

## PROBLEM FOR SELF-STUDY

Family Supermarkets (FS) has decided to increase the size of its Memphis store. It wants information about the profitability of individual product lines: soft drinks, fresh produce, and packaged food.

FS provides the following data for 2006 for each product line:

	Soft Drinks	Fresh Produce	Packaged Food
Revenues	\$317,400	\$840,240	\$483,960
Cost of goods sold	\$240,000	\$600,000	\$360,000
Cost of bottles returned	\$ 4,800	\$ 0	\$ 0
Number of purchase orders placed	144	336	144
Number of deliveries received	120	876	264
Hours of shelf-stocking time	216	2,160	1,080
Items sold	50,400	441,600	122,400

FS also provides the following information for 2006:

Activity (1)	Description of Activity (2)	Total Costs (3)	Cost-Allocation Base (4)
1. Bottle returns	Returning of empty bottles to store	\$ 4,800	Direct tracing to soft-drink line
2. Ordering	Placing of orders for purchases	\$ 62,400	624 purchase orders
3. Delivery	Physical delivery and receipt of merchandise	\$100,800	1,260 deliveries
4. Shelf-stocking	Stocking of merchandise on store shelves and ongoing restocking	\$ 69,120	3,456 hours of shelf-stocking time
5. Customer support	Assistance provided to customers, including checkout and bagging	\$122,880	614,400 items sold
Total		<u>\$360,000</u>	

### Required

- Family Supermarkets currently allocates store support costs (all costs other than cost of goods sold) to product lines on the basis of cost of goods sold of each product line. Calculate the operating income and operating income as a percentage of revenues for each product line.
- If Family Supermarkets allocates store support costs (all costs other than cost of goods sold) to product lines using an ABC system, calculate the operating income and operating income as a percentage of revenues for each product line.
- Comment on your answers in requirements 1 and 2.

### SOLUTION

- The following table shows the operating income and operating income as a percentage of revenues for each product line. All store support costs (all costs other than cost of goods sold) are allocated to product lines using cost of goods sold of each product line as the cost-allocation base. Total store support costs equal \$360,000 (cost of bottles returned, \$4,800 + cost of purchase orders, \$62,400 + cost of deliveries, \$100,800 + cost of shelf-stocking, \$69,120 + cost of customer support, \$122,880). The allocation rate for store support costs =  $\$360,000 \div \$1,200,000 = 30\%$  of cost of goods sold. To allocate support costs to each product line, FS multiplies the cost of goods sold of each product line by 0.30.

	Soft Drinks	Fresh Produce	Packaged Food	Total
Revenues	\$317,400	\$840,240	\$483,960	\$1,641,600
Cost of goods sold	240,000	600,000	360,000	1,200,000
Store support cost ( $\$240,000; \$600,000; \$360,000) \times 0.30$ )	72,000	180,000	108,000	360,000
Total costs	312,000	780,000	468,000	1,560,000
Operating income	\$ 5,400	\$ 60,240	\$ 15,960	\$ 81,600
Operating income $\div$ Revenues	1.70%	7.17%	3.30%	4.97%

2. Under an ABC system, FS identifies bottle-return costs as a direct cost because these costs can be traced to the soft drink product line. FS then calculates cost-allocation rates for each activity area (as in step 5 described in the chapter, p. 151). The activity rates are as follows:

Activity (1)	Cost Hierarchy (2)	Total Costs (3)	Quantity of Cost- Allocation Base (4)	Overhead Allocation Rate (5) = (3) ÷ (4)
Ordering	Batch-level	\$ 62,400	624 purchase orders	\$100 per purchase order
Delivery	Batch-level	\$100,800	1,260 deliveries	\$80 per delivery
Shelf-stocking	Output unit-level	\$ 69,120	3,456 shelf-stocking-hours	\$20 per stocking-hour
Customer support	Output unit-level	\$122,880	614,400 items sold	\$0.20 per item sold

Store support costs for each product line by activity are obtained by multiplying the total quantity of the cost-allocation base for each product line by the activity cost rate. Operating income and operating income as a percentage of revenues for each product line are as follows:

	Soft Drinks	Fresh Produce	Packaged Food	Total
Revenues	\$317,400	\$840,240	\$483,960	\$1,641,600
Cost of goods sold	240,000	600,000	360,000	1,200,000
Bottle-return costs	4,800	0	0	4,800
Ordering costs (144; 336; 144) purchase orders × \$100	14,400	33,600	14,400	62,400
Delivery costs (120; 876; 264) deliveries × \$80	9,600	70,080	21,120	100,800
Shelf-stocking costs (216; 2,160; 1,080) stocking-hours × \$20	4,320	43,200	21,600	69,120
Customer-support costs (50,400; 441,600; 122,400) items sold × \$0.20	10,080	88,320	24,480	122,880
Total costs	283,200	835,200	441,600	1,560,000
Operating income	\$ 34,200	\$ 5,040	\$ 42,360	\$ 81,600
Operating income ÷ Revenues	10.78%	0.60%	8.75%	4.97%

3. Managers believe the ABC system is more credible than the simple costing system. The ABC system distinguishes the different types of activities at FS more precisely. It also tracks more accurately how individual product lines use resources. Rankings of relative profitability—operating income as a percentage of revenues—of the three product lines under the simple costing system and under the ABC system are:

Simple Costing System		ABC System	
1. Fresh produce	7.17%	1. Soft drinks	10.78%
2. Packaged food	3.30%	2. Packaged food	8.75%
3. Soft drinks	1.70%	3. Fresh produce	0.60%

The percentage of revenues, cost of goods sold, and activity costs for each product line are as follows:

	Soft Drinks	Fresh Produce	Packaged Food
Revenues	19.34%	51.18%	29.48%
Cost of goods sold	20.00	50.00	30.00
Bottle returns	100.00	0	0
Activity areas:			
Ordering	23.08	53.84	23.08
Delivery	9.53	69.52	20.95
Shelf-stocking	6.25	62.50	31.25
Customer support	8.20	71.88	19.92

Soft drinks consume fewer resources than either fresh produce or packaged food. Soft drinks have fewer deliveries and require less shelf-stocking time than required for either fresh produce or packaged food. Most major soft-drink suppliers deliver merchandise to the store shelves and stock the shelves themselves. In contrast, the fresh produce area has the most deliveries and consumes a large percentage of shelf-stocking time. It also has the highest number of individual sales items. The simple costing system assumed that each product line used the resources in each activity area in the

same ratio as their respective individual cost of goods sold to total cost of goods sold. Clearly, this assumption is incorrect. The simple costing system is an example of averaging that is too broad.

FS managers can use the ABC information to guide decisions such as how to allocate a planned increase in floor space. An increase in the percentage of space allocated to soft drinks is warranted. Note, however, that ABC information should be but one input into decisions about shelf-space allocation. FS may have minimum limits on the shelf space allocated to fresh produce because of shoppers' expectations that supermarkets will carry products from this product line. In many situations, companies cannot make product decisions in isolation but must consider the effect that deemphasizing a product might have on customer demand for other products.

Pricing decisions can also be made in a more-informed way with ABC information. For example, suppose a competitor announces a 5% reduction in soft-drink prices. Given the 10.77% margin FS currently earns on its soft-drink product line, it has flexibility to reduce prices and still make a profit on this product line. In contrast, the simple costing system erroneously reported that soft drinks only had a 1.70% margin, leaving little room to counter a competitor's pricing initiatives.

## DECISION POINTS

The following question-and-answer format summarizes the chapter's learning objectives. Each decision presents a key question related to a learning objective. The guidelines are the answer to that question.

### Decision

1. When does product undercosting or overcosting occur?
2. How do managers refine a costing system?
3. What is the difference between the design of a simple costing system and an activity-based costing (ABC) system?
4. What is a cost hierarchy?
5. How do managers cost products or services using ABC systems?
6. How can ABC systems be used to manage better?
7. When can department costing systems be used instead of ABC systems?
8. When should managers use ABC systems?

### Guidelines

Product undercosting (overcosting) occurs when a product or service consumes a high (low) level of resources but is reported to have a low (high) cost. Broad averaging, or peanut-butter costing, a common cause of undercosting or overcosting, is the result of using broad averages that uniformly assign, or spread, the cost of resources to products when the individual products use those resources in a nonuniform way. Product-cost cross-subsidization exists when one undercosted (overcosted) product results in at least one other product being overcosted (undercosted).

Refining a costing system means making changes that result in cost numbers that better measure the way different cost objects, such as products, use different amounts of resources of the company. These changes can require additional direct-cost tracing, the choice of more-homogeneous indirect-cost pools, or the use of different cost-allocation bases.

