine-hour or direct labor-hour	=B33/B34	=C33/C34	
36				
37	**Step 3: Calculate the amount of overhead applied from both dep**			
38		Milling	Assembly	
39	Predetermined overhead rate per machine-hour or direct labor-hour	=B35	=C35	
40	Machine-hours or direct labor-hours for the job	=B16	=C17	
41	Manufacturing overhead applied	=B39*B40	=C39*C40	
42				
43	**Step 4: Calculate the total job cost for Job 407**			
44		Milling	Assembly	Total
45	Direct materials	=B18	=C18	=B45+C45
46	Direct labor cost	=B19	=C19	=B46+C46
47	Manufacturing overhead applied	=B41	=C41	=B47+C47
48	Total cost of Job 407			=SUM(D45:D47)
49				
50	**Step 5: Calculate the selling price for Job 407**			
51	Total cost of Job 407			=D48
52	Markup			=B4*D51
53	Selling price of Job 407			=D51+D52
54				

... Chapter 2 Formulas | Chapter 2 Requirement 1 ...

[Note: To display formulas in Excel 2013, select File > Options > Advanced > Display options for this worksheet > Show formulas in cells instead of their calculated amounts. To display the formulas in other versions of Excel, consult Excel Help.]

Chapter 2: Applying Excel (continued)

1. When the total fixed manufacturing overhead cost for the Milling Department is changed to $300,000, the worksheet changes as shown below:

	A	B	C	D	E
1	**Chapter 2: Applying Excel**				
2					
3	**Data**				
4	Markup on job cost	75%			
5					
6		Department			
7		Milling	Assembly		
8	Machine-hours	60,000	3,000		
9	Direct labor-hours	8,000	80,000		
10	Total fixed manufacturing overhead cost	$300,000	$500,000		
11	Variable manufacturing overhead per machine-hour	$2.00			
12	Variable manufacturing overhead per direct labor-hour		$3.75		
13					
14	Cost summary for Job 407	Department			
15		Milling	Assembly		
16	Machine-hours	90	4		
17	Direct labor-hours	5	20		
18	Direct materials	$800	$370		
19	Direct labor cost	$70	$280		
20					
21	*Enter a formula into each of the cells marked with a ? below*				
22					
23	**Step 1: Calculate the estimated total manufacturing overhead cost for each department**				
24		Milling	Assembly		
25	Total fixed manufacturing overhead cost	$300,000	$500,000		
26	Variable manufacturing overhead per machine-hour or direct labor-hour	$2.00	$3.75		
27	Total machine-hours or direct labor-hours	60,000	80,000		
28	Total variable manufacturing overhead	$120,000	$300,000		
29	Total manufacturing overhead	$420,000	$800,000		
30					
31	**Step 2: Calculate the predetermined overhead rate in each department**				
32		Milling	Assembly		
33	Total manufacturing overhead	$420,000	$800,000		
34	Total machine-hours or direct labor-hours	60,000	80,000		
35	Predetermined overhead rate per machine-hour or direct labor-hour	$7.00	$10.00		
36					
37	**Step 3: Calculate the amount of overhead applied from both departments to Job 407**				
38		Milling	Assembly		
39	Predetermined overhead rate per machine-hour or direct labor-hour	$7.00	$10.00		
40	Machine-hours or direct labor-hours for the job	90	20		
41	Manufacturing overhead applied	$630.00	$200.00		
42					
43	**Step 4: Calculate the total job cost for Job 407**				
44		Milling	Assembly	Total	
45	Direct materials	$800.00	$370.00	$1,170.00	
46	Direct labor cost	$70.00	$280.00	$350.00	
47	Manufacturing overhead applied	$630.00	$200.00	$830.00	
48	Total cost of Job 407			$2,350.00	
49					
50	**Step 5: Calculate the selling price for Job 407**				
51	Total cost of Job 407			$2,350.00	
52	Markup			$1,762.50	
53	Selling price of Job 407			$4,112.50	
54					

... Chapter 2 Requirement 1 Chapter 2 Requirem ...

The selling price of Job 407 has dropped from $4,348.75 to $4,112.50 because the fixed manufacturing overhead in the Milling Department decreased from $390,000 to $300,000. This reduced the predetermined overhead rate in the Milling Department from $8.50 per machine-hour to $7.00 per machine-hour and hence the amount of overhead applied to Job 407 in the Milling Department.

Chapter 2: Applying Excel (continued)

2. For the new Job 408, the worksheet should look like the following:

	A	B	C	D	E
1	**Chapter 2: Applying Excel**				
2					
3	**Data**				
4	Markup on job cost	75%			
5					
6		Department			
7		Milling	Assembly		
8	Machine-hours	60,000	3,000		
9	Direct labor-hours	8,000	80,000		
10	Total fixed manufacturing overhead cost	$390,000	$500,000		
11	Variable manufacturing overhead per machine-hour	$2.00			
12	Variable manufacturing overhead per direct labor-hour		$3.75		
13					
14	Cost summary for Job 408	Department			
15		Milling	Assembly		
16	Machine-hours	40	10		
17	Direct labor-hours	2	6		
18	Direct materials	$700	$360		
19	Direct labor cost	$50	$150		
20					
21	*Enter a formula into each of the cells marked with a ? below*				
22					
23	**Step 1: Calculate the estimated total manufacturing overhead cost for each department**				
24		Milling	Assembly		
25	Total fixed manufacturing overhead cost	$390,000	$500,000		
26	Variable manufacturing overhead per machine-hour or direct labor-hour	$2.00	$3.75		
27	Total machine-hours or direct labor-hours	60,000	80,000		
28	Total variable manufacturing overhead	$120,000	$300,000		
29	Total manufacturing overhead	$510,000	$800,000		
30					
31	**Step 2: Calculate the predetermined overhead rate in each department**				
32		Milling	Assembly		
33	Total manufacturing overhead	$510,000	$800,000		
34	Total machine-hours or direct labor-hours	60,000	80,000		
35	Predetermined overhead rate per machine-hour or direct labor-hour	$8.50	$10.00		
36					
37	**Step 3: Calculate the amount of overhead applied from both departments to Job 408**				
38		Milling	Assembly		
39	Predetermined overhead rate per machine-hour or direct labor-hour	$8.50	$10.00		
40	Machine-hours or direct labor-hours for the job	40	6		
41	Manufacturing overhead applied	$340.00	$60.00		
42					
43	**Step 4: Calculate the total job cost for Job 408**				
44		Milling	Assembly	Total	
45	Direct materials	$700.00	$360.00	$1,060.00	
46	Direct labor cost	$50.00	$150.00	$200.00	
47	Manufacturing overhead applied	$340.00	$60.00	$400.00	
48	Total cost of Job 408			$1,660.00	
49					
50	**Step 5: Calculate the selling price for Job 408**				
51	Total cost of Job 408			$1,660.00	
52	Markup			$1,245.00	
53	Selling price of Job 408			$2,905.00	
54					

... **Chapter 2 Requirement 2** Chapter 2 Requirem ...

