

CHAPTER 4

Activity-Based Costing

Learning Objectives

1. Discuss the difference between traditional costing and activity-based costing.
 2. Apply activity-based costing to a manufacturer.
 3. Explain the benefits and limitations of activity-based costing.
 4. Apply activity-based costing to service industries.
 - *5. Explain just-in-time (JIT) processing.
- *Note:** All **asterisked** Questions, Brief Exercises, Exercises, and Problems relate to material contained in the appendix to the chapter.

ANSWERS TO QUESTIONS

1. Direct labor is a valid basis for allocating overhead when: (a) direct labor constitutes a significant part of total product cost, and (b) there is a high correlation between direct labor and changes in the amount of overhead costs.

LO1 BT: K Difficulty: Easy TOT: 2 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Cost management

2. The amount of direct labor in many industries has greatly decreased, due to advances in computerized systems, technological innovation, global competition and automation. Total overhead costs resulting from depreciation on expensive equipment and machinery, utilities, repairs, and maintenance have significantly increased along with a reduction of direct labor hours due to terminating hourly employees. Many companies now use machine hours as the basis on which to allocate overhead in an automated manufacturing environment.

LO1 BT: K Difficulty: Easy TOT: 4 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management

3. In many automated manufacturing environments, machine hours is a more relevant basis on which to allocate overhead.

LO1 BT: K Difficulty: Easy TOT: 1 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management

4. Under a traditional volume-based costing system where overhead cost is allocated on the basis of units of output, the high-volume product will undoubtedly absorb more overhead than the low-volume product.

LO1 BT: K Difficulty: Easy TOT: 2 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management

5. The principal differences are:

	<u>Activity-Based Costing</u>	<u>Traditional Costing</u>
(1) Primary focus	Activities performed in making products	Units of production
(2) Bases of allocation	Multiple cost drivers	Single unit-level base

LO1 BT: K Difficulty: Easy TOT: 2 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management

6. Activity-based overhead rates are computed using the following formula:

$$\frac{\text{Estimated Overhead per Activity}}{\text{Estimated Use of Cost Drivers per Activity}}$$

LO2 BT: K Difficulty: Easy TOT: 2 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management

7. The four steps involved in developing an ABC system are:
 1. Identify and classify the major activities involved in the manufacture of specific products and allocate overhead to cost pools.
 2. Identify the cost driver that has a strong correlation to the costs accumulated in each cost pool and estimate total annual cost driver usage.
 3. Compute the activity-based overhead rate for each cost pool.
 4. Assign overhead costs to products using the overhead rates determined for each cost pool and each product's use of each cost driver.

LO2 BT: K Difficulty: Easy TOT: 4 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management

8. A value-added/non-value-added activity flowchart is based on a systematic analysis of all the activities (resource-consuming actions and transactions) performed to manufacture a product or render a service. The flowchart documents each activity and the time involved in each activity. The flow chart also documents management's proposed reengineering of the manufacturing process.

LO3 BT: K Difficulty: Easy TOT: 3 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management

Questions Chapter 4 (Continued)

9. An activity cost pool is the overhead cost attributed to a distinct type of activity or related activities.
LO2 BT: K Difficulty: Easy TOT: 1 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management
10. A cost driver is any factor or activity that has a direct cause-effect relationship with the resources consumed.
LO2 BT: K Difficulty: Easy TOT: 1 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management
11. A cost driver is accurate and appropriate if it measures the actual consumption of the activity in manufacturing a product or rendering a service and the data relating to the cost driver is available and easily obtained.
LO2 BT: K Difficulty: Easy TOT: 2 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management
12. The formula for assigning activity cost pools to products is:
Activity-based overhead rate X Expected or actual use of cost drivers per product
LO2 BT: K Difficulty: Easy TOT: 2 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management
13. The use of more cost pools results in more accurate product costing, enhanced control over overhead costs, and better management decisions.
LO3 BT: K Difficulty: Easy TOT: 1 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management
14. The limitations of ABC are: (a) increased costs that accompany multiple-activity cost pools and cost drivers and (b) some arbitrary allocations remain.
LO3 BT: K Difficulty: Easy TOT: 1 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management
15. ABC is the superior costing system when: (1) product lines differ greatly in volume and manufacturing complexity; (2) product lines are numerous, diverse, and require differing degrees of support services; (3) overhead costs constitute a significant portion of total costs; (4) the manufacturing process or the number of products has changed significantly; and (5) data from the existing system is being ignored or challenged by management.
LO3 BT: K Difficulty: Easy TOT: 3 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management
16. Basic ABC has been enhanced by identifying activities as value-added and non-value-added.
LO3 BT: K Difficulty: Easy TOT: 1 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management
17. Identifying non-value-added activities highlights for managers the activities that should be reduced or eliminated if they are not essential and they add no value to the product.
LO3 BT: K Difficulty: Easy TOT: 2 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management
18. The overall objective of ABC in service firms is no different than for manufacturing companies; that is, improved costing of services rendered (by job, service, contract, or customer). The general approach to costing is the same—analyze operations, identify activities, assign overhead costs to activity cost pools, and identify and use cost drivers to assign the cost pools to the services.
LO4 BT: K Difficulty: Easy TOT: 3 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management
19. Greater accuracy in cost allocation is achieved by recognizing the four levels of activity. Some activities are affected (driven) by changes in the number of **units** produced, while other activities are affected only by changes in the number of **batches** or the number of **products**, and some, **facility-level** activities, are unaffected by changes in either units, batches, or products produced.
LO3 BT: K Difficulty: Easy TOT: 3 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management

Questions Chapter 4 (Continued)

- *20. (a) Just-in-time processing has a just-in-time philosophy and a **pull** approach to eliminate inventory. It is dedicated to having the right amount of materials, parts, or products just as they are needed.
- (b) There are three important elements in JIT processing:
- (1) A company must have dependable suppliers who are willing to deliver on short notice exact quantities of raw materials according to precise quality specifications.
 - (2) A multiskilled workforce must be developed.
 - (3) A total quality control system must be established.