The ABC system differs from the simple system by its fundamental focus on activities. The ABC system typically has more-homogeneous indirect-cost pools than the simple system, and more cost drivers are used as cost-allocation bases.

A cost hierarchy categorizes costs into different cost pools on the basis of the different types of cost-allocation bases or different degrees of difficulty in determining cause-and-effect (or benefits-received) relationships. A four-part cost hierarchy consists of output unit-level costs, batch-level costs, product-sustaining or service-sustaining costs, and facility-sustaining costs.

In ABC, costs of activities are used to assign costs to other cost objects such as products or services based on the activities the products or services consume.

Activity-based management (ABM) is a management method of decision-making that uses ABC information to satisfy customers and improve profits. ABC systems are used for such management decisions as pricing, product-mix, cost reduction, process improvement, product and process redesign, and planning and managing activities.

Cost information in department costing systems approximates cost information in ABC systems only when each department has a single activity, or a single cost-allocation base for different activities, or when different products use the different activities of the department in the same proportions.

ABC systems are likely to yield the most benefits when indirect costs are a high percentage of total costs or when products and services make diverse demands on indirect resources. The main costs of ABC systems are the complexity of the measurements necessary to implement and update the systems.

## TERMS TO LEARN

This chapter and the Glossary at the end of this book contain definitions of:

activity (p. 144)	facility-sustaining costs (p. 148)	product undercosting (p. 140)
activity-based costing (ABC) (p. 144)	output unit-level costs (p. 147)	refined costing system (p. 143)
activity-based management (ABM) (p. 152)	product-cost cross-subsidization (p. 140)	service-sustaining costs (p. 148)
batch-level costs (p. 147)	product overcosting (p. 140)	
cost hierarchy (p. 147)	product-sustaining costs (p. 148)	



PH Grade Assist

### Prentice Hall Grade Assist (PHGA)

Your professor may ask you to complete selected exercises and problems in Prentice Hall Grade Assist (PHGA). PHGA is an online tool that can help you master the chapter's topics. It provides you with multiple variations of exercises and problems designated by the PHGA icon. You can rework these exercises and problems—each time with new data—as many times as you need. You also receive immediate feedback and grading.

## ASSIGNMENT MATERIAL

### Questions

- 5-1** What is broad averaging and what consequences can it have on costs?
- 5-2** Why should managers worry about product overcosting or undercosting?
- 5-3** What is costing system refinement? Describe three guidelines for refinement.
- 5-4** What is an activity-based approach to designing a costing system?
- 5-5** Describe four levels of a cost hierarchy.
- 5-6** Why is it important to classify costs into a cost hierarchy?
- 5-7** What are the key reasons for product cost differences between simple costing systems and ABC systems?
- 5-8** Describe four decisions for which ABC information is useful.
- 5-9** "Department indirect-cost rates are never activity-cost rates." Do you agree? Explain.
- 5-10** Describe four signs that help indicate when ABC systems are likely to provide the most benefits.
- 5-11** What are the main costs and limitations of implementing ABC systems?
- 5-12** "ABC systems only apply to manufacturing companies." Do you agree? Explain.
- 5-13** "Activity-based costing is the wave of the present and the future. All companies should adopt it." Do you agree? Explain.
- 5-14** "Increasing the number of indirect-cost pools is guaranteed to sizably increase the accuracy of product or service costs." Do you agree? Why?
- 5-15** The controller of a retail company has just had a \$50,000 request to implement an ABC system quickly turned down. A senior vice president, in rejecting the request, noted, "Given a choice, I will always prefer a \$50,000 investment in improving things a customer sees or experiences, such as our shelves or our store layout. How does a customer benefit by our spending \$50,000 on a supposedly better accounting system?" How should the controller respond?

### Exercises

- 5-16 Cost hierarchy.** Teledor, Inc., manufactures boom boxes (music systems with radio, cassette, and compact disc players) for several well-known companies. The boom boxes differ significantly in their complexity and their manufacturing batch sizes. The following costs were incurred in 2006.
- a. Indirect manufacturing labor costs such as supervision that supports direct manufacturing labor, \$1,000,000
  - b. Procurement costs of placing purchase orders, receiving materials, and paying suppliers related to the number of purchase orders placed, \$500,000
  - c. Cost of indirect materials, \$250,000
  - d. Costs incurred to set up machines each time a different product needs to be manufactured, \$600,000
  - e. Designing processes, drawing process charts, making engineering process changes for products, \$800,000
  - f. Machine-related overhead costs such as depreciation, maintenance, production engineering, \$1,100,000 (These resources relate to the activity of running the machines.)
  - g. Plant management, plant rent, and plant insurance, \$900,000

- Classify each of the preceding costs as output unit-level, batch-level, product-sustaining, or facility-sustaining. Explain each answer.
- Consider two types of boom boxes made by Teledor, Inc. One boom box is complex to make and is produced in many batches. The other boom box is simple to make and is produced in few batches. Suppose that Teledor needs the same number of machine-hours to make each type of boom box and that Teledor allocates all overhead costs using machine-hours as the only allocation base. How, if at all, would the boom boxes be miscosted? Briefly explain why.
- How is the cost hierarchy helpful to Teledor in managing its business?

**Required**

**5-17 ABC, cost hierarchy, service.** (CMA, adapted) Plymouth Test Laboratories does heat testing (HT) and stress testing (ST) on materials. Under its current simple costing system, Plymouth aggregates all operating costs of \$1,200,000 into a single overhead cost pool. Plymouth calculates a rate per test-hour of \$15 ( $\$1,200,000 \div 80,000$  total test-hours). HT uses 50,000 test-hours, and ST uses 30,000 test-hours. Gary Celeste, Plymouth's controller, believes that there is enough variation in test procedures and cost structures to establish separate costing and billing rates for HT and ST. The market for test services is becoming competitive. Without this information, any miscosting and mispricing of its services could cause Plymouth to lose business. Celeste divides Plymouth's costs into four activity-cost categories.

- Direct-labor costs, \$240,000. These costs can be directly traced to HT, \$180,000, and ST, \$60,000.
- Equipment-related costs (rent, maintenance, energy, and so on), \$400,000. These costs are allocated to HT and ST on the basis of test-hours.
- Setup costs, \$350,000. These costs are allocated to HT and ST on the basis of the number of setup-hours required. HT requires 13,500 setup-hours, and ST requires 4,000 setup-hours.
- Costs of designing tests, \$210,000. These costs are allocated to HT and ST on the basis of the time required to design the tests. HT requires 2,800 hours, and ST requires 1,400 hours.

- Classify each activity cost as output unit-level, batch-level, product- or service-sustaining, or facility-sustaining. Explain each answer.
- Calculate the cost per test-hour for HT and ST. Explain briefly the reasons why these numbers differ from the \$15 per test-hour that Plymouth calculated using its simple costing system.
- Explain the accuracy of the product costs calculated using the simple costing system and the ABC system. How might Plymouth's management use the cost hierarchy and ABC information to better manage its business?

**Required**

**5-18 Alternative allocation bases for a professional services firm.** The Wolfson Group (WG) provides tax advice to multinational firms. WG charges clients for (a) direct professional time (at an hourly rate) and (b) support services (at 30% of the direct professional costs billed). The three professionals in WG and their rates per professional hour are:

Professional	Billing Rate per Hour
Myron Wolfson	\$500
Ann Brown	120
John Anderson	80

WG has just prepared the May 2005 bills for two clients. The hours of professional time spent on each client are as follows:

Professional	Hours per Client	
	Seattle Dominion	Tokyo Enterprises
Wolfson	15	2
Brown	3	8
Anderson	22	30
Total	40	40

- What amounts did WG bill to Seattle Dominion and Tokyo Enterprises for May 2005?
- Suppose support services were billed at \$50 per professional labor-hour (instead of 30% of professional labor costs). How would this change affect the amounts WG billed to the two clients for May 2005? Comment on the differences between the amounts billed in requirements 1 and 2.
- How would you determine whether professional labor costs or professional labor-hours is the more appropriate allocation base for WG's support services?