Chapter 2: Applying Excel (continued)

3. When the total number of machine-hours in the Assembly Department increases from 3,000 machine-hours to 6,000 machine-hours, the work-sheet looks like the following:

	A	B	C	D	E
1	**Chapter 2: Applying Excel**				
2					
3	**Data**				
4	Markup on job cost	75%			
5					
6			Department		
7		Milling	Assembly		
8	Machine-hours	60,000	6,000		
9	Direct labor-hours	8,000	80,000		
10	Total fixed manufacturing overhead cost	$390,000	$500,000		
11	Variable manufacturing overhead per machine-hour	$2.00			
12	Variable manufacturing overhead per direct labor-hour		$3.75		
13					
14	Cost summary for Job 408		Department		
15		Milling	Assembly		
16	Machine-hours	40	10		
17	Direct labor-hours	2	6		
18	Direct materials	$700	$360		
19	Direct labor cost	$50	$150		
20					
21	*Enter a formula into each of the cells marked with a ? below*				
22					
23	**Step 1: Calculate the estimated total manufacturing overhead cost for each department**				
24		Milling	Assembly		
25	Total fixed manufacturing overhead cost	$390,000	$500,000		
26	Variable manufacturing overhead per machine-hour or direct labor-hour	$2.00	$3.75		
27	Total machine-hours or direct labor-hours	60,000	80,000		
28	Total variable manufacturing overhead	$120,000	$300,000		
29	Total manufacturing overhead	$510,000	$800,000		
30					
31	**Step 2: Calculate the predetermined overhead rate in each department**				
32		Milling	Assembly		
33	Total manufacturing overhead	$510,000	$800,000		
34	Total machine-hours or direct labor-hours	60,000	80,000		
35	Predetermined overhead rate per machine-hour or direct labor-hour	$8.50	$10.00		
36					
37	**Step 3: Calculate the amount of overhead applied from both departments to Job 408**				
38		Milling	Assembly		
39	Predetermined overhead rate per machine-hour or direct labor-hour	$8.50	$10.00		
40	Machine-hours or direct labor-hours for the job	40	6		
41	Manufacturing overhead applied	$340.00	$60.00		
42					
43	**Step 4: Calculate the total job cost for Job 408**				
44		Milling	Assembly	Total	
45	Direct materials	$700.00	$360.00	$1,060.00	
46	Direct labor cost	$50.00	$150.00	$200.00	
47	Manufacturing overhead applied	$340.00	$60.00	$400.00	
48	Total cost of Job 408			$1,660.00	
49					
50	**Step 5: Calculate the selling price for Job 408**				
51	Total cost of Job 408			$1,660.00	
52	Markup			$1,245.00	
53	Selling price of Job 408			$2,905.00	
54					

... Chapter 2 Requirement 3 Chapter 2 Requirem ...

The selling price for Job 408 is not affected by this change. The reason for this is that the total number of machine-hours in the Assembly Department has no effect on any cost. There would have been a change in costs and in the selling price if the total machine-hours in the Milling Department would have changed. This is because the predetermined overhead rate in that department is based on machine-hours and any change in the total machine-hours would affect the magnitude of the predetermined overhead rate in that department.

4. When the total number of direct labor-hours in the Assembly Department decreases from 80,000 direct labor-hours to 50,000 direct labor-hours, the worksheet looks like the following:

	A	B	C	D	E
1	Chapter 2: Applying Excel				
2					
3	**Data**				
4	Markup on job cost	75%			
5					
6		Department			
7		Milling	Assembly		
8	Machine-hours	60,000	3,000		
9	Direct labor-hours	8,000	50,000		
10	Total fixed manufacturing overhead cost	$390,000	$500,000		
11	Variable manufacturing overhead per machine-hour	$2.00			
12	Variable manufacturing overhead per direct labor-hour		$3.75		
13					
14	Cost summary for Job 408	Department			
15		Milling	Assembly		
16	Machine-hours	40	10		
17	Direct labor-hours	2	6		
18	Direct materials	$700	$360		
19	Direct labor cost	$50	$150		
20					
21	*Enter a formula into each of the cells marked with a ? below*				
22					
23	**Step 1: Calculate the estimated total manufacturing overhead cost for each department**				
24		Milling	Assembly		
25	Total fixed manufacturing overhead cost	$390,000	$500,000		
26	Variable manufacturing overhead per machine-hour or direct labor-hour	$2.00	$3.75		
27	Total machine-hours or direct labor-hours	60,000	50,000		
28	Total variable manufacturing overhead	$120,000	$187,500		
29	Total manufacturing overhead	$510,000	$687,500		
30					
31	**Step 2: Calculate the predetermined overhead rate in each department**				
32		Milling	Assembly		
33	Total manufacturing overhead	$510,000	$687,500		
34	Total machine-hours or direct labor-hours	60,000	50,000		
35	Predetermined overhead rate per machine-hour or direct labor-hour	$8.50	$13.75		
36					
37	**Step 3: Calculate the amount of overhead applied from both departments to Job 408**				
38		Milling	Assembly		
39	Predetermined overhead rate per machine-hour or direct labor-hour	$8.50	$13.75		
40	Machine-hours or direct labor-hours for the job	40	6		
41	Manufacturing overhead applied	$340.00	$82.50		
42					
43	**Step 4: Calculate the total job cost for Job 408**				
44		Milling	Assembly	Total	
45	Direct materials	$700.00	$360.00	$1,060.00	
46	Direct labor cost	$50.00	$150.00	$200.00	
47	Manufacturing overhead applied	$340.00	$82.50	$422.50	
48	Total cost of Job 408			$1,682.50	
49					
50	**Step 5: Calculate the selling price for Job 408**				
51	Total cost of Job 408			$1,682.50	
52	Markup			$1,261.88	
53	Selling price of Job 408			$2,944.38	
54					

... Chapter 2 Requirement 4

The selling price of Job 408 has increased from $2,905.00 to $2,944.38. This occurs because the decrease in the total number of direct labor-hours in the Assembly Department increases the predetermined overhead rate in that department from $10.00 per direct labor-hour to $13.75 per direct labor-hour. In effect, the same total fixed manufacturing overhead cost is spread across fewer total direct labor-hours.

