Chapter 2
Cost Terms, Concepts, and Classifications

Solutions to Questions

2-1 The three major elements of product costs in a manufacturing company are direct materials, direct labor, and manufacturing overhead.

2-2

a. Direct materials are an integral part of a finished product and their costs can be conveniently traced to it.

b. Indirect materials are generally small items of material such as glue and nails. They may be an integral part of a finished product but their costs can be traced to the product only at great cost or inconvenience. Indirect materials are ordinarily classified as manufacturing overhead.

c. Direct labor includes those labor costs that can be easily traced to particular products. Direct labor is also called "touch labor."

d. Indirect labor includes the labor costs of janitors, supervisors, materials handlers, and other factory workers that cannot be conveniently traced to particular products. These labor costs are incurred to support production, but the workers involved do not directly work on the product.

e. Manufacturing overhead includes all manufacturing costs except direct materials and direct labor.

2-3 A product cost is any cost involved in purchasing or manufacturing goods. In the case of manufactured goods, these costs consist of direct materials, direct labor, and manufacturing overhead. A period cost is a cost that is taken directly to the income statement as an expense in the period in which it is incurred.

2-4 The income statement of a manufacturing company differs from the income statement of a merchandising company in the cost of goods sold section. The merchandising company sells finished goods that it has purchased from a supplier. These goods are listed as "Purchases" in the cost of goods sold section. Since the manufacturing company produces its goods rather than buying them from a supplier, it lists "Cost of Goods Manufactured" in place of "Purchases." Also, the manufacturing company identifies its inventory in this section as "Finished Goods Inventory," rather than as "Merchandise Inventory."

2-5 The schedule of cost of goods manufactured lists the manufacturing costs that have been incurred during the period. These costs are organized under the three major categories of direct materials, direct labor, and manufacturing overhead. The total costs incurred are adjusted for any change in the Work in Process inventory to determine the cost of goods manufactured (i.e. finished) during the period.

The schedule of cost of goods manufactured ties into the income statement through the Cost of Goods Sold section. The cost of goods manufactured is added to the beginning Finished Goods inventory to determine the goods available for sale. In effect, the cost of goods manufactured takes the place of the "Purchases" account in a merchandising firm.

2-6 A manufacturing company has three inventory accounts: Raw Materials, Work in Process, and Finished Goods. A merchandising company generally identifies its inventory account simply as Merchandise Inventory.

2-7 Since product costs accompany units of product into inventory, they are sometimes called inventoriable costs. The flow is from direct materials, direct labor, and manufacturing overhead to Work in Process. As goods are completed, their cost is removed from Work in Process and transferred to Finished Goods. As goods are sold, their cost is removed from Finished Goods and transferred to Cost of Goods Sold. Cost of Goods Sold is an expense on the income statement.

2-8 Yes, costs such as salaries and depreciation can end up as assets on the balance sheet if these are manufacturing costs. Manufacturing costs are inventoried until the associated finished goods are sold. Thus, if some units are still in inventory, such costs may be part of either Work in Process inventory or Finished Goods inventory at the end of a period.

2-9 Cost behavior refers to how a cost will react or respond to changes in the level of activity.

2-10 No. A variable cost is a cost that varies, in total, in direct proportion to changes in the level of activity. A variable cost is constant per unit of product. A fixed cost is fixed in total, but will vary inversely on an average per-unit basis with changes in the level of activity.

2-11 When fixed costs are involved, the average cost of a unit of product will depend on the number of units being manufactured. As production increases, the average cost per unit will fall as the fixed cost is spread over more units. Conversely, as production declines, the average cost per unit will rise as the fixed cost is spread over fewer units.

2-12 Manufacturing overhead is an indirect cost since these costs cannot be easily and conveniently traced to particular units of products.

2-13 A differential cost is a cost that differs between alternatives in a decision. An opportunity cost is the potential benefit that is given up when one alternative is selected over another. A sunk cost is a cost that has already been incurred and cannot be altered by any decision taken now or in the future.

2-14 No; differential costs can be either variable or fixed. For example, the alternatives might consist of purchasing one machine rather than another to make a product. The difference in the fixed costs of purchasing the two machines would be a differential cost.

2-15

Direct labor cost	
(34 hours × $15 per hour)	$510
Manufacturing overhead cost	
(6 hours × $15 per hour)	90
Total wages earned	$600

2-16

Direct labor cost	
(45 hours × $14 per hour)	$630
Manufacturing overhead cost	
(5 hours × $7 per hour)	35
Total wages earned	$665

2-17 Costs associated with the quality of conformance can be broken down into prevention costs, appraisal costs, internal failure costs, and external failure costs. Prevention costs are incurred in an effort to keep defects from occurring. Appraisal costs are incurred to detect defects before they can create further problems. Internal and external failure costs are incurred as a result of producing defective units.

2-18 Total quality costs are usually minimized by *increasing* prevention and appraisal costs in order to reduce internal and external failure costs. Total quality costs usually decrease as prevention and appraisal costs increase.

2-19 Shifting the focus to prevention and away from appraisal is usually the most effective way to reduce total quality costs. It is usually more effective to prevent defects than to attempt to fix them after they have occurred.