**Required**

**5-19 Plantwide, department, and ABC indirect cost rates.** Automotive Products (AP) designs and produces automotive parts. In 2007, actual variable manufacturing overhead is \$308,600. AP's simple costing system allocates variable manufacturing overhead to its three customers based on machine-hours and prices its contracts based on full costs. One of its customers has regularly complained of being charged noncompetitive prices, so AP's controller Devon Smith realizes that it is time to examine the consumption of overhead resources more closely. He knows that there are three main departments that consume overhead



PH Grade Assist



PH Grade Assist



www.premhall.com/horngren/cost12e

resources: design, production, and engineering. Interviews with the department personnel and examination of time records yield the following detailed information:

	A	B	C	D	E	F
1			<b>Variable</b>	<b>Usage of Cost Drivers by Customer Contract</b>		
			<b>Manufacturing</b>	<b>United</b>	<b>Holden</b>	<b>Leland</b>
2	<b>Department</b>	<b>Cost Driver</b>	<b>Overhead in 2007</b>	<b>Motors</b>	<b>Motors</b>	<b>Vehicle</b>
3	Design	CAD-design hours	\$ 39,000	110	200	80
4	Engineering	Engineering hours	29,600	70	60	240
5	Production	Machine hours	240,000	120	2,800	1,080
6	Total		<u>\$308,600</u>			
7						

If you want to use Excel to solve this exercise, go to the Excel Lab at [www.prenhall.com/horngren/cost12e](http://www.prenhall.com/horngren/cost12e) and download the template for Exercise 5-19.

**Required**

1. Compute the variable manufacturing overhead allocated to each customer in 2007 using the simple costing system that has machine-hours as the allocation base.
2. Compute the variable manufacturing overhead allocated to each customer in 2007 using department-based variable manufacturing overhead rates.
3. Comment on your answers in requirements 1 and 2. Which customer do you think was complaining about being overcharged in the simple system? If the new department-based rates are used to price contracts, which customer(s) will be unhappy? How would you respond to these concerns?
4. How else might AP use the information available from its department-by-department analysis of variable manufacturing overhead costs?
5. AP's managers are wondering if they should further refine the department-by-department costing system into an ABC system by identifying different activities within each department. Under what conditions would it not be worthwhile to further refine the department costing system into an ABC system?



**5-20 ABC, process costing.** Parker Company produces mathematical and financial calculators. Data related to the two products are presented here.

	Mathematical	Financial
Annual production in units	50,000	100,000
Direct material costs	\$150,000	\$300,000
Direct manufacturing labor costs	\$ 50,000	\$100,000
Direct manufacturing labor-hours	2,500	5,000
Machine-hours	25,000	50,000
Number of production runs	50	50
Inspection hours	1,000	500

Total manufacturing overhead costs are:

	Total
Machining costs	\$375,000
Setup costs	120,000
Inspection costs	105,000

**Required**

1. Compute the manufacturing overhead cost per unit for each product.
2. Compute the manufacturing cost per unit for each product.



**5-21 Activity-based costing, service company.** Quikprint Corporation owns a small printing press that prints leaflets, brochures, and advertising materials. Quikprint classifies its various printing jobs as standard jobs or special jobs. Quikprint's simple job-costing system has two direct-cost categories (direct materials and direct labor) and a single indirect-cost pool. Quikprint allocates all indirect costs using printing machine-hours as the allocation base.

Quikprint is concerned about the accuracy of the costs assigned to standard and special jobs and therefore is planning to implement an activity-based costing system. Quikprint's ABC system would have the same direct-cost categories as its simple costing system. However, instead of a single indirect-cost pool there would now be six categories for assigning indirect costs: design, purchasing, setup, printing machine operations, marketing, and administration. To see how activity-based costing would affect the costs of standard and special jobs, Quikprint collects the following information for the fiscal year 2007 that just ended.

	A	B	C	D	E
1		<b>Standard Job</b>	<b>Special Job</b>	<b>Total</b>	<b>Cause-and-Effect Relationship between Allocation Base and Activity Cost</b>
2	Number of printing jobs	400	200		
3	Price per job	\$1,200	\$ 1,500		
4	Cost of supplies per job	\$ 200	\$ 250		
5	Direct manuf. labor cost per job	\$ 180	\$ 200		
6	Printing machine hours per job	10	10		
7	Cost of printing machine operations			\$150,000	Indirect costs of operating printing machines increase with printing machine hours
8	Setup hours per job	4	7		
9	Setup costs			\$ 90,000	Indirect setup costs increase with setup hours
10	Total number of purchase orders	400	500		
11	Purchase order costs			\$ 36,000	Indirect purchase order costs increase with number of purchase orders
12	Total design costs	\$8,000	\$32,000	\$ 40,000	Design costs are allocated to standard and special jobs based on a special study of the design department
13	Marketing costs	5%	5%	\$ 39,000	
14		of sales price	of sales price		
15	Administration costs			\$ 47,000	Demand for administrative resources increases with direct manufacturing labor costs

If you want to use Excel to solve this exercise, go to the Excel Lab at [www.prenhall.com/horngren/cost12e](http://www.prenhall.com/horngren/cost12e) and download the template for Exercise 5-21.

1. Calculate the cost of a standard job and a special job under the simple costing system.
2. Calculate the cost of a standard job and a special job under the activity-based costing system.
3. Compare the costs of a standard job and a special job in requirements 1 and 2. Why do the simple and activity-based costing systems differ in the cost of a standard job and a special job?
4. How might Quikprint use the new cost information from its activity-based costing system to better manage its business?

**Required**

**5-22 Allocation of costs to activities, unused capacity.** Harmon Academy, a private school for boys, serves 500 students: 200 in the middle school (grades 6–8) and 300 in the high school (grades 9–12). Each school has its own assistant principal, and there is one principal, Brian Smith, for all of Harmon Academy. For any single student, almost all of Harmon's costs are indirect. Harmon currently has five indirect cost categories, which are listed in column A of the following table. Smith wants to develop an activity-based costing system for the school. He identifies four activities—academic instruction, administration, sports training, and community relationships—related to the educational enterprise, which are shown in columns B, C, D, and E of the following table.



Smith and his team identify number of students as the cost driver of academic instruction and administration costs, and the number of team sports offered by the school as the cost driver of sports training costs. The cost of maintaining community relationships—dealing with the town board and participating in local activities—is a facility-sustaining cost that the school has to incur each year. This table shows the percentage of costs in each line item used by each activity.

	A	B	C	D	E	F
1		<b>Percentage of Costs Used by Each Activity</b>				
2	<b>Indirect Cost Categories</b>	<b>Academic Instruction</b>	<b>Administration</b>	<b>Sports Training</b>	<b>Community Relationships</b>	<b>2006 Expenditures</b>
3	Teachers' salaries and benefits	60%	20%	8%	12%	\$4,000,000
4	Principals' salaries and benefits	10%	60%	5%	25%	400,000
5	Facilities cost	35%	15%	45%	5%	2,600,000
6	Office staff salaries and benefits	5%	60%	10%	25%	300,000
7	Sports program staff salaries and benefits	35%	10%	45%	10%	500,000
8						<u>\$7,800,000</u>
9						

If you want to use Excel to solve this exercise, go to the Excel Lab at [www.prenhall.com/horngren/cost12e](http://www.prenhall.com/horngren/cost12e) and download the template for Exercise 5-22.

1. What is the overall cost of educating each student? Of this cost, what percentage is the cost of academic instruction? Of administration?

**Required**

- Smith is dismayed at the high cost of sports training. Further examination reveals that \$300,000 of those costs are for ice hockey, a sport pursued by a total of 40 students. What would the overall cost of educating each student be if the ice hockey program is eliminated and its cost saved?
- For the 2007 school year, Harmon charges an annual fee of \$1,000 for any student who wants to play ice hockey. As a result, 10 of the less-motivated students drop the sport. Assuming the costs of the school in 2007 are the same as in 2006, what is the overall cost of educating each student in 2007?
- Consider the costs of the academic instruction activity and assume they are fixed in the short run. At these costs, Harmon could serve 600 students. What is the cost of the academic instruction resources used by Harmon's current 500 students? What is the cost of unused academic instruction capacity? What actions can Smith take to reduce the cost of academic instruction per student in the short run? In the long run?



**5-23 ABC, retail product-line profitability.** Family Supermarkets (FS) decides to apply ABC analysis to three product lines: baked goods, milk and fruit juice, and frozen foods. It identifies four activities and their activity cost rates as:

Ordering	\$100 per purchase order
Delivery and receipt of merchandise	\$80 per delivery
Shelf-stocking	\$20 per hour
Customer support and assistance	\$0.20 per item sold

The revenues, cost of goods sold, store support costs, and activity-area usage of the three product lines are:

	Baked Goods	Milk and Fruit Juice	Frozen Products
Financial data			
Revenues	\$57,000	\$63,000	\$52,000
Cost of goods sold	\$38,000	\$47,000	\$35,000
Store support	\$11,400	\$14,100	\$10,500
Activity-area usage (cost-allocation base)			
Ordering (purchase orders)	30	25	13
Delivery (deliveries)	98	36	28
Shelf-stocking (hours)	183	166	24
Customer support (items sold)	15,500	20,500	7,900

Under its simple costing system, FS allocated support costs to products at the rate of 30% of cost of goods sold.