The Foundational 15

1. The first step is to calculate the estimated total overhead costs in Molding and Fabrication:

   Molding: Using the equation $Y = a + bX$, the estimated total manufacturing overhead cost is computed as follows:

   Y = $10,000 + ($1.40 per MH)(2,500 MHs)

Estimated fixed manufacturing overhead	$10,000
Estimated variable manufacturing overhead:	
$1.40 per MH × 2,500 MHs.....	3,500
Estimated total manufacturing overhead cost.....	$13,500

   Fabrication: Using the equation $Y = a + bX$, the estimated total manufacturing overhead cost is computed as follows:

   Y = $15,000 + ($2.20 per MH)(1,500 MHs)

Estimated fixed manufacturing overhead	$15,000
Estimated variable manufacturing overhead:	
$2.20 per MH × 1,500 MHs.....	3,300
Estimated total manufacturing overhead cost.....	$18,300

   The second step is to combine the estimated manufacturing overhead costs in Molding and Fabrication ($13,500 + $18,300 = $31,800) to enable calculating the predetermined overhead rate as follows:

Estimated total manufacturing overhead (a) .	$31,800	
Estimated total machine-hours (MHs) (b).....	4,000	MHs
Predetermined overhead rate (a) ÷ (b).....	$7.95	per MH

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

	Job P	*Job Q*
Actual machine-hours worked (a).....	2,300	1,700
Predetermined overhead rate per MH (b).....	$7.95	$7.95
Manufacturing overhead applied (a) × (b)	$18,285	$13,515

The Foundational 15

3. The total manufacturing cost assigned to Job P is computed as follows:

	Job P
Direct materials	$13,000
Direct labor	21,000
Manufacturing overhead applied	18,285
Total manufacturing cost	$52,285

4. Job P's unit product cost is computed as follows:

	Job P
Total manufacturing cost (a)	$52,285
Number of units (b)	20
Unit product cost (rounded) (a) ÷ (b)	$2,614

5. The total manufacturing cost assigned to Job Q is computed as follows:

	Job Q
Direct materials	$ 8,000
Direct labor	7,500
Manufacturing overhead applied	13,515
Total manufacturing cost	$29,015

6. Job Q's unit product cost is computed as follows:

	Job Q
Total manufacturing cost (a)	$29,015
Number of units (b)	30
Unit product cost (rounded) (a) ÷ (b)	$967

7. The selling prices are calculated as follows:

	Job P	*Job Q*
Total manufacturing cost	$52,285	$29,015
Markup (based on 80%)	41,828	23,212
Total price for the job (a)	$94,113	$52,227
Number of units in the job (b)	20	30
Selling price per unit (rounded) (a) ÷ (b)	$4,706	$1,741

The Foundational 15

8. The cost of goods sold is the sum of the manufacturing costs assigned to Jobs P and Q:

Total manufacturing cost assigned to Job P ...	$52,285
Total manufacturing cost assigned to Job Q ..	29,015
Cost of goods sold	$81,300

9. Molding: Using the equation $Y = a + bX$, the estimated total manufacturing overhead cost is computed as follows:

$$Y = \$10{,}000 + (\$1.40 \text{ per MH})(2{,}500 \text{ MHs})$$

Estimated fixed manufacturing overhead	$10,000
Estimated variable manufacturing overhead:	
$1.40 per MH × 2,500 MHs	3,500
Estimated total manufacturing overhead cost	$13,500

The predetermined overhead rate in Molding is computed as follows:

Estimated total manufacturing overhead (a) ...	$13,500	
Estimated total machine-hours (MHs) (b).....	2,500	MHs
Predetermined overhead rate (a) ÷ (b).....	$5.40	per MH

Fabrication: Using the equation $Y = a + bX$, the estimated total manufacturing overhead cost is computed as follows:

$$Y = \$15{,}000 + (\$2.20 \text{ per MH})(1{,}500 \text{ MHs})$$

Estimated fixed manufacturing overhead	$15,000
Estimated variable manufacturing overhead:	
$2.20 per MH × 1,500 MHs	3,300
Estimated total manufacturing overhead cost	$18,300

The predetermined overhead rate in Fabrication is computed as follows:

Estimated total manufacturing overhead (a) ...	$18,300	
Estimated total machine-hours (MHs) (b).....	1,500	MHs
Predetermined overhead rate (a) ÷ (b).....	$12.20	per MH

The Foundational 15

10. The applied overhead from Molding is computed as follows:

	Job P	*Job Q*
Machine-hours worked on job (a)	1,700	800
Molding overhead rate (b)	$5.40	$5.40
Manufacturing overhead applied (a) × (b)	$9,180	$4,320

11. The applied overhead from Fabrication is computed as follows:

	Job P	*Job Q*
Machine-hours worked on job (a)	600	900
Fabrication overhead rate (b)	$12.20	$12.20
Manufacturing overhead applied (a) × (b)	$7,320	$10,980

12. The unit product cost for Job P is computed as follows:

Direct materials		$13,000
Direct labor		21,000
Manufacturing overhead applied:		
Molding Department	$9,180	
Fabrication Department	7,320	16,500
Total manufacturing cost (a)		$50,500
Number of units in the job (b)		20
Unit product cost (a) ÷ (b)		$2,525

13. The unit product cost for Job Q is computed as follows:

Direct materials		$8,000
Direct labor		7,500
Manufacturing overhead applied:		
Molding Department	$4,320	
Fabrication Department	10,980	15,300
Total manufacturing cost (a)		$30,800
Number of units in the job (b)		30
Unit product cost (rounded) (a) ÷ (b)		$1,027