2-20 First, a quality cost report helps managers see the financial consequences of defects. Second, the report may help managers identify the most important areas for improvement. Third, the report helps managers see whether quality costs are appropriately distributed among prevention, appraisal, internal failure, and external failure costs.

2-21 Most accounting systems do not track and accumulate the costs of quality. It is particularly difficult to get a feel for the magnitude of quality costs since they are incurred in many departments throughout the organization.

Exercise 2-1 (15 minutes)

1. The cost of a hard-drive installed in a computer: direct materials cost.

2. The cost of advertising in the *Puget Sound Computer User* newspaper: marketing and selling cost.

3. The wages of employees who assemble computers from components: direct labor cost.

4. Sales commissions paid to the company's salespeople: marketing and selling cost.

5. The wages of the assembly shop's supervisor: manufacturing overhead cost.

6. The wages of the company's accountant: administrative cost.

7. Depreciation on equipment used to test assembled computers before release to customers: manufacturing overhead cost.

8. Rent on the facility in the industrial park: a combination of manufacturing overhead, administrative, and marketing and selling cost. The rent would most likely be prorated on the basis of the amount of space occupied by manufacturing, administrative, and marketing operations.

Exercise 2-2 (15 minutes)

	Product Cost	*Period Cost*
1. Depreciation on salespersons' cars		X
2. Rent on equipment used in the factory	X	
3. Lubricants used for maintenance of machines	X	
4. Salaries of finished goods warehouse personnel		X
5. Soap and paper towels used by factory workers at the end of a shift	X	
6. Factory supervisors' salaries	X	
7. Heat, water, and power consumed in the factory	X	
8. Materials used for boxing products for shipment overseas (units are not normally boxed)		X
9. Advertising costs		X
10. Workers' compensation insurance on factory employees	X	
11. Depreciation on chairs and tables in the factory lunchroom	X	
12. The wages of the receptionist in the administrative offices		X
13. Lease cost of the corporate jet used by the company's executives		X
14. Rent on rooms at a Florida resort for holding the annual sales conference		X
15. Attractively designed box for packaging the company's product—breakfast cereal	X	

Exercise 2-3 (15 minutes)

CyberGames
Income Statement

Sales		$1,450,000
Cost of goods sold:		
Beginning merchandise inventory	$ 240,000	
Add: Purchases	950,000	
Goods available for sale	1,190,000	
Deduct: Ending merchandise inventory	170,000	1,020,000
Gross margin		430,000
Less operating expenses:		
Selling expense	210,000	
Administrative expense	180,000	390,000
Net operating income		$ 40,000

Exercise 2-4 (15 minutes)

Lompac Products
Schedule of Cost of Goods Manufactured

Direct materials:		
Beginning raw materials inventory	$ 60,000	
Add: Purchases of raw materials	690,000	
Raw materials available for use	750,000	
Deduct: Ending raw materials inventory	45,000	
Raw materials used in production		$ 705,000
Direct labor		135,000
Manufacturing overhead		370,000
Total manufacturing costs		1,210,000
Add: Beginning work in process inventory		120,000
		1,330,000
Deduct: Ending work in process inventory		130,000
Cost of goods manufactured		$1,200,000

Exercise 2-5 (15 minutes)

A few of these costs may generate debate. For example, some may argue that the cost of advertising a Madonna rock concert is a variable cost since the number of people who come to the rock concert depends on the amount of advertising. However, one can argue that if the price is within reason, any Madonna rock concert in New York City will be sold out and the function of advertising is simply to let people know the event will be happening. Moreover, while advertising may affect the number of persons who ultimately buy tickets, the causation is in one direction. If more people buy tickets, the advertising costs don't go up.

	Cost Behavior	
	Variable	*Fixed*
1. X-ray film used in the radiology lab at Virginia Mason Hospital in Seattle	X	
2. The costs of advertising a Madonna rock concert in New York City		X
3. Rental cost of a McDonald's restaurant building in Hong Kong		X
4. The electrical costs of running a roller coaster at Magic Mountain	X	
5. Property taxes on your local cinema		X
6. Commissions paid to salespersons at Nordstrom	X	
7. Property insurance on a Coca-Cola bottling plant		X
8. The costs of synthetic materials used to make Nike running shoes	X	
9. The costs of shipping Panasonic televisions to retail stores	X	
10. The cost of leasing an ultra-scan diagnostic machine at the American Hospital in Paris		X

Exercise 2-6 (15 minutes)

	Cost	*Costing object*	*Direct Cost*	*Indirect Cost*
1.	The wages of pediatric nurses	The pediatric department	X	
2.	Prescription drugs	A particular patient	X	
3.	Heating the hospital	The pediatric department		X
4.	The salary of the head of pediatrics	The pediatric department	X	
5.	The salary of the head of pediatrics	A particular pediatric patient		X
6.	Hospital chaplain's salary	A particular patient		X
7.	Lab tests by outside contractor	A particular patient	X	
8.	Lab tests by outside contractor	A particular department	X	

Exercise 2-7 (15 minutes)

Item	Differential Cost	Opportunity Cost	Sunk Cost
1. Cost of the old X-ray machine........			X
2. The salary of the head of the Radiology Department................			
3. The salary of the head of the Pediatrics Department			
4. Cost of the new color laser printer......................................	X		
5. Rent on the space occupied by Radiology			
6. The cost of maintaining the old machine	X		
7. Benefits from a new DNA analyzer		X	
8. Cost of electricity to run the X-ray machines.............................	X		

Note: The costs of the salaries of the head of the Radiology Department and Pediatrics Department and the rent on the space occupied by Radiology are neither differential costs, nor opportunity costs, nor sunk costs. These are costs that do not differ between the alternatives and are therefore irrelevant in the decision, but they are not sunk costs since they occur in the future.