LO5 BT: K Difficulty: Easy TOT: 5 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management

SOLUTIONS TO EXERCISES

EXERCISE 4.2

(a) Traditional costing system

	<u>Product 540X</u>	<u>Product 137Y</u>	<u>Product 249S</u>
Sales	\$180,000	\$160,000	\$70,000
Costs	<u>55,000</u>	<u>50,000</u>	<u>15,000</u>
Operating income	<u>\$125,000</u>	<u>\$110,000</u>	<u>\$55,000</u>

(b) Activity-based costing system

	<u>Product 540X</u>	<u>Product 137Y</u>	<u>Product 249S</u>
Sales	\$180,000	\$160,000	\$70,000
Costs	<u>50,000</u>	<u>35,000</u>	<u>35,000</u>
Operating income	<u>\$130,000</u>	<u>\$125,000</u>	<u>\$35,000</u>

(c) Product 540X: $(\$130,000 - \$125,000) \div \$125,000 = 4.00\%$

Product 137Y $(\$125,000 - \$110,000) \div \$110,000 = 13.64\%$

Product 249S $(\$35,000 - \$55,000) \div \$55,000 = (36.36\%)$

[(540X: $(\$130,000 - \$125,000) \div \$125,000 = 4.00\%$); (137Y: $(\$125,000 - \$110,000) \div \$110,000 = 13.64\%$); (249S: $(\$35,000 - \$55,000) \div \$55,000 = (36.36\%)$)]

[(540X: (ABC oper. inc. – Trad. oper. inc.) \div Trad. oper. inc. = % diff. in oper. inc.); (137Y: (ABC oper. inc. – Trad. oper. inc.) \div Trad. oper. inc. = % diff. in oper. inc.); 249S(ABC oper. inc. – Trad. oper. inc.) \div Trad. oper. inc. = % diff. in oper. inc.)]

(d) **These costs are similar probably because the cost drivers are essentially the same; that is, they are based on a unit volume concept.**

LO1 BT: AP Difficulty: Easy TOT: 12 min. AACSB: Analytic AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management

EXERCISE 4.3

(a)	<u>Activity cost pools</u>	<u>Cost drivers</u>	<u>Estimated overhead</u>
	Cutting	Machine hours	\$360,000
	Design	Number of setups	585,000

Activity-based overhead rates

<u>Cutting</u>		<u>Design</u>	
$\frac{\$360,000}{200,000} = \$1.80 \text{ per machine hour}$		$\frac{\$585,000}{1,500} = \390 per setup	

	<u>Wool</u>	<u>Cotton</u>
Activity-based costing		
Cutting		
100,000 X \$1.80	\$180,000	
100,000 X \$1.80		\$180,000
Design		
1,000 X \$390	390,000	
500 X \$390		195,000
Total cost assigned	<u>\$570,000</u>	<u>\$375,000</u>

[(Wool: (100,000 x \$1.80) + (1,000 x \$390) = \$570,000); (Cotton: (100,000 x \$1.80) + (500 x \$390) = \$375,000)]

[(Wool: (No. of MH x OH rate/MH) + (No. of setups x OH rate/setup = Tot. OH cost assigned); (Cotton: (No. of MH x OH rate/MH) + (No. of setups x OH rate/setup = Tot. OH cost assigned)]

(b) $\frac{\text{Estimated overhead}}{\text{Estimated direct labors hours}} = \frac{\$945,000}{450,000} = \$2.10 \text{ per direct labor hour}$

	<u>Wool</u>	<u>Cotton</u>
Traditional costing		
225,000 X \$2.10	<u>\$472,500</u>	
225,000 X \$2.10		<u>\$472,500</u>

[(Wool: 225,000 x \$2.10 = \$472,500); (Cotton: (225,000 x \$2.10 = \$472,500)]

[(Wool: No. of DLH x OH rate/DLH = Tot. OH cost assigned); (Cotton: No. of DLH x OH rate/DLH = Tot. OH cost assigned)]

The wool product line is assigned \$97,500 (\$570,000 – \$472,500) more overhead cost when an activity-based costing system is used. As a result, the cotton product line is assigned \$97,500 (\$472,500 – \$375,000) less.

LO1, 2 BT: AN Difficulty: Easy TOT: 12 min. AACSB: Analytic AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management

EXERCISE 4.4

(a)	Direct labor hours for car wheels	(40,000 X 1)	=	40,000
	Direct labor hours for truck wheels	(10,000 X 3)	=	<u>30,000</u>
	Total direct labor hours			<u>70,000</u>

\$770,000 (total estimated overhead)

70,000 (total estimated direct labor = \$11 per direct labor hour.
hours)

Overhead assigned

Car wheels	(40,000 X \$11)	=	\$440,000
Truck wheels	(30,000 X \$11)	=	<u>330,000</u>
Total overhead			<u>\$770,000</u>

[(Car: 40,000 x \$11 = \$440,000); (Truck: 30,000 x \$11 = \$330,000)]

[(Car: No. of DLH x OH rate/DLH = Tot. OH cost assigned); (Truck: No. of DLH x OH rate/DLH = Tot. OH cost assigned)]

