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.

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

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 P
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 P
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

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 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

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 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 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

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

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

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 rates 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 2-22 (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

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.