

ACTIVITY BASED COSTING

Key Topics to Know

- Job Costing relied on a single plantwide overhead rate.
- Departments with very different processes may use departmental overhead rates instead of a single plantwide rate to improve accuracy.
- Differences between activity-based costing and a traditional costing system (either single rate or multiple rates)
- Understand the ABC methodology:
 - How to compute activity rates for cost pools.
 - How to assign costs to products.
 - How to compute overhead cost per unit for each product.
 - How to compute total unit cost for each product.
 - How to apply overhead to production in work-in-process.
 - Explain why product costs computed under activity based costing and conventional costing methods differ.
- Flow of costs in an activity based costing system.

Problems

Problem #1

P Company manufactures two products, Product C and Product D. Estimated manufacturing overhead costs are \$130,890 that will be applied to products on the basis of direct labor hours. Data concerning the current period's operations appear below:

	<u>Product C</u>	<u>Product D</u>
Estimated volume	400 units	1,200 units
Direct labor hours per unit	0.70 hour	1.20 hours
Direct material cost per unit	\$10.70	\$16.70
Direct labor cost per unit	\$11.20	\$19.20

Management is considering using activity-based costing to apply manufacturing overhead cost to products. The ABC system would have the following cost pools:

<u>Activity Cost Pool</u>	<u>Activity Measure</u>	<u>Estimated Overhead Cost</u>
Machine setups	Number of setups	\$ 13,570
Purchase Orders	Number of purchase orders	91,520
General Factory	Direct labor hours	25,800

<u>Activity Measure</u>	<u>Product C</u>	<u>Product D</u>	<u>Total</u>
Number of setups	100	130	230
Number of purchase orders	810	1,270	2,080
Number of direct labor hours	280	1,440	1,720

- Required:
- Compute the predetermined overhead rate under the current method and determine the unit product cost of each product.
 - Determine the activity rates (i.e. predetermined overhead rates)
 - Compute the total overhead cost applied to each product and determine the amount of overhead cost per unit of each product.
 - Compute the unit product cost of each product.
 - Compute the overhead applied to work-in-process using both traditional costing and ABC with the following actual activity:

<u>Activity Measure</u>	<u>Job</u>
Number of setups	10
Number of purchase orders	40
Number of direct labor hours	60

Problem #2

V Corporation's activity-based costing system has two cost pools: Machining and Set Up. The company's overhead costs, which consist of equipment depreciation and indirect labor, are allocated to the cost pools in proportion to the activity cost pools' consumption of resources.

Equipment depreciation	\$32,000
Indirect labor	4,000

Distribution of Resource Consumption by Cost Pool

	<u>Machining</u>	<u>Set Up</u>	<u>Total</u>
Equipment depreciation	\$12,800	\$19,200	\$32,000
Indirect labor	<u>2,000</u>	<u>400</u>	<u>2,400</u>
Total	\$14,800	\$19,600	\$34,400

Costs in the Machining cost pool are assigned to products based on machine-hours (MHs) and costs in the Set Up cost pool are assigned to products based on the number of batches.

	<u>MHs</u>	<u>Batches</u>
Product R3	3,800	300
Product D6	16,200	700

Additional data concerning the company's products appears below:

	<u>Product R3</u>	<u>Product D6</u>
Sales	\$168,700	\$185,600
Direct materials	77,800	72,300
Direct labor	75,800	79,300

- Required:
- Calculate activity rates for each activity cost pool using ABC.
 - Determine the amount of overhead cost that would be assigned to each product using ABC.
 - Determine the operating income for each product using ABC.

Problem #3

W Corporation has an activity-based costing system with two activity cost pools- Processing and Set Up that correspond to the two manufacturing departments. Costs in the Processing cost pool are assigned to products based on machine-hours (MHs) and costs in the Setting Up cost pool are assigned to products based on the number of batches. 90% of the machine hours are worked in the Processing Department and 10% are worked in the Set Up Department. Data concerning the two products and the company's costs and activity-based costing system appear below:

Processing	\$12,200
Setting Up	25,100

	<u>Machine Hours</u>		<u>Total</u>	<u>Batches</u>
	<u>Processing</u>	<u>Set Up</u>		
Product C7	2,160	240	2,400	700
Product P8	<u>15,840</u>	<u>1,760</u>	<u>17,600</u>	<u>300</u>
Total	18,000	2,000	20,000	1,000

	<u>Product C7</u>	<u>Product P8</u>
Sales	\$135,700	\$98,000
Direct materials	61,700	31,000
Direct labor	52,200	45,800

- Required:
- Calculate activity rates for each activity cost pool using activity-based costing.
 - Determine the amount of overhead cost that would be assigned to each product using activity-based costing.
 - Determine the single plant-wide overhead rate based on machine hours.
 - Determine the amount of overhead cost that would be assigned to each product using the single plant-wide overhead rate.
 - Determine the overhead rates for each manufacturing department based on machine hours.
 - Determine the amount of overhead cost that would be assigned to each product using the multiple department overhead rates.