(b)				Estimated Use of		ABC Overhead Rate
	<u>Activity Cost Pool</u>	<u>Estimated Overhead</u>	÷	<u>Cost Drivers</u>	=	<u>Rate</u>
	Setting up machines	\$220,000		1,000 setup		\$220/setup
	Assembling	280,000		70,000 DLHs		\$ 4/DLH
	Inspection	270,000		1,200 inspections		\$225/inspection

(c)		<u>Car Wheels</u>			
	<u>Activity</u>	<u>Use of Cost</u>		<u>Activity-Based</u>	
	<u>Cost Pools</u>	<u>Driver</u>		<u>Overhead</u>	
		<u>per Product</u>	x	<u>Rates</u>	=
	<u>Cost Assigned</u>				
	Setting up machines	200		\$220	\$ 44,000
	Assembling	40,000		\$ 4	160,000
	Inspection	100		\$225	<u>22,500</u>
	Total cost assigned				<u>\$226,500</u>

EXERCISE 4.4 (Continued)

Activity Cost Pools	Truck Wheels		Activity-Based Overhead Rates	=	Cost Assigned
	Use of Cost Driver per Product	X			
Setting up machines	800		\$220		\$176,000
Assembling	30,000		\$ 4		120,000
Inspection	1,100		\$225		247,500
Total cost assigned					<u>\$543,500</u>

[(Car: (200 x \$220) + (40,000 x \$4) + (100 x \$225) = \$226,500); (Truck: (800 x \$220) + (30,000 x \$4) + (1,100 x \$225) = \$543,500)]

[(Car: (No. of mach. setups x OH rate/setup) + (No. of DLH x OH rate/DLH) + (No. of inspect. x OH rate/inspect.) = Tot. OH cost assigned); (Truck: (No. of mach. setups x OH rate/setup) + (No. of DLH x OH rate/DLH) + (No. of inspect. x OH rate/inspect.) = Tot. OH cost assigned)]

- (d) Assuming that the cost drivers are a reasonable representation of what is occurring in the two product lines, it seems appropriate to switch to activity-based costing. By using this system, more accurate cost information is developed which should lead to better allocation of resources and pricing decisions in the future.

LO1, 2 BT: AN Difficulty: Easy TOT: 15 min. AACSB: Analytic AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management

EXERCISE 4.7

The following cost drivers might be used to assign overhead:

- | | |
|---------------------------------------|-------------------------|
| 1. Gallons of chemicals | 7. Number of bottles |
| 2. Number of carts or labor hours | 8. Number of bottles |
| 3. Number of carts | 9. Number of boxes |
| 4. Gallons of juice | 10. Number of shipments |
| 5. Gallons of juice | 11. Square feet |
| 6. Gallons of wine or months of aging | 12. Machine hours |

LO2 BT: AN Difficulty: Easy TOT: 15 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management

EXERCISE 4.10

(a) (1) Traditional product costing system:

\$400,000 X 0.70 = \$280,000 selling costs assigned in March to the “high intensity” product line.

(2) Activity-based costing system:

Activity Cost Pools	Cost Drivers Used	X	Activity-Based Overhead Rates	=	Overhead Cost Assigned
Sales commissions	\$900,000		\$0.05		\$ 45,000
Advertising—TV	250		\$300		75,000
Advertising—Internet	2,000		\$10		20,000
Catalogs	60,000		\$2.50		150,000
Cost of catalog sales	9,000		\$1.00		9,000
Credit and collection	\$900,000		\$0.03		<u>27,000</u>
Total assigned cost for March					<u>\$326,000</u>

(b) As compared to ABC, traditional costing grossly under costs the selling costs assigned to the “high intensity” product line. The difference of \$46,000 (\$326,000 – \$280,000) in the month of March is a 14.1% understatement.

[((\$326,000 - \$280,000) = \$46,000); (\$46,000 ÷ \$326,000 = 14.1%)]

[(Tot. assigned OH costs under ABC – Tot. assigned OH costs under traditional = Understated diff.); (Understated diff. ÷ Tot. assigned OH costs under ABC = Understated % diff.)]

LO1, 2, 3 BT: AP Difficulty: Easy TOT: 8 min. AACSB: Analytic AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management

EXERCISE 4.11

(a) 1. Traditional product costing system:

Quality-control overhead costs assigned in June to the low-calorie breakfast line are \$11,900 (\$70,000 X .17).

2. Activity-based costing system:

Activity Cost Pools	Cost Drivers Used	X	Activity- Based Overhead Rate	=	Overhead Cost Assigned
Inspections of material received	6,000		\$ 0.90		\$ 5,400
In-process inspections	10,000		\$ 0.33		3,300
FDA certification	420		\$ 12.00		<u>5,040</u>
Total assigned cost for June					<u>\$13,740</u>

(b) As compared to ABC, the traditional costing system under costs the quality-control overhead cost assigned to the low-calorie breakfast line by \$1,840 (\$13,740 – \$11,900) in the month of June. That is a 13.4% understatement.

[($\$13,740 - \$11,900 = \$1,840$); ($\$1,840 \div \$13,740 = 13.4\%$)]

[(Tot. assigned OH costs under ABC – Tot. assigned OH costs under traditional = Understated diff.); (Understated diff. \div Tot. assigned OH costs under ABC = Understated % diff.)]