Exercise 2-8 (15 minutes)

1. No. It appears that the overtime spent completing the job was simply a matter of how the job happened to be scheduled. Under these circumstances, an overtime premium probably should not be charged to a customer whose job happens to fall at the end of the day's schedule.

2.

Direct labor cost: 9 hours × $14 per hour	$126
General overhead cost: 1 hour × $7 per hour.......	7
Total labor cost..	$133

3. A charge for an overtime premium might be justified if the customer requested a "rush" order that caused the overtime.

Exercise 2-9 (15 minutes)

1.

	Prevention Cost	Appraisal Cost	Internal Failure Cost	External Failure Cost
a. Product testing		X		
b. Product recalls				X
c. Rework labor and overhead			X	
d. Quality circles	X			
e. Downtime caused by defects			X	
f. Cost of field servicing				X
g. Inspection of goods		X		
h. Quality engineering	X			
i. Warranty repairs				X
j. Statistical process control	X			
k. Net cost of scrap			X	
l. Depreciation of test equipment		X		
m. Returns and allowances arising from poor quality				X
n. Disposal of defective products			X	
o. Technical support to suppliers	X			
p. Systems development	X			
q. Warranty replacements				X
r. Field testing at customer site		X		
s. Product design	X			

2. Prevention costs and appraisal costs are incurred in an effort to keep poor quality of conformance from occurring. Internal and external failure costs are incurred because poor quality of conformance has occurred.

Exercise 2-10 (30 minutes)

1.

Mason Company
Schedule of Cost of Goods Manufactured

Direct materials:		
Raw materials inventory, beginning	$ 7,000	
Add: Purchases of raw materials	118,000	
Raw materials available for use	125,000	
Deduct: Raw materials inventory, ending	15,000	
Raw materials used in production		$110,000
Direct labor		70,000
Manufacturing overhead:		
Indirect labor	30,000	
Maintenance, factory equipment	6,000	
Insurance, factory equipment	800	
Rent, factory facilities	20,000	
Supplies	4,200	
Depreciation, factory equipment	19,000	
Total overhead costs		80,000
Total manufacturing costs		260,000
Add: Work in process, beginning		10,000
		270,000
Deduct: Work in process, ending		5,000
Cost of goods manufactured		$265,000

2. The cost of goods sold section of Mason Company's income statement:

Finished goods inventory, beginning	$ 20,000
Add: Cost of goods manufactured	265,000
Goods available for sale	285,000
Deduct: Finished goods inventory, ending	35,000
Cost of goods sold	$250,000

Exercise 2-11 (15 minutes)

Cost Item	Cost Behavior: Variable	Cost Behavior: Fixed	Selling and Administrative Cost	Product Cost
1. Hamburger buns at a Wendy's outlet..........	X			X
2. Advertising by a dental office		X	X	
3. Apples processed and canned by Del Monte .	X			X
4. Shipping canned apples from a Del Monte plant to customers	X		X	
5. Insurance on a Bausch & Lomb factory producing contact lenses		X		X
6. Insurance on IBM's corporate headquarters.........................		X	X	
7. Salary of a supervisor overseeing production of printers at Hewlett-Packard		X		X
8. Commissions paid to Encyclopedia Britannica salespersons.......	X		X	
9. Depreciation of factory lunchroom facilities at a General Electric plant........................		X		X
10. Steering wheels installed in BMWs	X			X

Exercise 2-12 (30 minutes)

1\. a.

Batteries purchased	8,000
Batteries drawn from inventory	7,600
Batteries remaining in inventory	400
Cost per battery	× $10
Cost in Raw Materials Inventory at April 30	$4,000

b.

Batteries used in production (7,600 – 100)	7,500
Motorcycles completed and transferred to Finished Goods (90% × 7,500 = 6,750)	6,750
Motorcycles still in Work in Process at April 30	750
Cost per battery	× $10
Cost in Work in Process Inventory at April 30	$7,500

c.

Motorcycles completed and transferred to Finished Goods (see above)	6,750
Motorcycles sold during the month (70% × 6,750 = 4,725)	4,725
Motorcycles still in Finished Goods at April 30	2,025
Cost per battery	× $10
Cost in Finished Goods Inventory at April 30	$20,250

d.

Motorcycles sold during the month (above)	4,725
Cost per battery	× $10
Cost in Cost of Goods Sold at April 30	$47,250

e.

Batteries used in salespersons' motorcycles	100
Cost per battery	× $10
Cost in Selling Expense at April 30	$ 1,000

2. Raw Materials Inventory—balance sheet
   Work in Process Inventory—balance sheet
   Finished Goods Inventory—balance sheet
   Cost of Goods Sold—income statement
   Selling Expense—income statement

Exercise 2-13 (15 minutes)

1\.