**Required**

- Use the simple costing system to prepare a product-line profitability report for FS.
- Use the ABC system to prepare a product-line profitability report for FS.
- What new insights does the ABC system in requirement 2 provide to FS managers?



**5-24 ABC, wholesale, customer profitability.** Villeagas Wholesalers sells furniture items to four department-store chains (customers). Mr. Villeagas commented, "We apply ABC to determine product-line profitability. The same ideas apply to customer profitability, and we should find out our customer profitability as well." Villeagas Wholesalers sends catalogs to corporate purchasing departments on a monthly basis. The customers are entitled to return unsold merchandise within a six-month period from the purchase date and receive a full purchase price refund. The following data were collected from last year's operations:

	Chain			
	1	2	3	4
Gross sales	\$50,000	\$30,000	\$100,000	\$70,000
Sales returns:				
Number of items	100	26	60	40
Amount	\$10,000	\$ 5,000	\$ 7,000	\$ 6,000
Number of orders:				
Regular	40	150	50	70
Rush	10	50	10	30

Villeagas has calculated the following activity rates.

Activity	Cost-Driver Rate
Regular order processing	\$20 per regular order
Rush order processing	\$100 per rush order
Returned items processing	\$10 per item
Catalogs and customer support	\$1,000 per customer

Customers pay the transportation costs. The cost of goods sold averages 80% of sales.

**Required**

Determine the contribution to profit from each chain last year. Comment on your solution.

**5-25 ABC, activity area cost-driver rates, product cross-subsidization.** Idaho Potatoes (IP) processes potatoes into potato cuts at its highly automated Pocatello plant. It sells potatoes to the retail consumer market and to the institutional market, which includes hospitals, cafeterias, and university dormitories.



IP's simple costing system has a single direct-cost category (direct materials, which are the raw potatoes) and a single indirect-cost pool (production support). Support costs are allocated on the basis of pounds of potato cuts processed. Support costs include packaging materials. The 2006 total actual costs for producing 1,000,000 pounds of potato cuts (900,000 for the retail market and 100,000 for the institutional market) are:

Direct materials used	\$150,000
Production support	\$983,000

The simple costing system does not distinguish between potato cuts produced for the retail and the institutional markets.

At the end of 2006, IP unsuccessfully bid for a large institutional contract. Its bid was reported to be 30% above the winning bid. This feedback came as a shock because IP included only a minimum profit margin on its bid. Moreover, the Pocatello plant was acknowledged as the most efficient in the industry.

As a result of its review process of the lost contract bid, IP decided to explore ways to refine its costing system. First, it identified that \$188,000 of the \$983,000 pertaining to packaging materials could be traced to individual jobs (\$180,000 for retail and \$8,000 for institutional). These costs will now be classified as direct materials. The \$150,000 of direct materials used were classified as \$135,000 for retail and \$15,000 for institutional. Second, it used ABC to examine how the two products (retail potato cuts and institutional potato cuts) used indirect support resources. The finding was that three activity areas could be distinguished.

- **Cleaning Activity Area**—IP uses 1,200,000 pounds of raw potatoes to yield 1,000,000 pounds of potato cuts. The cost-allocation base is pounds of raw potatoes cleaned. Costs in the cleaning activity area are \$120,000.
- **Cutting Activity Area**—IP processes raw potatoes for the retail market independently of those processed for the institutional market. The production line produces (a) 250 pounds of retail potato cuts per cutting-hour and (b) 400 pounds of institutional potato cuts per cutting-hour. The cost-allocation base is cutting-hours on the production line. Costs in the cutting activity area are \$231,000.
- **Packaging Activity Area**—IP packages potato cuts for the retail market independently of those packaged for the institutional market. The packaging line packages (a) 25 pounds of retail potato cuts per packaging-hour and (b) 100 pounds of institutional potato cuts per packaging-hour. The cost-allocation base is packaging-hours on the production line. Costs in the packaging activity area are \$444,000.

- Using the simple costing system, what is the cost per pound of potato cuts produced by IP?
- Calculate the cost rate per unit of the cost driver in the (a) cleaning, (b) cutting, and (c) packaging activity areas.
- Suppose IP uses information from its activity cost rates to calculate costs incurred on retail potato cuts and institutional potato cuts. Using the ABC system, what is the cost per pound of (a) retail potato cuts and (b) institutional potato cuts?
- Comment on the cost differences between the two costing systems in 1 and 3. How might IP use the information in 3 to make better decisions?

**Required**

**5-26 Activity-based costing, job-costing system.** The Hewlett-Packard (HP) plant in Roseville, California, assembles and tests printed-circuit (PC) boards. The job-costing system at this plant has two direct-cost categories (direct materials and direct manufacturing labor) and seven indirect-cost pools. These indirect-cost pools represent the seven activity areas that operating personnel at the plant determined are sufficiently different (in terms of cost-behavior patterns or individual products being assembled) to warrant separate cost pools. The cost-allocation base chosen for each activity area is the cost driver at that activity area.

Debbie Berlant, a newly appointed marketing manager at HP, is attending a training session that describes how an activity-based costing approach was used to design the Roseville plant's job-costing system. Berlant is provided with the following incomplete information for a specific job (an order for a single PC board, No. A82):

Direct materials	\$75.00	
Direct manufacturing labor	15.00	\$90.00
Manufacturing overhead (see below)		?
Total manufacturing cost		\$ ?

Manufacturing Overhead Cost Pool	Cost-Allocation Base	Cost-Allocation Rate	Units of Cost-Allocation Base Used on Job No. A82	Manufacturing Overhead Allocated to Job
1. Axial insertion	Axial insertions	0.08	45	?
2. Dip insertion	Dip insertions	0.25	?	6.00
3. Manual insertion	Manual insertions	?	11	5.50
4. Wave solder	Boards soldered	3.50	?	3.50
5. Backload	Backload insertions	?	6	4.20
6. Test	Budgeted time board is in test activity	90.00	0.25	?
7. Defect analysis	Budgeted time for defect analysis and repair	?	0.10	8.00

**Required**

1. Prepare an overview diagram of the activity-based job-costing system at the Roseville plant.
2. Fill in the blanks (noted by question marks) in the cost information provided to Berlant for Job No. A82.
3. Why might manufacturing managers and marketing managers favor this ABC job-costing system over the simple costing system, which had the same two direct-cost categories but only a single indirect-cost pool (manufacturing overhead allocated using direct manufacturing labor costs)?

**5-27 ABC, product costing at banks, cross-subsidization.** First International Bank (FIB) is examining the profitability of its Premier Account, a combined savings and checking account. Depositors receive a 7% annual interest rate on their average deposit. FIB earns an interest rate spread of 3% (the difference between the rate at which it lends money and the rate it pays depositors) by lending money for home loan purposes at 10%. Thus, FIB would gain \$60 on the interest spread if a depositor had an average Premier Account balance of \$2,000 in 2005 ( $\$2,000 \times 3\% = \$60$ ).

The Premier Account allows depositors unlimited use of services such as deposits, withdrawals, checking accounts, and foreign currency drafts. Depositors with Premier Account balances of \$1,000 or more receive unlimited free use of services. Depositors with minimum balances of less than \$1,000 pay a \$20-a-month service fee for their Premier Account.

FIB recently conducted an activity-based costing study of its services. It assessed the following costs for six individual services. The use of these services in 2005 by three customers is as follows:

	Activity-Based Cost per "Transaction"	Account Usage		
		Robinson	Skerrett	Farrel
Deposit/withdrawal with teller	\$ 2.50	40	50	5
Deposit/withdrawal with automatic teller machine (ATM)	0.80	10	20	16
Deposit/withdrawal on prearranged monthly basis	0.50	0	12	60
Bank checks written	8.00	9	3	2
Foreign currency drafts	12.00	4	1	6
Inquiries about account balance	1.50	10	18	9
Average Premier Account balance for 2005		\$1,100	\$800	\$25,000

Assume Robinson and Farrel always maintain a balance above \$1,000, whereas Skerrett always has a balance below \$1,000.

**Required**

1. Compute the 2005 profitability of the Robinson, Skerrett, and Farrel Premier Accounts at FIB.
2. What evidence is there of cross-subsidization among the three Premier Accounts? Why might FIB worry about this cross-subsidization if the Premier Account product offering is profitable as a whole?
3. What changes would you recommend for FIB's Premier Account?

**Problems**

**5-28 Job costing with single direct-cost category, single indirect-cost pool, law firm.** Wigan Associates is a recently formed law partnership. Ellery Hanley, the managing partner of Wigan Associates, has just finished a tense phone call with Martin Offiah, president of Widnes Coal. Offiah strongly complained about the price Wigan charged for some legal work done for Widnes Coal.