LO1, 2, 3 BT: AP Difficulty: Easy TOT: 8 min. AACSB: Analytic AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management

EXERCISE 4.13

1. Facility-level activity
2. Product-level activity
3. Batch-level activity
4. Product-level activity
5. Product-level activity
6. Batch-level activity
7. Facility-level activity
8. Batch-level or unit-level activity
9. Unit-level activity
10. Unit-level activity

LO3 BT: AN Difficulty: Easy TOT: 6 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation
IMA: Cost Management

EXERCISE 4.14

(a)

<u>Activity Cost Pools</u>	<u>Estimated Overhead</u>	\div	<u>Estimated use of Cost Drivers</u>	$=$	<u>ABC Overhead Rates</u>
Scheduling and travel	\$85,000		1,250 hours		\$ 68.00 per hour
Setup time	\$90,000		600 setups		\$150.00 per setup
Supervision	\$60,000		\$400,000*		\$ 0.15 per dollar

*\$100,000 + \$300,000

Commercial

<u>Activity Cost Pools</u>	<u>Use of Cost Drivers per Product</u>	\times	<u>ABC Overhead Rates</u>	$=$	<u>Cost Assigned</u>
Scheduling and travel	750 hours		\$ 68.00/hr.		\$ 51,000
Setup time	350 setups		\$150.00/setup		52,500
Supervision	\$100,000		\$ 0.15/dollar		<u>15,000</u>
Total assigned costs					<u>\$118,500</u>

Residential

<u>Activity Cost Pools</u>	<u>Use of Cost Drivers per Product</u>	\times	<u>ABC Overhead Rates</u>	$=$	<u>Cost Assigned</u>
Scheduling and travel	500 hours		\$ 68.00/hr.		\$ 34,000
Setup time	250 setups		\$150.00/setup		37,500
Supervision	\$300,000		\$ 0.15/dollar		<u>45,000</u>
Total assigned costs					<u>\$116,500</u>

EXERCISE 4.14 (Continued)

[(Commercial: (750 x \$68) + (350 x \$150) + (\$100,000 x \$0.15) = \$118,500); (Residential: (500 x \$68) + (250 x \$150) + (\$300,000 x \$0.15) = \$116,500)]

[(Commercial: (Hrs. of travel x OH rate/hr.) + (No. of setups x OH rate/setup) + (DL cost x OH rate/DL\$) = Tot. assigned OH costs); (Residential: (Hrs. of travel x OH rate/hr.) + (No. of setups x OH rate/setup) + (DL cost x OH rate/DL\$) = Tot. assigned OH costs)]

		<u>Commercial</u>		<u>Residential</u>
(b)				
Revenues		\$300,000		\$480,000
Direct material costs	\$ 30,000		\$ 50,000	
Direct labor costs	100,000		300,000	
Overhead costs	<u>118,500</u>	<u>248,500</u>	<u>116,500</u>	<u>466,500</u>
Operating income (loss)		<u>\$ 51,500</u>		<u>\$ 13,500</u>

- (c) Assuming that the cost drivers are a reasonable representation of what is being consumed by the two product lines, it seems appropriate to switch to activity-based costing. By using this system, more accurate cost information is developed which should lead to better allocations of resources, better profitability reporting, and more informative pricing decisions in the future.

LO4 BT: AP Difficulty: Easy TOT: 20 min. AACSB: Analytic AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management

SOLUTIONS TO PROBLEMS

PROBLEM 4.1

- (a) Computation of unit costs—traditional costing.

<u>Manufacturing Costs</u>	<u>Products</u>	
	<u>Home Model</u>	<u>Commercial Model</u>
Direct materials	\$18.50	\$26.50
Direct labor	19.00	19.00
Overhead	<u>24.68*</u>	<u>24.68*</u>
Total unit cost	<u>\$62.18</u>	<u>\$70.18</u>

*\$16.45 X 1.5 = \$24.68

- (b)

<u>Activity Cost Pool</u>	<u>Estimated Overhead</u>	<u>Estimated Use of Cost Drivers</u>	<u>Activity-Based Overhead Rate</u>
Receiving	\$ 80,400	335,000 Pounds	\$ 0.24 per pound
Forming	150,500	35,000 Machine hours	\$ 4.30 per machine hour

Assembling	412,300	217,000 Parts	\$ 1.90 per part
Testing	51,000	25,500 Tests	\$ 2.00 per test
Painting	52,580	5,258 Gallons	\$10.00 per gallon
Packing and shipping	837,500	335,000 Pounds	\$ 2.50 per pound
	<u>\$1,584,280</u>		

(c)

Activity Cost Pool	Home Model			Commercial Model		
	Use of Drivers by Product	Activity- Based Overhead Rates	Cost Assigned	Use of Drivers by Product	Activity- Based Overhead Rates	Cost Assigned
Receiving	215,000	\$ 0.24	\$ 51,600	120,000	\$ 0.24	\$ 28,800
Forming	27,000	\$ 4.30	116,100	8,000	\$ 4.30	34,400
Assembling	165,000	\$ 1.90	313,500	52,000	\$ 1.90	98,800
Testing	15,500	\$ 2.00	31,000	10,000	\$ 2.00	20,000
Painting	3,680	\$10.00	36,800	1,578	\$10.00	15,780
Packing and shipping	215,000	\$ 2.50	537,500	120,000	\$ 2.50	300,000
Total costs assigned (a)			<u>\$1,086,500</u>			<u>\$497,780</u>
Units produced (b)			<u>54,000</u>			<u>10,200</u>
Overhead cost per unit [(a) ÷ (b)]			<u>\$ 20.12</u>			<u>\$ 48.80</u>

[(Home: (215,000 x \$.24) + (27,000 x \$4.30) + (165,000 x \$1.90) + (15,500 x \$2) + (3,680 x \$10) + (215,000 x \$2.50) = \$1,086,500; \$1,086,500 ÷ 54,000 = \$20.12); (Commercial: (120,000 x \$.24) + (8,000 x \$4.30) + (52,000