The Foundational 15

14. The selling prices are calculated as follows:

	Job P	*Job Q*
Total manufacturing cost	$50,500	$30,800
Markup (based on 80%)	40,400	24,640
Total price for the job (a)	$90,900	$55,440
Number of units in the job (b)	20	30
Selling price per unit (a) ÷ (b)	$4,545	$1,848

15. The cost of goods sold is the sum of the manufacturing costs assigned to Jobs P and Q:

Total manufacturing cost assigned to Job P	$50,500
Total manufacturing cost assigned to Job Q	30,800
Cost of goods sold	$81,300

Exercise 2-1 (10 minutes)

The estimated total manufacturing overhead cost is computed as follows:

Y = $94,000 + ($2.00 per DLH)(20,000 DLHs)

Estimated fixed manufacturing overhead	$ 94,000
Estimated variable manufacturing overhead: $2.00 per DLH × 20,000 DLHs.....	40,000
Estimated total manufacturing overhead cost.....	$134,000

The plantwide predetermined overhead rate is computed as follows:

Estimated total manufacturing overhead (a).....	$134,000
Estimated total direct labor hours (b).....	20,000 DLHs
Predetermined overhead rate (a) ÷ (b).....	$6.70 per DLH

Exercise 2-2 (10 minutes)

Actual direct labor-hours (a).....	10,800
Predetermined overhead rate (b).....	$23.40
Manufacturing overhead applied (a) × (b)....	$252,720

Exercise 2-3 (10 minutes)

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

Direct labor cost (a)	$153
Direct labor wage rate per hour (b)	$17
Total direct labor hours (a) ÷ (b)	9

Total manufacturing cost assigned to Job A-500:

Direct materials	$231
Direct labor	153
Manufacturing overhead applied ($14 per DLH × 9 DLHs)	126
Total manufacturing cost	$510

2. Unit product cost for Job A-500:

Total manufacturing cost (a)	$510
Number of units in the job (b)	40
Unit product cost (a) ÷ (b)	$12.75

Exercise 2-4 (10 minutes)

1 and 2.

The total direct labor-hours required for Job N-60:

	Assembly	Testing & Packaging
Direct labor cost (a)	$180	$40
Direct labor wage rate per hour (b)	$20	$20
Total direct labor hours (a) ÷ (b)	9	2

The total manufacturing cost and unit product cost for Job N-60 is computed as follows:

Direct materials ($340 + $25)		$365
Direct labor ($180 + $40)		220
Assembly Department ($16 per DLH × 9 DLHs)	$144	
Testing & Packaging Department ($12 per DLH × 2 DLHs)	24	168
Total manufacturing cost		$753

Total manufacturing cost (a)	$753
Number of units in the job (b)	10
Unit product cost (a) ÷ (b)	$75.30

Exercise 2-5 (10 minutes)

1 and 2.

The total direct labor-hours required in Finishing for Job 700:

	Finishing
Direct labor cost (a)	$128
Direct labor wage rate per hour (b)	$16
Total direct labor hours (a) ÷ (b)	8

The total manufacturing cost and unit product cost for Job 700 is computed as follows:

Direct materials ($410 + $60)		$470
Direct labor ($128 + $48)		176
Finishing Department ($18 per DLH × 8 DLHs)	$144	
Fabrication Department (110% × $60)	66	210
Total manufacturing cost		$856

Total manufacturing cost (a)	$856
Number of units in the job (b)	15
Unit product cost (rounded) (a) ÷ (b)	$57.07

Exercise 2-6 (10 minutes)

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

$$Y = \$680{,}000 + (\$0.50 \text{ per DLH})(80{,}000 \text{ DLHs})$$

Estimated fixed overhead cost	$680,000
Estimated variable overhead cost: $0.50 per DLH × 80,000 DLHs	40,000
Estimated total overhead cost	$720,000

The predetermined overhead rate is computed as follows:

Estimated total overhead (a)	$720,000	
Estimated total direct labor-hours (b)	80,000	DLHs
Predetermined overhead rate (a) ÷ (b)	$9.00	per DLH

2. Total manufacturing cost assigned to Xavier:

Direct materials	$38,000
Direct labor	21,000
Overhead applied ($9.00 per DLH × 280 DLHs)	2,520
Total manufacturing cost	$61,520

Exercise 2-7 (20 minutes)

1. Step 1: The total direct labor-hours required for Job Omega:

Direct labor cost (a)	$345,000
Direct labor wage rate per hour (b).....	$15
Total direct labor hours worked (a) ÷ (b)	23,000

Step 2: Derive the plantwide predetermined overhead rate:

Manufacturing overhead applied to Job Omega (a)	$184,000	
Direct labor hours worked on Job Omega (b)	23,000	
Plantwide predetermined overhead rate (a) ÷ (b)	$8.00	per DLH

2. The job cost sheet for Job Alpha is derived as follows: (note that direct materials is the plug figure)

Direct materials (plug figure).....	$ 280,000
Direct labor (54,500 DLHs × $15 per DLH)	817,500
Manufacturing overhead applied ($8 per DLH × 54,500 DLHs).....	436,000
Total job cost (given).....	$1,533,500

Exercise 2-8 (10 minutes)

Direct material.....	$10,000
Direct labor	12,000
Manufacturing overhead applied:	
$12,000 × 125%	15,000
Total manufacturing cost	$37,000

Total manufacturing cost (a)	$37,000
Number of units in job (b).....	1,000
Unit product cost (a) ÷ (b).....	$37

Exercise 2-9 (30 minutes)

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

$$Y = \$1{,}980{,}000 + (\$2.00 \text{ per MH})(165{,}000 \text{ MHs})$$

Estimated fixed overhead	$1,980,000
Estimated variable overhead: $2.00 per MH × 165,000 MHs	330,000
Estimated total overhead cost	$2,310,000

The plantwide predetermined overhead rate is computed as follows:

Estimated total overhead (a)	$2,310,000	
Estimated total machine-hours (b)	165,000	MHs
Predetermined overhead rate (a) ÷ (b)	$14.00	per MH