Direct labor cost: 31 hours × $14 per hour	$434
Manufacturing overhead cost: 9 hours × $14 per hour...	126
Total cost	$560

2\.

Direct labor cost: 48 hours × $14 per hour	$672
Manufacturing overhead cost: 8 hours × $7 per hour.....	56
Total cost	$728

3. A company could treat the cost of fringe benefits relating to direct labor workers as part of manufacturing overhead. This approach spreads the cost of such fringe benefits over all units of output. Alternatively, the company could treat the cost of fringe benefits relating to direct labor workers as additional direct labor cost. This latter approach charges the costs of fringe benefits to specific jobs rather than to all units of output.

Problem 2-14 (30 minutes)

Name of the Cost	*Variable Cost*	*Fixed Cost*	*Product Cost* *Direct Materials*	*Product Cost* *Direct Labor*	*Product Cost* *Manufacturing Overhead*	*Period (selling and admin.) Cost*	*Opportunity Cost*	*Sunk Cost*
Rental revenue forgone, $30,000 per year							X	
Direct materials cost, $80 per unit	X		X					
Rental cost of warehouse, $500 per month		X				X		
Rental cost of equipment, $4,000 per month		X			X			
Direct labor cost, $60 per unit	X			X				
Depreciation of the annex space, $8,000 per year		X			X			X
Advertising cost, $50,000 per year		X				X		
Supervisor's salary, $1,500 per month		X			X			
Electricity for machines, $1.20 per unit	X				X			
Shipping cost, $9 per unit	X					X		
Return earned on investments, $3,000 per year							X	

Problem 2-15 (30 minutes)

Note to the Instructor: There may be some exceptions to the answers below. The purpose of this problem is to get the student to start *thinking* about cost behavior and cost purposes; therefore, try to avoid lengthy discussions about how a particular cost is classified.

					Manufacturing (Product) Cost	
	Cost Item	*Variable or Fixed*	*Selling Cost*	*Adminis-trative Cost*	*Direct*	*Indirect*
1.	Property taxes, factory	F				X
2.	Boxes used for packaging detergent produced by the company	V			X	
3.	Salespersons' commissions	V	X			
4.	Supervisor's salary, factory	F				X
5.	Depreciation, executive autos	F		X		
6.	Wages of workers assembling computers	V			X	
7.	Insurance, finished goods warehouses	F	X			
8.	Lubricants for machines	V				X
9.	Advertising costs	F	X			
10.	Microchips used in producing calculators	V			X	
11.	Shipping costs on merchandise sold	V	X			
12.	Magazine subscriptions, factory lunchroom	F				X
13.	Thread in a garment factory	V				X
14.	Billing costs	V	X*			
15.	Executive life insurance	F		X		

Problem 2-15 (continued)

	Cost Item	Variable or Fixed	Selling Cost	Adminis-trative Cost	Manufacturing (Product) Cost Direct	Manufacturing (Product) Cost Indirect
16.	Ink used in textbook production...................	V				X
17.	Fringe benefits, assembly-line workers	V			X**	
18.	Yarn used in sweater production	V			X	
19.	Wages of receptionist, executive offices........	F		X		

* Could be administrative cost.
** Could be indirect cost.

Problem 2-16 (30 minutes)

	Cost Behavior		*To Units of Product*	
Cost Item	*Variable*	*Fixed*	*Direct*	*Indirect*
1. Electricity used in operating machines	X			X
2. Rent on a factory building		X		X
3. Cloth used in drapery production	X		X	
4. Production superintendent's salary		X		X
5. Wages of laborers assembling a product.....................	X		X	
6. Depreciation of air purification equipment used in furniture production		X		X
7. Janitorial salaries		X		X
8. Peaches used in canning fruit	X		X	
9. Lubricants needed for machines................................	X			X
10. Sugar used in soft drink production............................	X		X	
11. Property taxes on the factory....................................		X		X
12. Wages of workers painting a product	X		X	
13. Depreciation on cafeteria equipment		X		X
14. Insurance on a building used in producing helicopters .		X		X
15. Cost of rotor blades used in producing helicopters.......	X		X	

Problem 2-17 (30 minutes)

1. Total wages for the week:

Regular time: 40 hours × $20 per hour		$800
Overtime: 6 hours × $30 per hour		180
Total wages		$980
Allocation of total wages:		
Direct labor: 46 hours × $20 per hour		$920
Manufacturing overhead: 6 hours × $10 per hour		60
Total wages		$980

2. Total wages for the week:

Regular time: 40 hours × $20 per hour		$ 800
Overtime: 8 hours × $30 per hour		240
Total wages		$1,040
Allocation of total wages:		
Direct labor: 45 hours × $20 per hour		$ 900
Manufacturing overhead:		
Idle time: 3 hours × $20 per hour	$60	
Overtime premium: 8 hours × $10 per hour	80	140
Total wages		$1,040

3. Total wages and fringe benefits for the week:

Regular time: 40 hours × $20 per hour		$ 800
Overtime: 10 hours × $30 per hour		300
Fringe benefits: 50 hours × $6 per hour		300
Total wages and fringe benefits		$1,400
Allocation of wages and fringe benefits:		
Direct labor: 48 hours × $20 per hour		$ 960
Manufacturing overhead:		
Idle time: 2 hours × $20 per hour	$ 40	
Overtime premium: 10 hours × $10 per hour	100	
Fringe benefits: 50 hours × $6 per hour	300	440
Total wages and fringe benefits		$1,400