PROBLEM 4.1 (Continued)

$\times \$1.90) + (10,000 \times \$2) + (1,578 \times \$10) + (120,000 \times \$2.50) = \$497,780$; $\$497,780 \div 10,200 = \48.80]
[(Home: (No. of lbs. \times OH rate/lb.) + (No. of MH \times OH rate/MH) + (No. of parts \times OH rate/part) + (No. of tests \times OH rate/test) + (No. of ga. \times OH rate/ga.) + (No. of lbs. \times OH rate/lb.) = Tot. OH assigned; Tot. OH assigned \div No. units made = OH cost/unit); (Commercial: (No. of lbs. \times OH rate/lb.) + (No. of MH \times OH rate/MH) + (No. of parts \times OH rate/part) + (No. of tests \times OH rate/test) + (No. of ga. \times OH rate/ga.) + (No. of lbs. \times OH rate/lb.) = Tot. OH assigned; Tot. OH assigned \div No. units made = OH cost/unit)]

(d)

<u>ABC Manufacturing Costs</u>	<u>Home Model</u>	<u>Commercial Model</u>
Direct materials	\$18.50	\$26.50
Direct labor	19.00	19.00
Overhead	<u>20.12</u>	<u>48.80</u>
Total cost per unit	<u>\$57.62</u>	<u>\$94.30</u>

<u>(e) Activity</u>	<u>Value- vs. Non-Value-Added</u>
Receiving	Non-value-added
Forming	Value-added
Assembling	Value-added
Testing	Non-value-added
Painting	Value-added
Packing and shipping	Value-added

(f) (1) Activity-based costing shows the commercial model absorbs nearly $2\frac{1}{2}$ ($\$48.80 \div \20.12) times as much overhead per unit as the home model.

(2) The comparison of ABC and traditional costing shows that the proper amount of overhead assigned to the two products is not equal at \$24.68 but rather \$20.12 for the home model and \$48.80 for the commercial model. Under traditional costing, the margin of error on the commercial model was almost 100%, an understatement of \$24.12 on an assignment of \$24.68. These distorted overhead assignments have likely led to overpricing the home model and underpricing the commercial model.

LO1, 2, 3 BT: AP Difficulty: Moderate TOT: 40 min. AACSB: Analytic AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management

PROBLEM 4.2

- (a) The allocation of total manufacturing overhead using activity-based costing is as follows:

Overhead Rate	Royale		Majestic		Total Overhead
	Cost Drivers Used	Cost Assigned	Cost Drivers Used	Cost Assigned	
Purchase orders @ \$30	17,000	\$ 510,000	23,000	\$ 690,000	\$1,200,000
Machine setups @ \$50	5,000	250,000	13,000	650,000	900,000
Machine hours @ \$40	75,000	3,000,000	45,000	1,800,000	4,800,000
Inspections @ \$25	11,000	275,000	17,000	425,000	700,000
Total assigned costs (a)		<u>\$4,035,000</u>		<u>\$3,565,000</u>	<u>\$7,600,000</u>
Units produced (b)		<u>25,000</u>		<u>10,000</u>	
Cost per unit (a) ÷ (b)		<u>\$ 161.40</u>		<u>\$ 356.50</u>	

[(Royale: (17,000 x \$30) + (5,000 x \$50) + (75,000 x \$40) + (11,000 x \$25) = \$4,035,000; \$4,035,000 ÷ 25,000 = \$161.40); (Majestic: (23,000 x \$30) + (13,000 x \$50) + (45,000 x \$40) + (17,000 x \$25) = \$3,565,000; \$3,565,000 ÷ 10,000 = \$356.50)]

[(Royale: (No. of P.O.s x OH rate/P.O.) + (No. of setups x OH rate/setup) + (No. of MH x OH rate/MH) + (No. of inspect. x OH rate/inspect.) = Tot. OH assigned costs; Tot. OH assigned costs ÷ No. units made = OH cost/unit); (Majestic: (No. of P.O.s x OH rate/P.O.) + (No. of setups x OH rate/setup) + (No. of MH x OH rate/MH) + (No. of inspect. x OH rate/inspect.) = Tot. OH assigned costs; Tot. OH assigned costs ÷ No. units made = OH cost/unit)]

- (b) The cost per unit and gross profit of each model under ABC were:

	Royale	Majestic
Direct materials	\$ 700.00	\$ 420.00
Direct labor	120.00	100.00
Manufacturing overhead	161.40	356.50
Total cost per unit	<u>\$ 981.40</u>	<u>\$ 876.50</u>
Sales price per unit	\$1,600.00	\$1,300.00
Cost per unit	<u>981.40</u>	<u>876.50</u>
Gross profit	<u>\$ 618.60</u>	<u>\$ 423.50</u>

- (c) Management's future plans for the two television models are not sound. Under ABC, the Royale model is \$195.10 (\$618.60 – \$423.50) per unit more profitable than the Majestic model. If either product should be phased out, it is the Majestic. However, by applying ABC and activity-based management analysis, Schultz may determine how to reduce the costs of producing the Majestic model.