2. Total manufacturing cost assigned to Job P90:

Direct materials	$1,150
Direct labor	830
Overhead applied ($14 per MH × 72 MHs)	1,008
Total manufacturing cost	$2,988

3a. Given that the company is operating at 50% of its manufacturing capacity, an argument can made that the company should pursue any business opportunities that generate a positive a contribution margin. Based on the information provided, it appears that Job P90 does generate a positive contribution margin as shown below:

Sales		$2,500
Direct materials	$1,150	
Direct labor	830	
Variable overhead applied ($2.00 per MH × 72 MHs)	144	2,124
Contribution margin		$ 376

Exercise 2-9 (continued)

3b. The CFO's argument is based on the assertion that Job P90 does not generate enough revenue to cover the cost of the manufacturing resources that it consumes. However, given that the company is operating at 50% of its manufacturing capacity, the overhead costs applied to Job P90 in requirement 2 do not represent the cost of the overhead resources consumed making Job P90. In other words, the overhead applied in requirement 2 includes a charge for used and unused capacity.

If we estimate a capacity-based overhead rate for the company and apply overhead costs to Job P90 using this rate, it reveals that the revenue generated by the job ($2,500) is still insufficient to cover its manufacturing costs of $2,556, as computed below:

The estimated total overhead cost (at capacity) is computed as follows (keep in mind that 165,000 MHs ÷ 50% = 330,000 MHs):

$$Y = \$1{,}980{,}000 + (\$2.00 \text{ per MH})(330{,}000 \text{ MHs})$$

Estimated fixed overhead	$1,980,000
Estimated variable overhead: $2.00 per MH × 330,000 MHs	660,000
Estimated total overhead cost	$2,640,000

The predetermined capacity-based overhead rate is computed as follows:

Estimated total overhead (a)	$2,640,000	
Estimated total machine-hours (b)	330,000	MHs
Predetermined overhead rate (a) ÷ (b)	$8.00	per MH

The total manufacturing cost assigned to Job P90 (using a capacity-based overhead rate):

Direct materials	$1,150
Direct labor	830
Overhead applied ($8 per MH × 72 MHs)	576
Total manufacturing cost	$2,556

Exercise 2-10 (10 minutes)

1. Yes, overhead should be applied to Job W 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

2. The direct materials ($2,500), direct labor ($4,000), and applied overhead ($3,000) for Job W will be included in Work in Process on Sigma Corporation's balance sheet.

Exercise 2-11 (30 minutes)

1. The estimated total fixed manufacturing overhead can be computed using the data from any of quarters 1-3. For illustrative purposes, we'll use the first quarter as follows:

Total overhead cost (First quarter)	$300,000
Variable cost element ($2.00 per unit × 80,000 units)	160,000
Fixed cost element	$140,000

2. The fixed and variable cost estimates from requirement 1 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	120,000
Estimated total manufacturing overhead cost	$260,000

The estimated unit product cost for the fourth quarter is computed as follows:

Direct materials	$180,000
Direct labor	96,000
Manufacturing overhead	260,000
Total manufacturing costs (a)	$536,000
Number of units to be produced (b)	60,000
Unit product cost (rounded) (a) ÷ (b)	$8.93

Exercise 2-11 (continued)

3. 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.

4. 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	400,000
Estimated total manufacturing overhead cost	$960,000

The annual predetermined overhead rate is computed as follows:

Estimated total manufacturing overhead (a)	$960,000	
Estimated total units produced (b)	200,000	
Predetermined overhead rate (a) ÷ (b)	$4.80	per unit

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

	Quarter			
	First	*Second*	*Third*	*Fourth*
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	384,000	192,000	96,000	288,000
Total cost (a)	$752,000	$376,000	$188,000	$564,000
Number of units produced (b)	80,000	40,000	20,000	60,000
Unit product cost (a) ÷ (b)	$9.40	$9.40	$9.40	$9.40

Exercise 2-12 (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	300,000
Estimated total manufacturing overhead cost	$950,000

The plantwide predetermined overhead rate is computed as follows:

Estimated total manufacturing overhead (a)	$950,000	
Estimated total machine-hours (b)	100,000	MHs
Predetermined overhead rate (a) ÷ (b)	$9.50	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)	380
Total manufacturing cost	$1,040

3. The unit product cost of Job 400 is computed as follows:

Total manufacturing cost (a)	$1,040
Number of units in the job (b)	52
Unit product cost (a) ÷ (b)	$20

4. The selling price per unit is computed as follows:

Total manufacturing cost	$1,040
Markup (120% of manufacturing cost)	1,248
Selling price for Job 400 (a)	$2,288
Number of units in Job 400 (b)	52
Selling price per unit (a) ÷ (b)	$44

Exercise 2-12 (continued)

5. Possible critiques of Moody's pricing tactics include (1) relying on a plantwide overhead rate to allocate overhead costs to jobs may distort the cost base used for cost-plus pricing, (2) relying on an absorption approach may allocate unused capacity costs to jobs thereby distorting the cost base for cost-plus pricing, and (3) relying on absorption cost-plus pricing ignores the customers' willingness to pay based on their perceived value of the product or service.

Exercise 2-13 (20 minutes)

1. Cutting Department:

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

   Y = $264,000 + ($2.00 per MH)(48,000 MHs)

Estimated fixed manufacturing overhead	$264,000
Estimated variable manufacturing overhead	
$2.00 per MH × 48,000 MHs	96,000
Estimated total manufacturing overhead cost.....	$360,000

   The predetermined overhead rate is computed as follows:

Estimated total manufacturing overhead (a) .	$360,000	
Estimated total machine-hours (b)	48,000	MHs
Predetermined overhead rate (a) ÷ (b).....	$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 per DLH)(30,000 DLHs)

Estimated fixed manufacturing overhead	$366,000
Estimated variable manufacturing overhead	
$4.00 per DLH × 30,000 DLHs	120,000
Estimated total manufacturing overhead cost.....	$486,000

   The predetermined overhead rate is computed as follows:

Estimated total manufacturing overhead (a) ..	$486,000	
Estimated total direct labor-hours (b)	30,000	DLHs
Predetermined overhead rate (a) ÷ (b).....	$16.20	per DLH

Exercise 2-13 (continued)