Problem 2-17 (continued)

4. Allocation of wages and fringe benefits:

Direct labor:		
Wage cost: 48 hours × \$20 per hour	\$960	
Fringe benefits: 48 hours × \$6 per hour	288	\$1,248
Manufacturing overhead:		
Idle time: 2 hours × \$20 per hour	40	
Overtime premium: 10 hours × \$10 per hour	100	
Fringe benefits: 2 hours × \$6 per hour	12	152
Total wages and fringe benefits		\$1,400

Problem 2-18 (60 minutes)

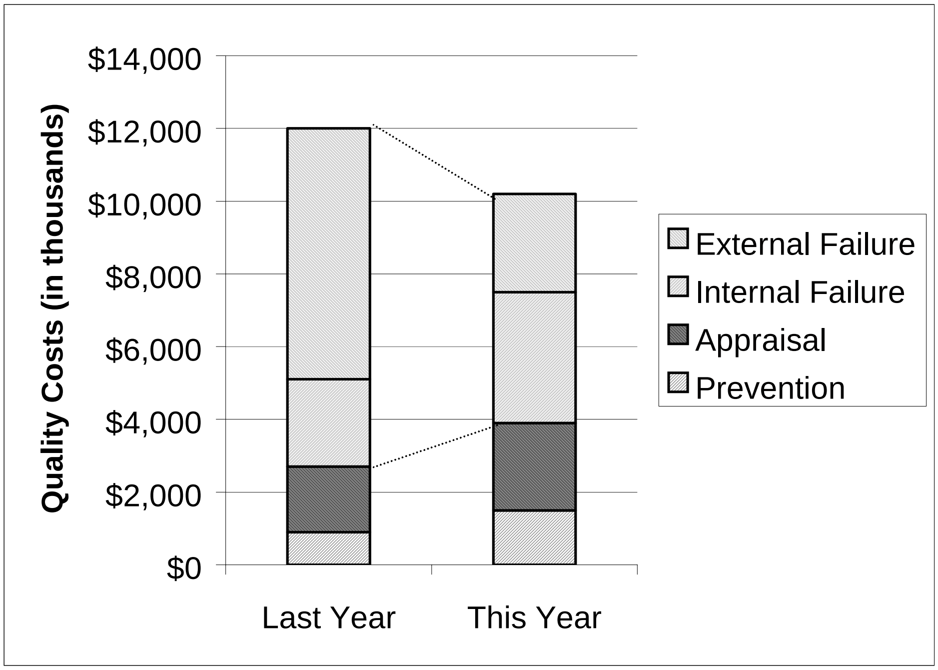
1.