LO2 BT: AP Difficulty: Moderate TOT: 30 min. AACSB: Analytic AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management

PROBLEM 4.3

(a) Predetermined overhead rate using machine hours:

$$\$868,000 \div 100,000 \text{ hrs.} = \$8.68 \text{ per machine hour}$$

(b) Manufacturing cost per stairway under traditional costing:

Direct materials.....	\$ 103,600
Direct labor.....	112,000
Overhead (14,500 X \$8.68).....	<u>125,860</u>
Total cost of 250 stairs.....	<u>\$ 341,460</u>

Cost per stairway (\$341,460 ÷ 250).....	<u>\$1,365.84</u>
--	-------------------

[\$103,600 + \$112,000 + (14,500 x \$8.68) = \$341,460; \$341,460 ÷ 250 = \$1,365.84]

[DM + DL + (No. of MH x OH rate/MH) = Tot. cost; Tot. cost ÷ No. of stairways = Tot. cost/stairway]

(c) Manufacturing cost per stairway under activity-based costing:

Computation of Activity-Based Overhead Rates

Activity Cost Pools	Estimated Overhead ÷	Estimated Use of Cost Drivers per Activity	= Activity-Based Overhead Rate
Purchasing	\$ 75,000	600 Orders	\$125 per order
Handling materials	82,000	8,000 Moves	\$10.25 per move
Production	210,000	100,000 D/L Hours	\$2.10 per D/L hour
Setting up machines	105,000	1,250 Setups	\$84 per setup
Inspecting	90,000	6,000 Inspections	\$15 per inspection
Inventory control	126,000	168,000 Components	\$0.75 per component
Utilities	<u>180,000</u>	90,000 Sq. ft.	\$2.00 per sq. ft.
	<u>\$868,000</u>		

Assignment of Overhead to Order of 250 Stairs

Activity Cost Pools	Use of Cost Drivers	Activity-Based Overhead Rates X	= Cost Assigned
Purchasing	60 Orders	\$125	\$ 7,500
Handling materials	800 Moves	\$10.25	8,200
Production	5,000 D/L Hours	\$2.10	10,500
Setting up machines	100 Setups	\$84	8,400
Inspecting	450 Inspections	\$15	6,750
Inventory control	16,000 Components	\$0.75	12,000
Utilities	8,000 Sq. ft.	\$2.00	<u>16,000</u>
Total overhead assigned			<u>\$69,350</u>

PROBLEM 4.3 (Continued)

$[(60 \times \$125) + (800 \times \$10.25) + (5,000 \times \$2.10) + (100 \times \$84) + (450 \times \$15) + (16,000 \times \$0.75) + (8,000 \times \$2) = \$69,350]$

$[(\text{No. of P.O.s} \times \text{OH rate/P.O.}) + (\text{No. of moves} \times \text{OH rate/move}) + (\text{No. of DLHs} \times \text{OH rate/DLH}) + (\text{No. of setups} \times \text{OH rate/setup}) + (\text{No. of inspect.} \times \text{OH rate/inspect.}) + (\text{No. of components} \times \text{OH rate/component}) + (\text{No. of sq. ft.} \times \text{OH rate/sq. ft.}) = \text{Tot. OH assigned}]$

Total manufacturing cost per stairway under ABC:

Direct materials.....	\$ 103,600
Direct labor.....	112,000
Overhead.....	69,350
Total cost of 250 stairs	<u>\$ 284,950</u>

Total cost per stairway (\$284,950 ÷ 250)..... \$1,139.80

$(\$103,600 + \$112,000 + \$69,350 = \$284,950; \$284,950 \div 250 = \$1,139.80)$

$(\text{DM} + \text{DL} + \text{OH} = \text{Tot. cost}; \text{Tot. cost} \div \text{No. of stairways} = \text{Tot. cost/stairway})$

- (d) The difference between the traditional cost and the activity-based cost per unit, \$1,365.84 versus \$1,139.80, is not great in amount but \$226.04 (\$1,365.84 – \$1,139.80) is 19.8% of the more correct ABC cost per unit. Activity-based costing is the preferable costing system for setting prices because the real costs are more accurately reflected, leading to more competitive pricing. The greater accuracy is a result of multiple, more relevant activity cost drivers under ABC than the single cost driver used with the traditional volume-based system.

LO1, 2 BT: AN Difficulty: Moderate TOT: 45 min. AACSB: Analytic AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management

PROBLEM 4.4

(a) Computation of unit costs—traditional costing

Overhead cost per direct labor hour is $\$1,241,660 \div (150,000 + 27,000) = \7.015

<u>Manufacturing Costs</u>	<u>Products</u>	
	<u>CoolDay</u>	<u>LiteMist</u>
Direct materials	\$0.400	\$1.200
Direct labor	0.500	0.900
Overhead	<u>0.351*</u>	<u>0.631**</u>
	<u>\$1.251</u>	<u>\$2.731</u>

*\$7.015 X .05 **\$7.015 X .09

[(CoolDay: \$0.400 + \$0.500 + (.05 x \$7.015) = \$1.251); (LiteMist: \$1.200 + \$0.900 + (.09 x \$7.015) = \$2.731)]

[(CoolDay: DM + DL + (DLHs x OH rate/DLH) = Tot. unit cost); (LiteMist: DM + DL + (DLHs x OH rate/DLH) = Tot. unit cost)]

(b)

<u>Activity Cost Pools</u>	<u>Estimated Overhead</u>	<u>Estimated Use of Cost Drivers</u>	<u>Activity-Based Overhead Rates</u>
Grape processing	\$ 145,860	6,600	\$22.10 per cart
Aging	396,000	6,600,000	\$ 0.06 per month
Bottling and corking	270,000	900,000	\$ 0.30 per bottle
Labeling and boxing	189,000	900,000	\$ 0.21 per bottle
Maintain and inspect equipment	<u>240,800</u>	800	\$301 per inspection
	<u>\$1,241,660</u>		