Problem #4

M Company allocates overhead in the Machining Department on the basis of machine hours, while in the Assembly Department overhead is allocated on the basis of direct labor cost. The following budget data are provided:

	<u>Machining</u>	<u>Assembly</u>
Manufacturing overhead	\$500,000	\$1,075,000
Direct labor	350,000	500,000
Machine hours	100,000	10,000
Direct labor hours	50,000	150,000

The following information is provided for a job (Job No. 510) recently completed by the company:

	<u>Machining</u>	<u>Assembly</u>
Direct materials	\$25,000	\$37,500
Direct labor	10,000	12,500
Machine hours	5,000	1,000
Direct labor hours	2,000	3,000

- Required:
- Compute the two departmental overhead rates.
 - Compute the cost of Job No. 510.
 - Assume that the company decides to use a single overhead rate for the two departments, calculated by adding their overhead costs and using direct labor hours as the allocation base. What would the overhead rate be, and how much manufacturing overhead cost would be assigned to Job No. 510?

Multiple Choice Questions

The next 4 questions refer to the following information.

N Company produces two different products using two different activities: Machining, which uses machine hours as an activity driver, and Inspection, which uses number of batches as an activity driver. The cost of Machining is \$500,000, while the cost of Inspection is \$30,000. Usage of the activity drivers are as follows:

	Product A	Product B	Total
Machine hours	1,000	3,000	4,000
Number of batches	45	15	60

Product A is assigned \$125,000 in Machining cost, and \$22,500 in Inspection cost. Product B uses 75% of total machine hours and 25% of total batches.

1. What is the activity rate for Inspection?
 - a) \$125 per batch
 - b) \$500 per batch
 - c) \$667 per batch
 - d) \$2,000 per batch
2. What is the total Inspection cost assigned to Product A?
 - a) \$7,500
 - b) \$22,500
 - c) \$125,000
 - d) \$375,000
3. What is the total activity cost assigned to Product B?
 - a) \$7,500
 - b) \$147,500
 - c) \$375,000
 - d) \$382,500
4. What proportion of Machining activity is used by Product A?
 - a) 25%
 - b) 33%
 - c) 67%
 - d) 75%

5. Which of the following is most likely to be true of the manufacturing overhead costs assigned to a product with relatively low volume and high complexity?
- An ABC system will assign more manufacturing overhead costs to the product than a volume-based system.
 - A volume-based system will assign more manufacturing overhead costs to the product than an ABC system.
 - An ABC system will assign the same manufacturing overhead costs to the product as a volume-based system.
 - An ABC system will assign manufacturing overhead costs to the product, while a volume-based system will not.
6. B Company manufactures a product that uses \$15 in direct materials and \$5 in direct labor per unit. Under the traditional costing system Buhl uses, manufacturing overhead applied to each unit is \$12. Buhl is considering switching to an ABC system, under which the total overhead cost would be \$25 per unit. What is the total manufacturing cost per unit for Buhl under the ABC system?
- \$20
 - \$25
 - \$32
 - \$45
7. L Company has provided the following data from its activity-based costing accounting system:

<u>Pools</u>	<u>Total Cost</u>	<u>Total Activity</u>	
Designing products	\$1,372,448	7,798	product design hours
Setting up batches	\$33,300	740	batch set-ups
Assembling products	\$126,160	6,640	assembly hours

The activity rate for the Designing Products activity cost pool is closest to:

- \$101 per hour
- \$1,372,448 per hour
- \$176 per hour
- \$57 per hour

8. In activity-based costing, the activity rate for an activity cost pool is computed by dividing the total overhead cost in the activity cost pool by:
- the direct labor-hours required by the product.
 - the machine-hours required by the product.
 - the total activity for the activity cost pool.
 - the total direct labor-hours for the activity cost pool.
9. N Company manufactures and sells two products: Product U5 and Product X2. The company has an activity-based costing system with the following activity cost pools, activity measures, and expected activity:

<u>Activity Cost Pools</u>	<u>Activity Measures</u>	<u>Estimated Overhead Cost</u>	<u>Expected Activity</u>		<u>Total</u>
			<u>Product U5</u>	<u>Product X2</u>	
Labor-related	DLHs	\$36,180	2,400	1,200	3,600
Product testing	tests	65,760	400	600	1,000
General factory	MHs	<u>133,984</u>	4,000	3,900	7,900
		<u>\$235,924</u>			

The total overhead applied to Product U5 under activity-based costing is closest to:

- \$141,555
- \$67,839
- \$157,272
- \$118,264

10. M Company manufactures and sells two products: Product K2 and Product O8. Data concerning the expected production of each product and the expected total direct labor-hours (DLHs) required to produce that output appear below:

	<u>Expected Production</u>	<u>Direct Labor- Hours Per Unit</u>	<u>Total Direct Labor-Hours</u>
Product K2	500	9.0	4,500
Product O8	700	12.0	<u>8,400</u>
Total direct labor-hours			<u>12,900</u>

The direct labor rate is \$21.10 per DLH. The direct materials cost per unit for each product is given below:

	<u>Direct Materials Cost per Unit</u>
Product K2	\$201.30
Product O8	<u>\$298.90</u>

The company is considering adopting an activity-based costing system with the following activity cost pools, activity measures, and expected activity:

<u>Activity Cost Pools</u>	<u>Activity Measures</u>	<u>Estimated Overhead Cost</u>	<u>Expected Activity</u>		<u>Total</u>
			<u>Product K2</u>	<u>Product O8</u>	
Labor- related	DLHs	\$426,861	4,500	8,400	12,900
Machine	setups	59,328	400	500	900

setups					
General					
factory	MHs	<u>442,085</u>	4,300	4,200	8,500
		<u>\$928,274</u>			

The unit product cost of Product K2 under the company's traditional costing method in which all overhead is allocated on the basis of direct labor-hours is closest to:

- a) \$1,038.84
- b) \$689.01
- c) \$859.29
- d) \$984.48

Solutions to Problems

Problem #1

a)

	<u>Product C</u>	<u>Product D</u>	<u>Total</u>
Direct labor hours:	400 units	1,200 units	
	X .7 dlh/unit	X 1.2 dlh/unit	
	280 dlh	1,440 dlh	1,720 dlh

Predetermined overhead rate: $\$130,890 / 1,720 \text{ dlh} =$ $\$76.10/\text{dlh}$

<u>Unit Product Cost:</u>	<u>Product C</u>	<u>Product D</u>
Direct Materials	\$10.70	\$ 16.70
Direct Labor	11.20	19.20
Manufacturing Overhead	<u>* 53.27</u>	<u>** 91.32</u>
Total Unit Cost	<u>\$ 75.17</u>	<u>\$127.22</u>

*.7 dlh/unit * \$76.10 = \$53.27

** 1.2 dlh/unit * \$76.10 = \$91.32

b)

<u>Activity Cost Pool</u>	<u>OH Cost</u>	<u>Activity</u>	<u>Activity Rate</u>
Machine set-ups	\$ 13,570	230 setups	\$59 per setup
Purchase orders	91,520	2,080 orders	\$44 per order
General Factory	25,800	1,720 dlh	\$15 per dlh

c)

<u>Activities</u>	<u>Activity Rates</u>	<u>Product C</u>		<u>Product D</u>	
		<u>Estimated Activity</u>	<u>Amount</u>	<u>Estimated Activity</u>	<u>Amount</u>
Machine set-ups	\$59 per setup	100	\$5,900	130	\$7,670
Purchase orders	\$44 per order	810	35,640	1,270	55,880
General Factory	\$15 per dlh	280	<u>4,200</u>	1,440	<u>21,600</u>
Total overhead cost			\$45,740		\$85,150
Number of Units			<u>400</u>		<u>1,200</u>
Overhead cost per unit			<u>\$114.35</u>		<u>\$70.96</u>

d)

<u>Unit Product Cost:</u>	<u>Product C</u>	<u>Product D</u>
Direct Materials	\$10.70	\$ 16.70
Direct Labor	11.20	19.20
Manufacturing Overhead	<u>114.35</u>	<u>70.96</u>
Total Unit Cost	\$136.25	\$106.86

e)