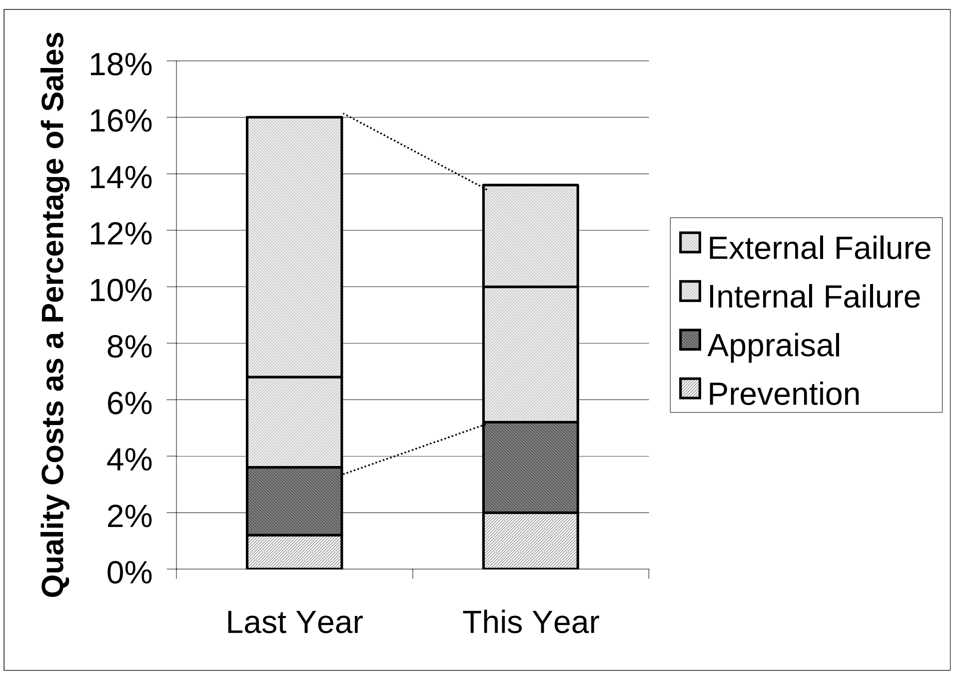
Florex Company
Quality Cost Report

	This Year		Last Year	
	Amount	Percent of Sales	Amount	Percent of Sales
Prevention costs:				
Quality engineering	$ 570	0.76	$ 420	0.56
Systems development	750	1.00	480	0.64
Statistical process control	180	0.24	0	0.00
Total prevention costs	1,500	2.00	900	1.20
Appraisal costs				
Inspection	900	1.20	750	1.00
Product testing	1,200	1.60	810	1.08
Supplies used in testing	60	0.08	30	0.04
Depreciation of testing equipment	240	0.32	210	0.28
Total appraisal costs	2,400	3.20	1,800	2.40
Internal failure costs:				
Net cost of scrap	1,125	1.50	630	0.84
Rework labor	1,500	2.00	1,050	1.40
Disposal of defective products	975	1.30	720	0.96
Total internal failure costs	3,600	4.80	2,400	3.20
External failure costs:				
Cost of field servicing	900	1.20	1,200	1.60
Warranty repairs	1,050	1.40	3,600	4.80
Product recalls	750	1.00	2,100	2.80
Total external failure costs	2,700	3.60	6,900	9.20
Total quality cost	$10,200	13.60	$12,000	16.00

Problem 2-18 (continued)

2.





Problem 2-18 (continued)

3. The overall impact of the company's increased emphasis on quality over the past year has been positive in that total quality costs have decreased from 16% of sales to 13.6% of sales. Despite this improvement, the company still has a poor distribution of quality costs. The bulk of the quality costs in both years is traceable to internal and external failure, rather than to prevention and appraisal. Although the distribution of these costs is poor, the trend this year is toward more prevention and appraisal as the company has given more emphasis on quality.

   Probably due to the increased spending on prevention and appraisal activities during the past year, internal failure costs have increased by one half, going from $2.4 million to $3.6 million. The reason internal failure costs have gone up is that, through increased appraisal activity, defects are being caught and corrected before products are shipped to customers. Thus, the company is incurring more cost for scrap, rework, and so forth, but it is saving huge amounts in field servicing, warranty repairs, and product recalls. External failure costs have fallen sharply, decreasing from $6.9 million last year to just $2.7 million this year.

   If the company continues its emphasis on prevention and appraisal—and particularly on prevention—its total quality costs should continue to decrease in future years. Although internal failure costs are increasing for the moment, these costs should decrease in time as better quality is designed into products. Appraisal costs should also decrease as the need for inspection, testing, and so forth decreases as a result of better engineering and tighter process control.

Problem 2-19 (30 minutes)

1.

Name of the Cost	Variable Cost	Fixed Cost	Product Cost: Direct Materials	Product Cost: Direct Labor	Product Cost: Mfg. Overhead	Period (selling and admin) Cost	Opportunity Cost	Sunk Cost
Staci's current salary, $3,800 per month		X					X	
Building rent, $500 per month.........		X			X			
Clay and glaze, $2 per pot	X		X					
Wages of production workers, $8 per pot	X			X				
Advertising, $600 per month		X				X		
Sales commission, $4 per pot	X					X		
Rent of production equipment, $300 per month		X			X			
Legal and filing fees, $500		X				X		X
Rent of sales office, $250 per month		X				X		
Phone for taking orders, $40 per month		X				X		
Interest lost on savings account, $1,200 per year...........................		X					X	

2. The $500 cost of incorporating the business is not a differential cost. Even though the cost was incurred to start the business, it is a sunk cost. Whether Staci produces pottery or stays in her present job, she will have incurred this cost.

Problem 2-20 (15 minutes)

1. The controller is correct in his viewpoint that the salary cost should be classified as a selling (marketing) cost. The duties described in the problem have nothing to do with manufacturing a product, but rather deal with moving *finished units* from the factory to distribution warehouses. Selling costs include all costs necessary to secure customer orders and to get the finished product into the hands of customers. Coordination of shipments of finished units from the factory to distribution warehouses falls in this category.

2. No, the president is not correct. The reported net operating income for the year will differ depending on how the salary cost is classified. If the salary cost is classified as a selling expense all of it will appear on the income statement as a period cost. However, if the salary cost is classified as a manufacturing (product) cost, then it will be added to Work In Process Inventory along with other manufacturing costs for the period. To the extent that goods are still in process at the end of the period, part of the salary cost will remain with these goods in the Work in Process Inventory account. Only that portion of the salary cost that has been assigned to finished units will leave the Work In Process Inventory account and be transferred into the Finished Goods Inventory account. In like manner, to the extent that goods are unsold at the end of the period, part of the salary cost will remain with these goods in the Finished Goods Inventory account. Only the portion of the salary that has been assigned to finished units *that are sold during the period* will appear on the income statement as an expense (part of Cost of Goods Sold) for the period. The remainder of the salary costs will be on the balance sheet as part of inventories.

Problem 2-21 (15 minutes)

Item	*Description*	*Direct or Indirect Cost of the Meals-On-Wheels Program*		*Direct or Indirect Cost of Particular Seniors Served by the Meals-On-Wheels Program*		*Variable or Fixed with Respect to the Number of Seniors Served by the Meals-On-Wheels Program*	
		Direct	*Indirect*	*Direct*	*Indirect*	*Variable*	*Fixed*
a.	The cost of leasing the meals-on-wheels van........	X			X		X
b.	The cost of incidental supplies such as salt, pepper, napkins, and so on	X			X*	X	
c.	The cost of gasoline consumed by the meals-on-wheels van	X			X	X	
d.	The rent on the facility that houses Madison Seniors Care Center, including the meals-on-wheels program		X		X*		X
e.	The salary of the part-time manager of the meals-on-wheels program................................	X			X		X
f.	Depreciation on the kitchen equipment used in the meals-on-wheels program	X			X		X
g.	The hourly wages of the caregiver who drives the van and delivers the meals.........................	X		X		X	
h.	The costs of complying with health safety regulations in the kitchen	X			X		X
i.	The costs of mailing letters soliciting donations to the meals-on-wheels program	X			X		X

*These costs could be direct costs of serving particular seniors.