PROBLEM 4.4 (Continued)

(c)

Activity Cost Pools	CoolDay			LiteMist		
	Use of Cost Drivers	X	Activity- Based Overhead Rates = Cost Assigned	Use of Cost Drivers	X	Activity- Based Overhead Rates = Cost Assigned
Grape processing	6,000		\$22.10 \$132,600	600		\$22.10 \$ 13,260
Aging	3,000,000		\$ 0.06 180,000	3,600,000		\$ 0.06 216,000
Bottling and corking	600,000		\$ 0.30 180,000	300,000		\$ 0.30 90,000
Labeling and boxing	600,000		\$ 0.21 126,000	300,000		\$ 0.21 63,000
Maintain and inspect equipment	350		\$301 105,350	450		\$301 135,450
Overhead costs assigned (a)			<u>\$723,950</u>			<u>\$517,710</u>
Liters produced (b)			<u>3,000,000</u>			<u>300,000</u>
Overhead cost per liter [(a) ÷ (b)]			<u>\$0.241</u>			<u>\$1.726</u>

[(CoolDay: (6,000 x \$22.10) + (3,000,000 x \$.06) + (600,000 x \$.30) + (600,000 x \$.21) + (350 x \$301) =

\$723,950; \$723,950 ÷ 3,000,000 = \$.241); (LiteMist: (600 x \$22.10) + (3,600,000 x \$.06) + (300,000 x \$.30) +

(300,000 x \$.21) + (450 x \$301) = \$517,710; \$517,710 ÷ 300,000 = \$1.726)]

[(CoolDay: (No. of carts x OH rate/cart) + (No. of mos. x OH rate/mo.) + (No. of bottles x OH rate/bottle) + (No. of bottles x OH rate/bottle) + (No. of inspect. x OH rate/inspect.) = Tot. OH costs assigned; Tot. OH costs assigned ÷ No. of liters made = OH cost/liter); (LiteMist: (No. of carts x OH rate/cart) + (No. of mos. x OH rate/mo.) + (No. of bottles x OH rate/bottle) + (No. of bottles x OH rate/bottle) + (No. of inspect. x OH rate/inspect.) = Tot. OH costs assigned; Tot. OH costs assigned ÷ No. of liters made = OH cost/liter)]

PROBLEM 4.4 (Continued)

(d)

<u>Manufacturing Costs</u>	<u>Products</u>	
	<u>CoolDay</u>	<u>LiteMist</u>
Direct materials	\$0.400	\$1.200
Direct labor	0.500	0.900
Overhead	<u>0.241</u>	<u>1.726</u>
	<u>\$1.141</u>	<u>\$3.826</u>

(e) To: Mr. Jack Eller

From: Student

Subject: Product costs using traditional approach versus ABC

The memorandum covers the following points:

- a. ABC assigns overhead costs as a function of each product's use of cost drivers. Thus, ABC results in overhead assignment that more closely approximates each product's generation of overhead costs.
- b. Traditional approaches that assign costs as a function of volume tend to be biased toward assigning too much overhead to high volume, simple products, and too little to low volume, complex products. This is because the actual incurrence of overhead costs is rarely correlated with labor costs.
- c. In the case of the Benton Corporation, the LiteMist product required the company to begin using more complex methods and equipment. Overhead costs increased substantially. When overhead costs were assigned using labor rates, too much overhead was assigned to the high volume CoolDay product. This reduced the apparent profitability of this product.

LO1, 2 BT: AN Difficulty: Moderate TOT: 50 min. AACSB: Analytic AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management

PROBLEM 4.5

- (a) Computation of assigned overhead under traditional costing (“direct labor dollars” appears in the first line of the schedule of overhead data):

Predetermined overhead rate X direct labor dollars

Overhead assigned to audit: $0.40 \times \$1,100,000 = \$440,000$

Overhead assigned to tax: $0.40 \times \$700,000 = \$280,000$

[(Audit: $\$1,100,000 \times .40 = \$440,000$); (Tax: $\$700,000 \times .40 = \$280,000$)]

[(Audit: (DL\$ x OH rate/DL\$ = OH assigned)); (Tax: (DL\$ x OH rate/DL\$ = OH assigned))]

- (b) (1) Computation of activity-based overhead rates:

Activity Cost Pools	Estimated Overhead ÷	Expected Use of Cost Drivers per Activity	=	Activity-Based Overhead Rates
Employee training	\$216,000	\$1,800,000 Direct labor dollars		\$0.12 per DL dollar
Typing and secretarial	76,200	2,500 Reports/forms		\$30.48 per report/form
Computing	204,000	60,000 Minutes		\$3.40 per minute
Facility rental	142,500	40 Employees		\$3,562.50 per employee
Travel	81,300	Direct		Direct
	<u>\$720,000</u>			

- (2) Assignment of overhead to audit and tax services:

Activity Cost Pools	Audit			Tax		
	Use of Cost Driver per Service	Activity-Based Overhead Rate	= Cost Assigned	Use of Cost Driver per Service	Activity-Based Overhead Rate	= Cost Assigned
Employee training	\$1,100,000	\$0.12	\$132,000	\$700,000	\$0.12	\$ 84,000
Typing and secretarial	800	\$30.48	24,384	1,700	\$30.48	51,816
Computing	27,000	\$3.40	91,800	33,000	\$3.40	112,200
Facility rental	22	\$3,562.50	78,375	18	\$3,562.50	64,125
Travel	56,000	Direct	<u>56,000</u>	25,300	Direct	<u>25,300</u>
Overhead costs assigned			<u>\$382,559</u>			<u>\$337,441</u>