	<u>Overhead</u>	<u>Activity</u>	<u>Overhead</u>
	<u>rate</u>		<u>applied</u>
Traditional	\$76.10	60 dlh	\$4,566
ABC			
Machine set-ups	\$59.00	10 setups	\$590
Purchase orders	\$44.00	40 po's	\$1,760
General Factory	\$15.00	60 dlh	<u>\$900</u>
Total			\$3,250

Problem #2

a)

<u>Activity Cost Pool</u>	<u>OH Cost</u>	<u>Activity</u>	<u>Activity Rate</u>
Machining	\$14,800	20,000 MHs	\$.74 per MH
Setting Up	19,600	1,000 batches	\$19.60 per batch

b)

<u>Activities</u>	<u>Activity</u> <u>Rates</u>	<u>Product R3</u>		<u>Product D6</u>	
		<u>Estimated</u> <u>Activity</u>	<u>Amount</u>	<u>Estimated</u> <u>Activity</u>	<u>Amount</u>
Machining	\$.74 per MH	3,800	\$2,812	16,200	\$11,988
Setting Up	\$19.60 per batch	300	<u>5,880</u>	700	<u>13,720</u>
Total overhead cost			\$8,692		\$25,700

c)

	<u>Product R3</u>	<u>Product D6</u>
Sales	\$168,700	\$185,600
Direct materials	77,800	72,300
Direct labor	75,800	79,300
Machining overhead	2,812	11,988
Set Up overhead	<u>5,880</u>	<u>13,720</u>
Operating Income	\$6,408	\$8,292

Problem #3

a)

<u>Activity Cost Pool</u>	<u>OH Cost</u>	<u>Activity</u>	<u>Activity Rate</u>
Processing	\$12,200	20,000 MHs	\$.61 per MH
Setting Up	25,100	1,000 batches	\$25.10 per batch

b)

<u>Activities</u>	<u>Activity Rates</u>	<u>Product C7</u>		<u>Product P8</u>	
		<u>Estimated Activity</u>	<u>Amount</u>	<u>Estimated Activity</u>	<u>Amount</u>
Machining	\$.61 per MH	2,400	\$1,464	17,600	\$10,736
Setting Up	\$25.10 per batch	700	<u>17,570</u>	300	<u>7,530</u>
Total overhead cost			\$19,034		\$18,266

c)

Processing	\$12,200
Setting Up	<u>25,100</u>
Total	\$36,300
Total MH	<u>20,000</u>
Overhead rate	\$1.815

d)

	<u>Product C7</u>	<u>Product P8</u>
Machine hours	2,400	17,600
Overhead rate	<u>\$1.815</u>	<u>\$1.815</u>
Total overhead	\$4,356	\$31,944

e)

	<u>Processing</u>	<u>Set Up</u>
Overhead cost	\$12,200	\$25,100
Machine hours	<u>18,000</u>	<u>2,000</u>
Overhead rate	<u>\$.68</u>	<u>\$12.55</u>
Product C7		
Processing	2,160 MH x .68 =	\$1,464
Set-Up	240 MH x \$12.55 =	<u>\$3,012</u>
Product total		\$4,476
Product P8		
Processing	15,840 MH x \$.68 =	\$10,736
Set-Up	1,760 MH x \$12.55 =	<u>\$22,088</u>
Product total		\$32,824
Total overhead		\$37,300

Problem #4

a)			
Machining	<u>\$500,000</u>		\$5.00 per MH
	100,000 MH		
Assembly	<u>\$1,075,000</u>		\$2.15 per DL\$
	\$500,000 DL\$		

b)				
	<u>Machining</u>	<u>Assembly</u>	<u>Job 510</u>	
Direct materials	\$25,000	\$37,500	\$62,500	
Direct labor	10,000	12,500	22,500	
Overhead				
Machining	25,000		25,000	
Assembly		26,875	<u>26,875</u>	
Total			\$136,875	

c)			
Plant-wide	<u>\$1,575,000</u>		\$7.875 per DLH
	200,000 DLH		

	<u>Activity</u>	<u>Rate</u>	<u>Overhead</u>
Plant-wide	5,000 DLH	\$7.875 per DLH	\$39,375
Departmental	Machining		\$25,000
	Assembly		<u>26,875</u>
			\$51,875

Solutions to Multiple Choice Questions

- 1. B
- 2. B
- 3. D
- 4. A
- 5. A
- 6. D
- 7. C
- 8. C
- 9. D
- 10. A