Problem 2-22 (45 minutes)

1. An analysis of the company's quality cost report is presented below:

	This Year			Last Year		
	Amount	*Percent**		*Amount*	*Percent**	
Prevention costs:						
Machine maintenance ...	$ 120	2.5	20.3	$70	1.7	10.4
Training suppliers	10	0.2	1.7	0	0.0	0.0
Quality circles	20	0.4	3.4	0	0.0	0.0
Total prevention costs	150	3.1	25.4	70	1.7	10.4
Appraisal costs:						
Incoming inspection......	40	0.8	6.8	20	0.5	3.0
Final testing	90	1.9	15.3	80	1.9	11.9
Total appraisal costs........	130	2.7	22.0	100	2.4	14.9
Internal failure costs:						
Rework........................	130	2.7	22.0	50	1.2	7.5
Scrap...........................	70	1.5	11.9	40	1.0	6.0
Total internal failure costs...........................	200	4.2	33.9	90	2.1	13.4
External failure costs:						
Warranty repairs...........	30	0.6	5.1	90	2.1	13.4
Customer returns..........	80	1.7	13.6	320	7.6	47.8
Total external failure costs...........................	110	2.3	18.6	410	9.8	61.2
Total quality cost............	$ 590	12.3	100.0	$670	16.0	100.0
Total production cost.......	$4,800			$4,200		

* Percentage figures may not add down due to rounding.

Problem 2-22 (continued)

From the above analysis it would appear that Mercury, Inc.'s program has been successful.

- Total quality costs have declined from 16.0% to 12.3% as a percentage of total production cost. In dollar amount, total quality costs went from \$670,000 last year to \$590,000 this year.
- External failure costs, those costs signaling customer dissatisfaction, have declined from 9.8% of total production costs to 2.3%. These declines in warranty repairs and customer returns should result in increased sales in the future.
- Appraisal costs have increased from 2.4% to 2.7% of total production cost.
- Internal failure costs have increased from 2.1% to 4.2% of production costs. This increase has probably resulted from the increase in appraisal activities. Defective units are now being spotted more frequently before they are shipped to customers.
- Prevention costs have increased from 1.7% of total production cost to 3.1% and from 10.4% of total quality costs to 25.4%. The \$80,000 increase is more than offset by decreases in other quality costs.

2. The initial effect of emphasizing prevention and appraisal was to reduce external failure costs and increase internal failure costs. The increase in appraisal activities resulted in catching more defective units before they were shipped to customers. As a consequence, rework and scrap costs increased. In the future, an increased emphasis on prevention should result in a decrease in internal failure costs. And as defect rates are reduced, resources devoted to appraisal can be reduced.

3. To measure the cost of not implementing the quality program, management could assume that sales and market share would continue to decline and then calculate the lost profit. Or, management might assume that the company will have to cut its prices to hang on to its market share. The impact on profits of lowering prices could be estimated.

Problem 2-23 (30 minutes)

1. A cost that is classified as a period cost will be recognized on the income statement as an expense in the current period. A cost that is classified as a product cost will be recognized on the income statement as an expense (i.e., cost of goods sold) only when the associated units of product are sold. If some units are unsold at the end of the period, the costs of those unsold units are treated as assets. Therefore, by reclassifying period costs as product costs, the company is able to carry some costs forward in inventories that would have been treated as current expenses.

2. The discussion below is divided into two parts—Gallant's actions to postpone expenditures and the actions to reclassify period costs as product costs.

   The decision to postpone expenditures is highly questionable. It is one thing to postpone expenditures due to a cash bind; it is quite another to postpone expenditures in order to hit a profit target. Postponing these expenditures may have the effect of ultimately increasing future costs and reducing future profits. If orders to the company's suppliers are changed, it may disrupt the suppliers' operations. The additional costs may be passed on to Gallant's company and may create ill will and a feeling of mistrust. Postponing maintenance on equipment is particularly questionable. The result may be breakdowns, inefficient and/or unsafe operations, and a shortened life for the machinery.

   Interestingly, in a survey of 649 managers reported in *Management Accounting*, only 12% stated that it is unethical to defer expenses and thereby manipulate quarterly earnings. The proportion who felt it was unethical increased to 24% when it involved annual earnings. Another 41% said that deferring expenses is a questionable practice when it involved quarterly reports and 35% said this when annual reports were involved. Finally, 47% said that it is completely ethical to manipulate quarterly reports in this way and 41% gave the green light for annual reports. (See William J. Bruns, Jr. and Kenneth A. Merchant, "The Dangerous Morality of Managing Earnings," *Management Accounting*, August 1990, pp. 22-25)

Problem 2-23 (continued)

Gallant's decision to reclassify period costs is not ethical—assuming that there is no intention of disclosing in the financial reports this reclassification. Such a reclassification would be a violation of the principle of consistency in financial reporting and is a clear attempt to mislead readers of the financial reports. Although some may argue that the overall effect of Gallant's action will be a "wash"—that is, profits gained in this period will simply be taken from the next period—the trend of earnings will be affected. Hopefully, the auditors would discover any such attempt to manipulate annual earnings and would refuse to issue an unqualified opinion due to the lack of consistency. However, recent accounting scandals may lead to some skepticism about how forceful auditors have been in enforcing tight accounting standards.