Hanley also received a phone call from its only other client (St. Helen's Glass), which was very pleased with both the quality of the work and the price charged on its most recent job.

Wigan Associates uses a cost-based approach to pricing (billing) each job. Currently it uses a simple costing system with a single direct-cost category (professional labor-hours) and a single indirect-cost pool (general support). Indirect costs are allocated to cases on the basis of professional labor-hours per case. The job files show the following:

	Widnes Coal	St. Helen's Glass
Professional labor	104 hours	96 hours

Professional labor costs at Wigan Associates are \$70 an hour. Indirect costs are allocated to cases at \$105 an hour. Total indirect costs in the most recent period were \$21,000.

**Required**

1. Why is it important for Wigan Associates to understand the costs associated with individual jobs?
2. Compute the costs of the Widnes Coal and St. Helen's Glass jobs using Wigan's simple costing system.

**5-29 Job costing with multiple direct-cost categories, single indirect-cost pool, law firm (continuation of 5-28).** Hanley asks his assistant to collect details on those costs included in the \$21,000 indirect-cost pool that can be traced to each individual job. After analysis, Wigan is able to reclassify \$14,000 of the \$21,000 as direct costs:

Other Direct Costs	Widnes Coal	St. Helen's Glass
Research support labor	\$1,600	\$ 3,400
Computer time	500	1,300
Travel and allowances	600	4,400
Telephones/faxes	200	1,000
Photocopying	250	750
Total	<u>\$3,150</u>	<u>\$10,850</u>

Hanley decides to calculate the costs of each job as if Wigan had used six direct cost-pools and a single indirect-cost pool. The single indirect-cost pool would have \$7,000 of costs and would be allocated to each case using the professional labor-hours base.

1. What is the revised indirect-cost allocation rate per professional labor-hour for Wigan Associates when total indirect costs are \$7,000?
2. Compute the costs of the Widnes and St. Helen's jobs if Wigan Associates had used its refined costing system with multiple direct-cost categories and one indirect-cost pool.
3. Compare the costs of Widnes and St. Helen's jobs in requirement 2 with those in requirement 2 of Problem 5-28. Comment on the results.

**Required**

**5-30 Job costing with multiple direct-cost categories, multiple indirect-cost pools, law firm (continuation of 5-28 and 5-29).** Wigan has two classifications of professional staff: partners and associates. Hanley asks his assistant to examine the relative use of partners and associates on the recent Widnes Coal and St. Helen's jobs. The Widnes job used 24 partner-hours and 80 associate-hours. The St. Helen's job used 56 partner-hours and 40 associate-hours. Therefore, totals of the two jobs together were 80 partner-hours and 120 associate-hours. Hanley decides to examine how using separate direct-cost rates for partners and associates and using separate indirect-cost pools for partners and associates would have affected the costs of the Widnes and St. Helen's jobs. Indirect costs in each indirect-cost pool would be allocated on the basis of total hours of that category of professional labor. From the total indirect cost-pool of \$7,000, \$4,600 is attributable to the activities of partners, and \$2,400 is attributable to the activities of associates.

The rates per category of professional labor are as follows:

Category of Professional Labor	Direct Cost per Hour	Indirect Cost per Hour
Partner	\$100.00	$\$4,600 \div 80 \text{ hours} = \$57.50$
Associate	50.00	$\$2,400 \div 120 \text{ hours} = \$20.00$

1. Compute the costs of the Widnes and St. Helen's cases using Wigan's further refined system, with multiple direct-cost categories and multiple indirect-cost pools.
2. For what decisions might Wigan Associates find it more useful to use this job-costing approach rather than the approaches in Problem 5-28 or 5-29?

**Required**

**5-31 Plantwide, department, and activity-cost rates.** (CGA, adapted) The Sayther Company manufactures and sells two products, A and B. The manufacturing activity is organized in two departments. Manufacturing overhead costs at its Portland plant are allocated to each product using a plantwide rate of \$17 per direct manufacturing labor-hour. This rate is based on budgeted manufacturing overhead of \$340,000 and 20,000 budgeted direct manufacturing labor-hours:

Manufacturing Department	Budgeted Manufacturing Overhead	Budgeted Direct Manufacturing Labor-Hours
1	\$240,000	10,000
2	100,000	10,000
Total	<u>\$340,000</u>	<u>20,000</u>

The number of direct manufacturing labor-hours required to manufacture each product is:

Manufacturing Department	Product A	Product B
1	4	1
2	1	4
Total	<u>5</u>	<u>5</u>

Per-unit costs for the two categories of direct manufacturing costs are:

Direct Manufacturing Costs	Product A	Product B
Direct material costs	\$120	\$150
Direct manufacturing labor costs	80	80

At the end of the year, there was no work in process. There were 200 finished units of product A and 600 finished units of product B on hand. Assume that the budgeted production level of the Portland plant was exactly attained.

Sayther sets the selling price of each product by adding 120% to its unit manufacturing costs; that is, if the unit manufacturing costs are \$100, the selling price is \$220 (\$100 + \$120). This 120% markup is designed to cover costs upstream to manufacturing (R&D and design) and costs downstream from manufacturing (marketing, distribution, and customer service), as well as to provide a profit.

**Required**

1. How much manufacturing overhead cost would be included in the inventory of products A and B if Sayther used (a) a plantwide overhead rate and (b) department overhead rates?
2. By how much would the selling prices of product A and product B differ if Sayther used a plantwide overhead rate instead of department overhead rates?
3. Should Sayther Company prefer plantwide or department overhead rates?
4. Under what conditions should Sayther Company further subdivide the department cost pools into activity cost pools?

**5-32 Plantwide versus department overhead cost rates.** (CMA, adapted) The MumsDay Corporation manufactures a complete line of fiberglass suitcases. MumsDay has three manufacturing departments (molding, component, and assembly) and two support departments (maintenance and power).

The sides of the cases are manufactured in the Molding Department. The frames, hinges, locks, and so forth are manufactured in the Component Department. The cases are completed in the Assembly Department. Varying amounts of materials, time, and effort are required for each of the various cases. The Maintenance Department and Power Department provide services to the three manufacturing departments.

MumsDay has always used a plantwide manufacturing overhead rate. Direct manufacturing labor-hours are used to allocate the overhead to each product. The budgeted rate is calculated by dividing the company's total budgeted manufacturing overhead cost by the total budgeted direct manufacturing labor-hours to be worked in the three manufacturing departments.

Whit Portlock, manager of Cost Accounting, has recommended that MumsDay use department overhead rates. Portlock has projected operating costs and production levels for the coming year. They are presented (in thousands) by department in the following table:

	Manufacturing Department		
	Molding	Component	Assembly
<b>Manufacturing Department Operating Data</b>			
Direct manufacturing labor-hours	500	2,000	1,500
Machine-hours	875	125	—
<b>Manufacturing Department Costs</b>			
Direct materials	\$12,400	\$30,000	\$ 1,250
Direct manufacturing labor	3,500	20,000	12,000
Manufacturing department overhead	21,000	16,200	22,600
Total manufacturing departmental costs	<u>\$36,900</u>	<u>\$66,200</u>	<u>\$35,850</u>
<b>Use of Support Departments</b>			
Estimated usage of maintenance resources in labor-hours for coming year	90	25	10
Estimated usage of power (in kilowatt-hours) for coming year	360	320	120

Estimated costs are \$4,000 for the Maintenance Department and \$18,400 for the Power Department and are in addition to the manufacturing department overhead costs shown in the table.

**Required**

1. Calculate the plantwide overhead rate for MumsDay Corporation for the coming year using the same method as used in the past.
2. Whit Portlock has been asked to develop department overhead rates for comparison with the plantwide rate. Follow these steps in developing the department rates:
  - a. Allocate the Maintenance Department and Power Department costs to the three manufacturing departments.
  - b. Calculate department overhead rates for the three manufacturing departments using a machine-hour allocation base for the Molding Department and a direct manufacturing labor-hour allocation base for the Component Department and Assembly Department.
3. Should the MumsDay Corporation use a plantwide rate or department rates to allocate overhead cost to its products? Explain your answer.
4. Under what conditions should MumsDay Corporation further subdivide the department cost pools into activity cost pools?

**5-33 Activity-based costing, unused capacity.** Bronco Electric operates at capacity and manufactures and sells two types of motors: a special motor, Thermo, and a basic motor, Basca. Bronco's simple product costing system has two direct-cost categories (direct materials and direct manufacturing labor) and a single indirect-cost pool. Bronco allocates all indirect costs using direct manufacturing labor-hours as the allocation base.



Recently, a team of managers from product design, manufacturing, sales, and marketing decided to replace the single indirect-cost pool with seven indirect-cost pools: design, setups, materials handling, manufacturing operations, shipping, distribution, and administration. The two direct-cost categories were retained. The team felt that the simple costing system did not accurately represent the indirect resources demanded by each product. The team collected the following information for 2006, the year just ended.