2. Total manufacturing cost assigned to Job 203:

Direct materials ($500 + $310)		$ 810
Direct labor ($108 + $360)		468
Cutting Department (80 MHs × $7.50 per MH)	$600	
Finishing Department (20 DLH × $16.20 per DLH)	324	924
Total manufacturing cost		$2,202

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 overhead 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 2-14 (10 minutes)

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

$$Y = \$4{,}800{,}000 + (\$0.05 \text{ per DL\$})(\$8{,}000{,}000)$$

Estimated fixed overhead	$4,800,000
Estimated variable overhead: $0.05 per DL$ × $8,000,000 DL$	400,000
Estimated total overhead cost	$5,200,000

The predetermined overhead rate is computed as follows:

Estimated total overhead (a)	$5,200,000	
Estimated total direct labor-dollars (b)	8,000,000	DL$
Predetermined overhead rate (a) ÷ (b)	$0.65	per DL$

2. Total cost assigned to *You Can Say That Again*:

Direct materials	$1,259,000
Direct labor	2,400,000
Overhead applied ($0.65 per DL$ × $2,400,000)	1,560,000
Total job cost	$5,219,000

Exercise 2-15 (45 minutes)

1a. The first step is to calculate the estimated total overhead costs in Molding and Fabrication:

Molding: Using the equation $Y = a + bX$, the estimated total manufacturing overhead cost would be calculated as follows:

Y = $700,000 + ($3.00 per MH)(20,000 MHs)

Estimated fixed manufacturing overhead.....	$700,000
Estimated variable manufacturing overhead: $3.00 per MH × 20,000 MHs.....	60,000
Estimated total manufacturing overhead cost.....	$760,000

Fabrication: Using the equation $Y = a + bX$, the estimated total manufacturing overhead cost would be calculated as follows:

Y = $210,000 + ($1.00 per MH)(30,000 MHs)

Estimated fixed manufacturing overhead.....	$210,000
Estimated variable manufacturing overhead: $1.00 per MH × 30,000 MHs.....	30,000
Estimated total manufacturing overhead cost.....	$240,000

The second step is to combine the estimated manufacturing overhead costs in Molding and Fabrication ($760,000 + $240,000 = $1,000,000) to enable calculating the predetermined overhead rate as follows:

Estimated total manufacturing overhead (a)	$1,000,000	
Estimated total machine-hours (b)	50,000	MHs
Predetermined overhead rate (a) ÷ (b)	$20.00	per MH

Exercise 2-15 (continued)

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

	D-70	*C-200*
Direct materials	$ 700,000	$ 550,000
Direct labor	360,000	400,000
Manufacturing overhead applied ($20.00 per MH × 20,000 MHs; $20.00 per MH × 30,000 MHs)	400,000	600,000
Total manufacturing cost	$1,460,000	$1,550,000

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

	D-70	*C-200*
Total manufacturing cost (a)	$1,460,000	$1,550,000
Markup percentage (b)	150%	150%
Bid price (a) × (b)	$2,190,000	$2,325,000

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 $3,010,000 (=$1,460,000 + $1,550,000).

Exercise 2-15 (continued)

2a. Molding Department:

Using the equation $Y = a + bX$, the estimated total manufacturing overhead cost would be depicted as follows:

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

Estimated fixed manufacturing overhead.....	$700,000
Estimated variable manufacturing overhead: $3.00 per MH × 20,000 MHs.....	60,000
Estimated total manufacturing overhead cost.....	$760,000

The predetermined overhead rate is computed as follows:

Estimated total manufacturing overhead (a).	$760,000	
Estimated total machine-hours (b).....	20,000	MHs
Predetermined overhead rate (a) ÷ (b).....	$38.00	per MH

Fabrication Department:

Using the equation $Y = a + bX$, the estimated total manufacturing overhead cost would be depicted as follows:

$$Y = \$210{,}000 + (\$1.00 \text{ per MH})(30{,}000 \text{ MHs})$$

Estimated fixed manufacturing overhead.....	$210,000
Estimated variable manufacturing overhead: $1.00 per MH × 30,000 MHs.....	30,000
Estimated total manufacturing overhead cost.....	$240,000

The predetermined overhead rate is computed as follows:

Estimated total manufacturing overhead (a).	$240,000	
Estimated total direct labor-hours (b).....	30,000	MHs
Predetermined overhead rate (a) ÷ (b).....	$8.00	per MH

Exercise 2-15 (continued)

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

	D-70	*C-200*
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 × $8 per MH; 24,000 MH × $8 per MH)	48,000	192,000
Total manufacturing cost	$1,640,000	$1,370,000

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

	D-70	*C-200*
Total manufacturing cost (a)	$1,640,000	$1,370,000
Markup percentage (b)	150%	150%
Bid price (a) × (b)	$2,460,000	$2,055,000

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 $3,010,000 (=$1,640,000 + $1,370,000).

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 $270,000 (=$2,460,000 – $2,190,000) 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 ($8). Conversely, Job C-200 is an intensive user of the less-expensive Fabrication machine-hours, so its departmental bid price is $270,000 lower than the plantwide bid price.

Exercise 2-15 (continued)

Whether a job-order costing system relies on plantwide overhead cost allocation or departmental overhead cost allocation 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 plantwide overhead cost allocation 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.

Problem 2-16 (30 minutes)

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

Y = $784,000 + ($2.00 per DLH)(140,000 DLHs)

Estimated fixed manufacturing overhead	$ 784,000
Estimated variable manufacturing overhead: $2.00 per DLH × 140,000 DLH	280,000
Estimated total manufacturing overhead cost	$1,064,000

The predetermined overhead rate is computed as follows:

Estimated total manufacturing overhead (a)	$1,064,000	
Estimated total direct labor-hours (b)	140,000	DLH
Predetermined overhead rate (a) ÷ (b)	$7.60	per DLH

1b. Total manufacturing cost assigned to Job 550:

Direct materials	$175
Direct labor	225
Manufacturing overhead applied ($7.60 per DLH × 15 DLH)	114
Total manufacturing cost of Job 550	$514

1c. The selling price for Job 550 is computed as follows:

	Job 550
Total manufacturing cost	$ 514
Markup (200%)	1,028
Selling price	$1,542

Problem 2-16 (continued)