[(Audit: $(\$1,100,000 \times \$0.12) + (800 \times \$30.48) + (27,000 \times \$3.40) + (22 \times \$3,562.50) + \$56,000 = \$382,559$); (Tax: $(\$700,000 \times \$0.12) + (1,700 \times \$30.48) + (33,000 \times \$3.40) + (18 \times \$3,562.50) + \$25,300 = \$337,441$)]

[(Audit: (DL\$ x OH rate/DL\$) + (No. of reports x OH rate/report) + (No. of min. x OH rate/min.) + (No. of emp. X OH rate/emp.) + Travel = Tot. OH costs assigned); (Tax: (DL\$ x OH rate/DL\$) + (No. of reports x OH rate/report) + (No. of min. x OH rate/min.) + (No. of emp. X OH rate/emp.) + Travel = Tot. OH costs assigned)]

PROBLEM 4.5 (Continued)

(c) Overhead is assigned to the two service lines as follows:

	<u>Audit</u>	<u>Tax</u>
Traditional costing	\$440,000	\$280,000
ABC	<u>382,559</u>	<u>337,441</u>
Difference	<u><u>\$ 57,441</u></u>	<u><u>\$ 57,441</u></u>

The \$57,441 difference for audits is 13% lower under ABC, while the \$57,441 difference for tax is 20.5% higher under ABC. Clearly, ABC should be used to determine the relative profitability of each service.

LO1, 2, 3, 4 BT: AN Difficulty: Moderate TOT: 35 min. AACSB: Analytic AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management

(a) Computation of activity-based overhead rate:

<u>Activity Cost Pools</u>	<u>Total Estimated Overhead</u>	<u>÷</u>	<u>Estimated Use of Cost Drivers Per Activity</u>	<u>=</u>	<u>Activity-Based Overhead Rates</u>
Market analysis	\$1,050,000		15,000 Hours		\$ 70 per hour
Product design	2,350,000		2,500 Designs		\$ 940 per design
Product development	3,600,000		90 Products		\$40,000 per product
Prototype testing	1,400,000		500 Tests		\$ 2,800 per test

(b) Charges to in-house manufacturing department:

In-House Manufacturing Department

<u>Activity Cost Pools</u>	<u>Cost Drivers Used</u>	<u>X</u>	<u>Activity-Based Overhead Rates</u>	<u>=</u>	<u>Cost Assigned</u>
Market analysis	1,800 Hours		\$ 70		\$ 126,000
Product design	280 Designs		\$ 940		263,200
Product development	10 Products		\$40,000		400,000
Prototype testing	92 Tests		\$ 2,800		257,600
Total overhead assigned					<u>\$1,046,800</u>

[(1,800 x \$70) + (280 x \$940) + (10 x \$40,000) + (92 x \$2,800) = \$1,046,800]

[(No. of hrs. x OH rate/hr.) + (No. of designs x OH rate/design) + (No. of prod. X OH rate/prod.) + (No. of tests x OH rate/test) = Tot. OH assigned]

(c) Charges to outside R & D contractor:

Outside Contract Costs

<u>Activity Cost Pools</u>	<u>Cost Drivers Used</u>	<u>X</u>	<u>Activity-Based Overhead Rates</u>	<u>=</u>	<u>Cost Assigned</u>
Market analysis	800 Hours		\$ 70		\$ 56,000
Product design	178 Designs		\$ 940		167,320
Product development	3 Products		\$40,000		120,000
Prototype testing	70 Tests		\$ 2,800		196,000
Total overhead assigned					<u>\$539,320</u>

[(800 x \$70) + (178 x \$940) + (3 x \$40,000) + (70 x \$2,800) = \$539,320]

[(No. of hrs. x OH rate/hr.) + (No. of designs x OH rate/design) + (No. of prod. X OH rate/prod.) + (No. of tests x OH rate/test) = Tot. OH assigned]

CT 4.2 (Continued)

- (d) **Activity-based costing permits the company to identify its R&D costs by the activities that cause the costs; that is, ABC allows closer scrutiny of the causes for cost incurrences; hence, greater control. By charging in-house manufacturing departments for their fair share of the company's R&D costs, these departments may exert their own control over such costs. Activity-based costing allows Ideal to compile realistic costs for bidding and charging outside users of its R&D department's services.**

LO1, 2, 3 BT: AP Difficulty: Moderate TOT: 30 min. AACSB: Analytic AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management

- (a) The stakeholders (parties affected by Curtis's and Ed's actions) in this case are:
- Curtis as cost accountant.
 - Ed and all personnel employed in the production of the Supercut Model of lawn tractor.
 - Hi-Power Mower management.
 - Hi-Power Mower owners (stockholders).
 - The stakeholder group may be expanded to include Hi-Power Mower's suppliers, creditors, and customers.
- (b) The objective of cost accounting is to provide useful, accurate information for decision making by managers. Ed is coercing Curtis to massage the data to save the product line and, thus, Ed's job. Ed is advocating knowingly providing false data, deceiving management, and jeopardizing Curtis's job.
- (c) Curtis is a management accountant employed by Hi-Power Mower Company. His first job responsibility is to his employer to: (1) communicate information fairly and objectively and (2) disclose fully all relevant information that could reasonably be expected to influence an intended user's understanding of the reports, comments, and recommendations presented. Curtis's obligation is to provide management with timely, truthful information.

LO1 BT: E Difficulty: Easy TOT: 20 min. AACSB: Ethics, Communication AICPA FC: Measurement Analysis and Interpretation AICPA PC: Professional Behavior, Communication IMA: Cost Management, Business Applications