	A	B	C	D	E	F	G
				Basca	Thermo	Total	Cause-and-Effect Relationship Between Allocation Base and Activity Cost
1							
2	Number of motors			30,000	15,000		
3	Selling price			\$300	\$400		
4	Direct material cost per motor			\$100	\$150		
5	Direct manufacturing labor-hours per motor at a direct manufacturing labor rate of \$20 per hour			2.0	2.5		
6	Total machine-hours			45,000	30,000		
7							
8	Manufacturing operations					\$3,000,000	Indirect manufacturing operations costs increase with machine hours
9	Number of motors per batch			500	100		
10	Setup hours per batch			10	16		
11	Setup costs					\$ 600,000	Indirect setup costs increase with setup hours
12	Number of different components per motor			55	75		
13	Materials-handling hours to move a load <sup>1</sup>			0.2	0.2		
14	Materials-handling costs					\$ 582,000	Indirect materials-handling costs increase with materials-handling hours
15	Total number of components changed for each product			10	20		
16	Design costs					\$ 900,000	Indirect design costs increase with number of components changed
17	Total number of shipments for each product			120	180		
18	Shipping costs					\$ 90,000	Indirect costs incurred to prepare batches for shipment increase with number of shipments
19	Cubic feet per motor			1	1.5		
20	Distribution costs					\$ 315,000	Indirect distribution costs increase with cubic feet of motors delivered
21							
22	Administration costs					\$ 390,000	Demand for administrative resources increases with direct manufacturing labor-hours
23							
24	<sup>1</sup> Each load moves the quantity of a particular component required for the manufacturer of a batch of products. For example, because						
25	Basca has 55 different types of components, it takes 55 loads for all the components required to manufacture a batch of Basca to be						
26	transported from the store to the production area.						

If you want to use Excel to solve this problem, go to the Excel Lab at [www.prenhall.com/horngren/cost12e](http://www.prenhall.com/horngren/cost12e) and download the template for Problem 5-33.

- Calculate the cost per unit of Basca and Thermo under the simple costing system.
- Calculate the cost per unit of Basca and Thermo under the activity-based costing system.
- Compare the cost per unit for each product in requirements 1 and 2. Why do the simple and activity-based costing systems differ in the cost per unit for each product? Why might these differences be important for Bronco Electric?
- Suppose distribution costs of \$315,000 are fixed in the short run and that Bronco's distribution activity was operating at capacity in 2006. Bronco has found a way to reduce the bulkiness of the deliveries so that it now takes 0.9 cubic foot per motor for Basca and 1.2 cubic feet per motor for Thermo. What is the total cost of distribution resources used for Basca and Thermo? What is the cost of unused distribution capacity?
- What actions can Bronco take to reduce distribution costs in the short run? In the long run?

### Required

**5-34 Activity-based costing, merchandising.** Pharmicare, Inc., a distributor of special pharmaceutical products, has three main market segments:

- General supermarket chains
- Drugstore chains
- Mom-and-Pop single-store pharmacies



Rick Flair, the new controller of Pharmicare, reported the following data for 2005:

	A	B	C	D	E
1	<b>Pharmacare, 2005</b>	<b>General</b>			
2		<b>Supermarket</b>	<b>Drugstore</b>	<b>Mom-and-Pop</b>	
3		<b>Chains</b>	<b>Chains</b>	<b>Single Stores</b>	<b>Pharmacare</b>
4	Revenues	\$3,708,000	\$3,150,000	\$1,980,000	\$8,838,000
5	Cost of goods sold	3,600,000	3,000,000	1,800,000	8,400,000
6	Gross Margin	<u>\$ 108,000</u>	<u>\$ 150,000</u>	<u>\$ 180,000</u>	438,000
7	Other operating costs				301,080
8	Operating income				<u>\$ 136,920</u>
9					

For many years, Pharmacare has used gross margin percentage  $[(\text{Revenue} - \text{Cost of goods sold}) \div \text{Revenue}]$  to evaluate the relative profitability of its market segments. But, Flair recently attended a seminar on activity-based costing and is considering using it at Pharmacare to analyze and allocate "other operating costs." He meets with all the key managers and several of his operations and sales staff and they agree that there are five key activities that drive other operating costs at Pharmacare:

Activity Area	Cost Driver
Order processing	Number of customer purchase orders
Line-item processing	Number of line items ordered by customers
Delivering to stores	Number of store deliveries
Cartons shipped to store	Number of cartons shipped
Stocking of customer store shelves	Hours of shelf-stocking

Each customer order consists of one or more line items. A line item represents a single product (such as Extra-Strength Tylenol Tablets). Each product line item is delivered in one or more separate cartons. Each store delivery entails the delivery of one or more cartons of products to a customer. Pharmacare's staff stacks cartons directly onto display shelves in customers' stores. Currently, there is no additional charge to the customer for shelf-stocking, and not all customers use Pharmacare for this activity. The level of each activity in the three market segments and the total cost incurred for each activity in 2005 is shown below:

	A	B	C	D	E
13	<b>Activity-based Cost Data</b>	<b>Activity Level</b>			
14	<b>Pharmacare, 2005</b>	<b>General</b>			<b>Total Cost</b>
15		<b>Supermarket</b>	<b>Drugstore</b>	<b>Mom-and-Pop</b>	<b>of Activity</b>
16	<b>Activity</b>	<b>Chains</b>	<b>Chains</b>	<b>Single Stores</b>	<b>in 2005</b>
17	Orders processed (number)	140	360	1,500	\$ 80,000
18	Line items ordered (number)	1,960	4,320	15,000	63,840
19	Store deliveries made (number)	120	300	1,000	71,000
20	Cartons shipped to stores (number)	36,000	24,000	16,000	76,000
21	Shelf-stocking (hours)	360	180	100	10,240
22					<u>\$301,080</u>
23					

If you want to use Excel to solve this problem, go to the Excel Lab at [www.prenhall.com/horngren/cost12e](http://www.prenhall.com/horngren/cost12e) and download the template for Problem 5-34.

### Required

1. Compute the 2005 gross-margin percentage for each of Pharmacare's three market segments.
2. Compute the cost driver rates for each of the five activity areas.
3. Use the activity-based costing information to allocate the \$301,080 of "other operating costs" to each of the market segments. Compute the operating income for each market segment.
4. Comment on the results. What new insights are available with the activity-based costing information?

**5-35 Activity-based costing, product-cost cross-subsidization.** Baker's Delight (BD) has been in the food-processing business three years. For its first two years (2005 and 2006), its sole product was raisin cake. All cakes were manufactured and packaged in one-pound boxes. BD used a normal costing system. The two direct-cost categories were direct materials and direct manufacturing labor. The sole indirect manufacturing cost category—manufacturing overhead—was allocated to products using pounds of production as the allocation base.

In its third year (2007), BD added a second product—layered carrot cake—which was also packaged in one-pound boxes. This product differs from raisin cake in several ways:

- More-expensive ingredients are used.
- More direct manufacturing labor time is required.
- More-complex manufacturing processing is required.

In 2007, BD continued to use its simple costing system, in which it allocated manufacturing overhead using total pounds (boxes) produced of raisin and layered carrot cakes.

Direct material cost in 2007 was \$0.60 per pound of raisin cake and \$0.90 per pound of layered carrot cake. Direct manufacturing labor cost in 2007 was \$0.14 per pound of raisin cake and \$0.20 per pound of layered carrot cake.

During 2007, BD sales staff reported greater-than-expected sales of layered carrot cake and less-than-expected sales of raisin cake. The budgeted and actual sales volume for 2007 is as follows:

	Budgeted	Actual
Raisin cake	160,000 pounds	120,000 pounds
Layered carrot cake	40,000 pounds	80,000 pounds

The budgeted manufacturing overhead for 2007 is \$210,800.

At the end of 2007, Jonathan Davis, the controller of BD, decided to investigate how an activity-based costing system would have affected the product-cost numbers. After consultation with operating personnel, the single manufacturing overhead cost pool was subdivided into five activity areas. These activity areas, the cost-allocation base, the budgeted 2007 cost-allocation rate, and the quantity of the cost-allocation base used by the raisin and layered carrot cakes are as follows:

Activity	Cost-Allocation Base	Budgeted 2007 Cost per Unit of Cost-Allocation Base	Quantity of Cost-Allocation Base	
			Raisin Cake	Layered Carrot Cake
Mixing	Labor-hours	\$0.04	600,000	640,000
Cooking	Oven-hours	\$0.14	240,000	240,000
Cooling	Cool room-hours	\$0.02	360,000	400,000
Creaming/Icing	Machine-hours	\$0.25	0	240,000
Packaging	Machine-hours	\$0.08	360,000	560,000

1. Compute the 2007 product cost per pound of raisin cake and layered carrot cake produced using the simple costing system used in the 2005 to 2007 period.
2. Compute the 2007 product cost per pound of raisin cake and layered carrot cake produced using the activity-based costing system.
3. Explain the difference in product costs per pound computed in requirements 1 and 2.
4. Describe three uses Baker's Delight might make of the activity-based cost numbers.