2a. The estimated total overhead cost is computed as follows:

$$Y = \$784{,}000 + (\$4.00 \text{ per MH})(70{,}000 \text{ MHs})$$

Estimated fixed manufacturing overhead	$ 784,000
Estimated variable manufacturing overhead: $4.00 per MH × 70,000 MHs	280,000
Estimated total manufacturing overhead cost	$1,064,000

The predetermined overhead rate is computed as follows:

Estimated total manufacturing overhead (a)	$1,064,000	
Estimated total machine-hours (b)	70,000	MHs
Predetermined overhead rate (a) ÷ (b)	$15.20	per MH

2b. Total manufacturing cost assigned to Job 550:

Direct materials	$175
Direct labor	225
Manufacturing overhead applied ($15.20 per MH × 5 MH)	76
Total manufacturing cost of Job 550	$476

2c. The selling price for Job 550 is computed as follows:

	Job 550
Total manufacturing cost	$ 476
Markup (200%)	952
Selling price	$1,428

3. The price for Job 550 using direct labor-hours as the allocation base ($1,542) is $114 higher than the price derived using machine-hours as the allocation base ($1,428). If machine-hours is the better choice for an allocation base, then if Landen continues to use direct labor-hours as its overhead allocation base, it will overprice jobs that are intensive users of direct labor-hours and non-intensive users of machine-hours. In a bidding situation, Landen will tend to lose bids on jobs such as Job 550 if its competitors have more accurate cost accounting systems.

Problem 2-17 (20 minutes)

1. The predetermined plantwide overhead rate is computed as follows:

Estimated manufacturing overhead (a)	$1,400,000	
Estimated total direct labor-hours (b)	80,000	DLHs
Predetermined overhead rate (a) ÷ (b).....	$17.50	per DLH

The overhead applied to Job Bravo is computed as follows:

Direct labor-hours worked on Bravo (a)	14	
Predetermined overhead rate (b)	$17.50	per DLH
Overhead applied to Bravo (a) × (b)	$245	

2. The predetermined overhead rate in Assembly is computed as follows:

Estimated manufacturing overhead (a)	$600,000	
Estimated total direct labor-hours (b)	50,000	DLHs
Predetermined overhead rate (a) ÷ (b).....	$12.00	per DLH

The predetermined overhead rate in Fabrication is computed as follows:

Estimated manufacturing overhead (a)	$800,000	
Estimated total machine-hours (b)	100,000	MHs
Predetermined overhead rate (a) ÷ (b).....	$8.00	per MH

The overhead applied to Job Bravo is computed as follows:

	Assembly	Fabrication	Total
Quantity of allocation base used (a)	11	6	
Predetermined overhead rate (b)	$12.00	$8.00	
Overhead applied to Bravo (a) × (b)	$132	$48	$180

Problem 2-18 (15 minutes)

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

$$Y = \$350{,}000 + (\$1.00 \text{ per DLH})(20{,}000 \text{ DLHs})$$

Estimated fixed overhead	$350,000
Estimated variable overhead: $1.00 per DLH × 20,000 DLHs	20,000
Estimated total overhead cost	$370,000

The predetermined overhead rate is computed as follows:

Estimated total overhead (a)	$370,000	
Estimated total direct labor-hours (b)	20,000	DLHs
Predetermined overhead rate (a) ÷ (b)	$18.50	per DLH

2. Total manufacturing cost assigned to Mr. Wilkes:

Direct materials	$590
Direct labor	109
Overhead applied ($18.50 per DLH × 6 DLH)	111
Total cost assigned to Mr. Wilkes	$810

3. The price charged to Mr. Wilkes is computed as follows:

	Job Wilkes
Total manufacturing cost	$ 810
Markup (40%)	324
Selling price	$1,134

Problem 2-19 (20 minutes)

1. Molding Department:

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

   Y = $497,000 + $1.50 per MH × 70,000 MHs

Estimated fixed manufacturing overhead	$497,000
Estimated variable manufacturing overhead:	
$1.50 per MH × 70,000 MHs	105,000
Estimated total manufacturing overhead cost.....	$602,000

   The predetermined overhead rate is computed as follows:

Estimated total manufacturing overhead (a) .	$602,000	
Estimated total machine-hours (b)	70,000	MHs
Predetermined overhead rate (a) ÷ (b)	$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 per DLH × 60,000 DLHs

Estimated fixed manufacturing overhead	$615,000
Estimated variable manufacturing overhead:	
$2.00 per DLH × 60,000 DLHs	120,000
Estimated total manufacturing overhead cost.....	$735,000

   The predetermined overhead rate is computed as follows:

Estimated total manufacturing overhead (a) .	$735,000	
Estimated total DLHs (b)	60,000	DLHs
Predetermined overhead rate (a) ÷ (b)	$12.25	per DLH

Problem 2-19 (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	1,029
Total overhead cost	$1,975

3. Total cost of Job 205:

	Molding Dept.	*Painting Dept.*	*Total*
Direct materials	$ 770	$1,332	$2,102
Direct labor	525	1,470	1,995
Manufacturing overhead applied	946	1,029	1,975
Total manufacturing cost	$2,241	$3,831	$6,072

Unit product cost for Job 205:

Total manufacturing cost (a)	$6,072	
Number of units in the job (b)	50	units
Unit product cost (a) ÷ (b)	$121.44	per unit

Problem 2-20 (45 minutes)

1a. The first step is to calculate the total estimated overhead costs in ICU and Other:

ICU: Using the equation $Y = a + bX$, the estimated total overhead cost would be calculated as follows:

Y = $3,200,000 + ($236 per patient-day)(2,000 patient-days)

Estimated fixed overhead.....	$3,200,000
Estimated variable overhead:	
$236 per patient-day × 2,000 patient-days.....	472,000
Estimated total overhead cost.....	$3,672,000

Other: Using the equation $Y = a + bX$, the estimated total overhead cost would be calculated as follows:

Y = $14,000,000 + ($96 per patient-day)(18,000 patient-days)

Estimated fixed overhead	$14,000,000
Estimated variable overhead:	
$96 per patient-day × 18,000 patient-days	1,728,000
Estimated total overhead cost.....	$15,728,000