**Required**

**5-36 ABC, health care.** Uppervale Health Center runs three programs: (1) alcoholic rehabilitation, (2) drug addict rehabilitation, and (3) aftercare (counseling and support of patients after release from a mental hospital).

The center's budget for 2006 follows:

Professional salaries:			
4 physicians × \$150,000	\$	600,000	
18 psychologists × \$75,000		1,350,000	
20 nurses × \$30,000		<u>600,000</u>	\$2,550,000
Medical supplies			300,000
General overhead (administrative salaries, rent, utilities, etc.)			<u>880,000</u>
Total			<u>\$3,730,000</u>

Muriel Clayton, the director of the center, is keen on determining the cost of each program. Clayton compiled the following data describing employee allocations to individual programs:

	Alcohol	Drug	Aftercare	Total Employees
Physicians		4		4
Psychologists	6	4	8	18
Nurses	4	6	10	20

Eighty patients are in residence in the alcohol program, each staying about six months. Thus, the clinic provides 40 patient-years of service in the alcohol program. Similarly, 100 patients are involved in the drug program for about six months each. Thus, the clinic provides 50 patient-years of service in the drug program.

Clayton has recently become aware of activity-based costing as a method to refine costing systems. She asks her accountant, Huey Deluth, how she should apply this technique. Deluth obtains the following information:

1. Consumption of medical supplies depends on the number of patient-years.
2. General overhead costs consists of:

Rent and clinic maintenance	\$180,000
Administrative costs to manage patient charts, food, laundry	600,000
Laboratory services	<u>100,000</u>
Total	<u>\$880,000</u>

3. Other information about individual departments are:

	Alcohol	Drug	Aftercare	Total
Square feet of space occupied by each program	9,000	9,000	12,000	30,000
Patient-years of service	40	50	60	150
Number of laboratory tests	400	1,400	700	2,500

**Required**

1. a. Selecting cost-allocation bases that you believe are the most appropriate for allocating indirect costs to programs, calculate the indirect cost rates for medical supplies; rent and clinic maintenance; administrative costs for patient charts, food, and laundry; and laboratory services.
- b. Using an activity-based costing approach to cost analysis, calculate the cost of each program and the cost per patient-year of the alcohol and drug programs.
- c. What benefits can Uppervale Health Center obtain by implementing the ABC system?
2. What factors, other than cost, do you think Uppervale Health Center should consider in allocating resources to its programs?

**5-37 Activity-based job costing.** Schramka Company manufactures a variety of prestige boardroom chairs. Its job-costing system uses an activity-based approach. There are two direct-cost categories (direct materials and direct manufacturing labor) and three indirect-cost pools. The cost pools represent three activity areas at the plant.

Manufacturing Activity Area	Budgeted Costs for 2007	Cost Driver Used as Allocation Base	Cost-Allocation Rate
Materials handling	\$ 200,000	Parts	\$ 0.25
Cutting	2,000,000	Parts	2.50
Assembly	2,000,000	Direct manufacturing labor-hours	25.00

Two styles of chairs were produced in March: the executive chair and the chairman chair. Their quantities, direct material costs, and other data for March 2007 are as follows:

	Units Produced	Direct Material Costs	Number of Parts	Direct Manufacturing Labor-Hours
Executive chair	5,000	\$600,000	100,000	7,500
Chairman chair	100	25,000	3,500	500

The direct manufacturing labor rate is \$20 per hour. Assume no beginning or ending inventory.

**Required**

1. Compute the March 2007 total manufacturing costs and unit costs of the executive chair and the chairman chair.
2. The upstream activities to manufacturing (R&D and design) and the downstream activities (marketing, distribution, and customer service) are analyzed, and the unit costs in 2007 are budgeted to be:

	Upstream Activities	Downstream Activities
Executive chair	\$ 60	\$110
Chairman chair	146	236

Compute the full cost per unit of each chair. (Full cost of each chair is the sum of the costs of all business functions in the value chain.)

3. Compare the per-unit cost figures for the executive chair and the chairman chair computed in requirements 1 and 2. Why do the costs differ for each chair? Why might these differences be important to Schramka Company?

**5-38 Activity-based job costing, unit-cost comparisons.** The Tracy Corporation has a machining facility specializing in jobs for the aircraft-components market. Tracy's previous simple job-costing system had two direct-cost categories (direct materials and direct manufacturing labor) and a single indirect-cost pool (manufacturing overhead, allocated using direct manufacturing labor-hours). The indirect cost-allocation rate of the simple system for 2007 would have been \$115 per direct manufacturing labor-hour.

Recently a team with members from product design, manufacturing, and accounting used an ABC approach to refine its job-costing system. The two direct-cost categories were retained. The team decided to replace the single indirect-cost pool with five indirect-cost pools. The cost pools represent five activity areas at the plant, each with its own supervisor and budget responsibility. Pertinent data are as follows:

Activity Area	Cost-Allocation Base	Cost-Allocation Rate
Materials handling	Parts	\$ 0.40
Lathe work	Lathe turns	0.20
Milling	Machine-hours	20.00
Grinding	Parts	0.80
Testing	Units tested	15.00



Information-gathering technology has advanced to the point at which the data necessary for budgeting in these five activity areas are collected automatically.

Two representative jobs processed under the ABC system at the plant in the most recent period had the following characteristics:

	Job 410	Job 411
Direct material cost per job	\$ 9,700	\$59,900
Direct manufacturing labor cost per job	\$750	\$11,250
Number of direct manufacturing labor-hours per job	25	375
Parts per job	500	2,000
Lathe turns per job	20,000	60,000
Machine-hours per job	150	1,050
Units per job (all units are tested)	10	200

1. Compute the manufacturing cost per unit for each job under the previous simple job-costing system. **Required**
2. Compute the manufacturing cost per unit for each job under the activity-based costing system.
3. Compare the per-unit cost figures for Jobs 410 and 411 computed in requirements 1 and 2. Why do the simple and the activity-based costing systems differ in the manufacturing cost per unit for each job? Why might these differences be important to Tracy Corporation?
4. How might Tracy Corporation use information from its ABC system to better manage its business?

**5-39 ABC, implementation, ethics.** (CMA, adapted) Applewood Electronics, a division of Elgin Corporation, manufactures two large-screen television models: the Monarch, which has been produced since 2001 and sells for \$900, and the Regal, a newer model introduced in early 2004 that sells for \$1,140. Based on the following income statement for the year ended November 30, 2005, senior management at Elgin have decided to concentrate Applewood's marketing resources on the Regal model and to begin to phase out the Monarch model.

**Applewood Electronics**  
**Income Statement**  
**For the Fiscal Year Ended November 30, 2005**

	Monarch	Regal	Total
Revenues	\$19,800,000	\$4,560,000	\$24,360,000
Cost of goods sold	12,540,000	3,192,000	15,732,000
Gross margin	7,260,000	1,368,000	8,628,000
Selling and administrative expense	5,830,000	978,000	6,808,000
Operating income	<u>\$ 1,430,000</u>	<u>\$ 390,000</u>	<u>\$ 1,820,000</u>
Units produced and sold	22,000	4,000	
Net income per unit sold	\$65.00	\$97.50	

Unit costs for Monarch and Regal are as follows:

	Monarch	Regal
Direct materials	\$208	\$584
Direct manufacturing labor		
Monarch (1.5 hours × \$12)	18	
Regal (3.5 hours × \$12)		42
Machine costs <sup>a</sup>		
Monarch (8 hours × \$18)	144	
Regal (4 hours × \$18)		72
Manufacturing overhead other than machine costs <sup>b</sup>	200	100
Total cost	<u>\$570</u>	<u>\$798</u>

<sup>a</sup>Machine costs include lease costs of the machine, repairs, and maintenance.

<sup>b</sup>Manufacturing overhead was allocated to products based on machine-hours at the rate of \$25 per hour.

Applewood's controller, Susan Benzo, is advocating the use of activity-based costing and activity-based management and has gathered the following information about the company's manufacturing overhead costs for the year ended November 30, 2005.