The second step is to combine the estimated overhead costs in ICU and Other ($3,672,000 + $15,728,000 = $19,400,000) to enable calculating the predetermined overhead rate as follows:

Estimated total overhead (a).....	$19,400,000	
Estimated total patient-days (b).....	20,000	patient-days
Predetermined overhead rate (a) ÷ (b)	$970	per patient-day

Problem 2-20 (continued)

1b. The total cost assign to Patients A and B is computed as follows:

	Patient A	*Patient B*
Direct materials	$ 4,500	$ 6,200
Direct labor	25,000	36,000
Overhead applied ($970 per patient-day × 14 patient days; ($970 per patient-day × 21 patient days)	13,580	20,370
Total cost	$43,080	$62,570

2a. The overhead rate in ICU is computed as follows:

Y = $3,200,000 + ($236 per patient-day)(2,000 patient-days)

Estimated fixed overhead	$3,200,000
Estimated variable overhead:	
$236 per patient-day × 2,000 patient-days	472,000
Estimated total overhead cost	$3,672,000

The predetermined overhead rate is computed as follows:

Estimated total overhead (a)	$3,672,000	
Estimated total patient-days (b)	2,000	patient-days
Predetermined overhead rate (a) ÷ (b)	$1,836	per patient-day

The overhead rate in Other is computed as follows:

Y = $14,000,000 + ($96 per patient-day)(18,000 patient-days)

Estimated fixed overhead	$14,000,000
Estimated variable overhead:	
$96 per patient-day × 18,000 patient-days	1,728,000
Estimated total overhead cost	$15,728,000

The predetermined overhead rate is computed as follows:

Estimated total overhead (a)	$15,728,000	
Estimated total patient-days (b)	18,000	patient-days
Predetermined overhead rate (rounded) (a) ÷ (b)	$873.78	per patient-day

Problem 2-20 (continued)

2b. The total cost assigned to Patient A:

Direct materials		$ 4,500
Direct labor		25,000
ICU ($1,836 per patient-day × 0 patient-days)	$ 0	
Other ($873.78 per patient day × 14 patient-days) (rounded to nearest dollar)	12,233	12,233
Total cost assigned to Patient A		$41,733

The total cost assigned to Patient B:

Direct materials		$ 6,200
Direct labor		36,000
ICU ($1,836 per patient-day × 7 patient-days)	$12,852	
Other ($873.78 per patient day × 14 patient-days) (rounded to nearest dollar)	12,233	25,085
Total cost assigned to Patient B		$67,285

3. Relying on just one predetermined overhead rate overlooks the fact that some departments are more intensive users of overhead resources than others. As the name implies, patients in the ICU require more intensive (and expensive) care than other patients in other departments. Broadly speaking, relying on only one overhead rate, will most likely overcost patients with less severe illnesses and undercost patients with more severe illnesses.

Problem 2-21 (30 minutes)

1. The plantwide predetermined overhead rate is computed as follows:

Estimated manufacturing overhead (a)	$600,000	
Estimated total direct labor-hours (b)	60,000	DLHs
Predetermined overhead rate (a) ÷ (b).....	$10	per DLH

The overhead applied to Job A is computed as follows:

Direct labor-hours worked on Job A (a)	15	
Predetermined overhead rate (b)	$10	per DLH
Overhead applied to Job A (a) × (b).....	$150	

The overhead applied to Job B is computed as follows:

Direct labor-hours worked on Job B (a)	9	
Predetermined overhead rate (b)	$10	per DLH
Overhead applied to Job B (a) × (b).....	$90	

2. The predetermined overhead rate in Machining is computed as follows:

Estimated manufacturing overhead (a).....	$500,000	
Estimated total machine-hours (b)	50,000	MHs
Predetermined overhead rate (a) ÷ (b).....	$10	per MH

The predetermined overhead rate in Assembly is computed as follows:

Estimated manufacturing overhead (a).....	$100,000	
Estimated total direct labor-hours (b)	50,000	DLHs
Predetermined overhead rate (a) ÷ (b).....	$2	per DLH

The overhead applied to Job A is computed as follows:

	Machining	Assembly	Total
Quantity of allocation base used (a) .	11	10	
Predetermined overhead rate (b)	$10	$2	
Overhead applied to Job A (a) × (b).	$110	$20	$130

Problem 2-21 (continued)

The overhead applied to Job B is computed as follows:

	Machining	Assembly	Total
Quantity of allocation base used (a) .	12	5	
Predetermined overhead rate (b)	$10	$2	
Overhead applied to Job B (a) × (b).	$120	$10	$130

3. The plantwide approach will overcost jobs that are intensive users of Assembly and minimal users of Machining. Conversely, it will undercost products that are intensive users of Machining and minimal users of Assembly. These cost distortions will adversely impact the company's pricing process. Jobs that get overcosted will have selling prices that are greater than the prices that would be established using departmental overhead allocation. Jobs that get undercosted will have selling prices that are less than the prices that would be established using departmental overhead allocation.

Case (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. The manufacturing overhead cost applied to the Koopers job is computed as follows:

$9,500 × 140% = $13,300

2. a.

	Fabricating Department	*Machining Department*	*Assembly Department*
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 × 175%	$4,900
Machining Department:	
$500 × 400%	2,000
Assembly Department:	
$6,200 × 30%	1,860
Total applied overhead	$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

Case (continued)

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 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 (see requirement 1b)	13,300
Total manufacturing cost	$27,400
Bidding rate	× 1.5
Total bid price	$41,100

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

Direct materials	$ 4,600
Direct labor	9,500
Manufacturing overhead applied (see requirement 2b)	8,760
Total manufacturing cost	$22,860
Bidding rate	× 1.5
Total bid price	$34,290

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.

Communicating in Practice

Date: Current date
To: Instructor
From: Student's Name
Subject: Talk with a Controller

The student's memorandum should address the following:

- The name, title, and job affiliation of the individual interviewed. (Note: Not specifically required in problem but essential and, as such, a good topic for class discussion, if appropriate.)
- A list of the company's main products.
- Identification of the type of costing system in use (job-order, process, or other).
- Brief description of how overhead is assigned to products (including basis for allocation and whether more than one overhead rate is in use).
- Indication as to whether any changes have been made to or are being considered in relation to the company's costing system, and, if applicable, a brief description of the changes.