Activity Center (Cost-Allocation Base)	Total Activity Costs	Units of the Cost-Allocation Base		
		Monarch	Regal	Total
Soldering (number of solder points)	\$ 942,000	1,185,000	385,000	1,570,000
Shipments (number of shipments)	860,000	16,200	3,800	20,000
Quality control (number of inspections)	1,240,000	56,200	21,300	77,500
Purchase orders (number of orders)	950,400	80,100	109,980	190,080
Machine power (machine-hours)	57,600	176,000	16,000	192,000
Machine setups (number of setups)	750,000	16,000	14,000	30,000
Total manufacturing overhead	<u>\$4,800,000</u>			

After completing her analysis, Benzo shows the results to Fred Duval, the Applewood division president. Duval does not like what he sees. "If you show headquarters this analysis, they are going to ask us to phase out the Regal line, which we have just introduced. This whole costing stuff has been a major problem for us. First Monarch was not profitable and now Regal."

"Looking at the ABC analysis, I see two problems. First, we do many more activities than the ones you have listed. If you had included all activities, maybe your conclusions would be different. Second, you used number of setups and number of inspections as allocation bases. The numbers would be different had you used setup-hours and inspection-hours instead. I know that measurement problems precluded you from using these other cost-allocation bases, but I believe you ought to make some adjustments to our current numbers to compensate for these issues. I know you can do better. We can't afford to phase out either product."

Benzo knows her numbers are fairly accurate. As a quick check, she calculates the profitability of Regal and Monarch using more and different allocation bases. The set of activities and activity rates she had used resulted in numbers that closely approximate those based on more-detailed analyses. She is confident that headquarters, knowing that Regal was introduced only recently, will not ask Applewood to phase it out. She is also aware that a sizable portion of Duval's bonus is based on division revenues. Phasing out either product would adversely affect his bonus. Still, she feels some pressure from Duval to do something.

**Required**

1. Using activity-based costing, calculate the profitability of the Regal and Monarch models.
2. Explain briefly why these numbers differ from the profitability of the Regal and Monarch models calculated using Applewood's existing simple costing system.
3. Comment on Duval's concerns about the accuracy and limitations of ABC.
4. How might Applewood find the ABC information helpful in managing its business?
5. What should Susan Benzo do?

**Collaborative Learning Problem**

**5-40 Activity-based costing, cost hierarchy.** (CMA, adapted) Coffee Bean, Inc. (CBI) buys coffee beans from around the world and roasts, blends, and packages them for resale. The major cost is direct materials; however, there is substantial manufacturing overhead in the predominantly automated roasting and packaging process. The company uses relatively little direct labor.

Some of the coffees are very popular and sell in large volumes, whereas a few of the newer blends sell in very low volumes. CBI prices its coffee at budgeted cost, including allocated overhead, plus a markup on cost of 30%.

Data for the 2006 budget include manufacturing overhead of \$3,000,000, which has been allocated on the basis of each product's budgeted direct-labor cost. The budgeted direct-labor cost for 2006 totals \$600,000. Purchases and use of materials (mostly coffee beans) are budgeted to total \$6,000,000.

The budgeted direct costs for one-pound bags of two of the company's products are:

	Mauna Loa	Malaysian
Direct materials	\$4.20	\$3.20
Direct labor	0.30	0.30

CBI's controller believes the existing simple costing system may be providing misleading cost information. She has developed an activity-based analysis of the 2006 budgeted manufacturing overhead costs, which is shown in the following table:

Activity	Cost Driver	Cost-Driver Rate
Purchasing	Purchase orders	\$500
Materials handling	Loads moved	400
Quality control	Batches	240
Roasting	Roasting-hours	10
Blending	Blending-hours	10
Packaging	Packaging-hours	10

Budgeted data regarding the 2006 production of the Mauna Loa and Malaysian coffee follow. There will be no beginning or ending materials inventory for either of these coffees.

	Mauna Loa	Malaysian
Expected sales	100,000 pounds	2,000 pounds
Purchase orders	4	4
Batches	10	4
Loads moved	30	12
Roasting-hours	1,000	20
Blending-hours	500	10
Packaging-hours	100	2

- Using CBI's simple costing system:
  - Determine the company's 2006 budgeted manufacturing overhead rate using direct-labor cost as the single allocation base.
  - Determine the 2006 budgeted costs and selling prices of 1 pound of Mauna Loa coffee and 1 pound of Malaysian coffee.
- Use the controller's activity-based approach to estimate the 2006 budgeted cost for 1 pound of
  - Mauna Loa coffee
  - Malaysian coffee
 Allocate all costs to the 100,000 pounds of Mauna Loa and the 2,000 pounds of Malaysian. Compare the results with those in requirement 1.
- Examine the implications of your answers to requirement 2 for CBI's pricing and product-mix strategy.

**Required**



### Get Connected: Cost Accounting in the News

Go to [www.prenhall.com/horngren/cost/2e](http://www.prenhall.com/horngren/cost/2e) for additional online exercise(s) that explore issues affecting the accounting world today. These exercises offer you the opportunity to analyze and reflect on how cost accounting helps managers to make better decisions and handle the challenges of strategic planning and implementation.

## CHAPTER 5

## Case

### COLOMBO FROZEN YOGURT: Activity-Based Costing

As you've seen in this chapter, activity-based costing systems are useful in helping managers make better decisions about pricing, product mix, and cost management related to product design and efficiency. In fact, General Mills used ABC to identify and analyze the costs associated with the different channels used to market its Colombo frozen yogurt products.

Before performing ABC analysis, General Mills charged the same prices and provided the same promotions—\$3 per case—to its customers, whether the customer was in the grocery (food purchased for later consumption or preparation at home) or the food-service (outside of home, immediate consumption) channel. Upon closer examination of the food-service channel, General Mills discovered segments within food service: destination yogurt shops or restaurants and impulse locations, located in business cafeterias and on college campuses and military bases. General Mills also noticed that sales dollars for frozen yogurt products were relatively constant, but profits were declining. The company sensed that destination yogurt shops may be more profitable than impulse locations, but it didn't have the information about profit differences to make changes. General Mills' logic was: Destination shops/restaurants focus on maximizing profit per square foot and managing the average sale per customer. However, impulse locations focus on cost per serving, and this segment of the business was growing at a much faster rate than the destination shop segment.

The sales data and income statements for last year by segment were:

Category	Impulse Locations	Yogurt Shops	Total
Sales in cases	1,200,000	300,000	1,500,000
Sales revenue	\$23,880,000	\$5,970,000	\$29,850,000
Deduct: Promotions	3,600,000	900,000	4,500,000
Net sales	\$20,280,000	\$5,070,000	\$25,350,000
Deduct: COGS	13,800,000	3,450,000	17,250,000
Gross margin	\$ 6,480,000	\$1,620,000	\$ 8,100,000
Deduct: Merchandising	1,380,000	345,000	1,725,000
Deduct: SG&A*	948,000	237,000	1,185,000
Net income	\$ 4,152,000	\$1,038,000	\$ 5,190,000

\*Selling, general, and administrative expenses

Cost of goods sold includes \$14,250,000 for ingredients, packaging, and storage, and \$3,000,000 for pick, pack, and shipping. The product is the same across segments, so cost to produce is the same. However, pick, pack, and shipping costs vary if the order is for a full pallet. Full pallets cost \$75 to pick and ship, whereas individual orders cost \$2.25 per case. There are 75 cases in a pallet, with pallet and case usage by segment shown here:

	Impulse Segment	Yogurt Shops	Total
Cases in full pallets	60,000	240,000	300,000
Individual cases	1,140,000	60,000	1,200,000
Total cases	1,200,000	300,000	1,500,000

Merchandising costs consist mainly of kits at \$500 each. A total of 3,450 kits were delivered last year, 90 of them to yogurt shops. For SG&A, costs were allocated to products based on gross sales dollars. When a random sample of the sales force was asked to keep diaries for 60 days, the resulting data revealed they spent much more time per sales dollar on yogurt sales than other General Mills products they represented. As a result, when SG&A costs were allocated based on time, the total allocation to yogurt jumped from \$1,185,000 to \$3,900,000. Of the total time spent on selling Colombo frozen yogurt, only 1% of that time was spent in shops.

### QUESTIONS

- How do the two segments identified by General Mills for Colombo frozen yogurt sales differ from each other?
- Using ABC analysis, restate the income statements, above, to show new net income (*hint*: add a line item for shipping). What is net income per case?
- Based on your analysis in question 2, what changes should General Mills make?

(IMA adapted; "Colombo Frozen Yogurt," John Guy and Jane Saly, *Cases from Management Accounting Practice*, Vol. 15, Institute of Management Accountants, 2000.) © IMA. Reprinted with permission from the Institute of Management Accountants, Montvale, N.J., [www.imanet.org](http://www.imanet.org).