Problem 2-24 (60 minutes)

1.

Meriwell Company
Schedule of Cost of Goods Manufactured

Direct materials:		
Raw materials inventory, beginning	$ 9,000	
Add: Purchases of raw materials	125,000	
Raw materials available for use	134,000	
Deduct: Raw materials inventory, ending	6,000	
Raw materials used in production		$128,000
Direct labor		70,000
Manufacturing overhead:		
Depreciation, factory	27,000	
Utilities, factory	8,000	
Maintenance, factory	40,000	
Supplies, factory	11,000	
Insurance, factory	4,000	
Indirect labor	15,000	
Total overhead costs		105,000
Total manufacturing costs		303,000
Add: Work in process inventory, beginning		17,000
		320,000
Deduct: Work in process inventory, ending		30,000
Cost of goods manufactured		$290,000

Problem 2-24 (continued)

2.

Meriwell Company
Income Statement

Sales		$500,000
Cost of goods sold:		
Finished goods inventory, beginning	$ 20,000	
Add: Cost of goods manufactured	290,000	
Goods available for sale	310,000	
Deduct: Finished goods inventory, ending	40,000	270,000
Gross margin		230,000
Less operating expenses:		
Selling expenses	80,000	
Administrative expenses	110,000	190,000
Net operating income		$ 40,000

3. Direct materials: $128,000 ÷ 10,000 units = $12.80 per unit.
   Factory Depreciation: $27,000 ÷ 10,000 units = $2.70 per unit.

4. Direct materials:
   Unit cost: $12.80 (unchanged)
   Total cost: 15,000 units × $12.80 per unit = $192,000.

   Factory Depreciation:
   Unit cost: $27,000 ÷ 15,000 units = $1.80 per unit.
   Total cost: $27,000 (unchanged)

5. Unit cost for depreciation dropped from $2.70 to $1.80, because of the increase in production between the two years. Since fixed costs do not change *in total* as the activity level changes, they will decrease on a unit basis as the activity level rises.

Problem 2-25 (45 minutes)

1.

Cost Item	Cost Behavior: Variable	Cost Behavior: Fixed	Selling or Administrative Cost	Product Cost: Direct	Product Cost: Indirect
Factory labor, direct	$118,000			$118,000	
Advertising		$50,000	$50,000		
Factory supervision		40,000			$40,000
Property taxes, factory building		3,500			3,500
Sales commissions	80,000		80,000		
Insurance, factory		2,500			2,500
Depreciation, office equipment		4,000	4,000		
Lease cost, factory equipment		12,000			12,000
Indirect materials, factory	6,000				6,000
Depreciation, factory building		10,000			10,000
General office supplies	3,000		3,000		
General office salaries		60,000	60,000		
Direct materials used	94,000			94,000	
Utilities, factory	20,000				20,000
Total costs	$321,000	$182,000	$197,000	$212,000	$94,000

Problem 2-25 (continued)

2.

Direct	$212,000
Indirect	94,000
Total	$306,000

$306,000 ÷ 2,000 sets = $153 per set

3. The average product cost per set would increase. This is because the fixed costs would be spread over fewer units, causing the average cost per unit to rise.

4. a. Yes, the president may expect a minimum price of $153, which is the average cost to manufacture one set. He might expect a price even higher than this to cover a portion of the administrative costs as well. The brother-in-law probably is thinking of cost as including only direct materials, or, at most, direct materials and direct labor. Direct materials alone would be only $47 per set, and direct materials and direct labor would be only $106.

   b. The term is opportunity cost. The full, regular price of a set might be appropriate here, since the company is operating at full capacity, and this is the amount that must be given up (benefit forgone) to sell a set to the brother-in-law.

Problem 2-26 (60 minutes)

1.

Swift Company
Schedule of Cost of Goods Manufactured
For the Month Ended August 31

Direct materials:		
Raw materials inventory, August 1	$ 8,000	
Add: Purchases of raw materials	165,000	
Raw materials available for use	173,000	
Deduct: Raw materials inventory, August 31	13,000	
Raw materials used in production		$160,000
Direct labor		70,000
Manufacturing overhead:		
Indirect labor cost	12,000	
Utilities (60% × $15,000)	9,000	
Depreciation, factory equipment	21,000	
Insurance (75% × $4,000)	3,000	
Rent on facilities (80% × $50,000)	40,000	
Total overhead costs		85,000
Total manufacturing costs		315,000
Add: Work in process inventory, August 1		16,000
		331,000
Deduct: Work in process inventory, August 31		21,000
Cost of goods manufactured		$310,000

Problem 2-26 (continued)

2.

Swift Company
Income Statement
For the Month Ended August 31

Sales		$450,000
Less cost of goods sold:		
Finished goods inventory, August 1	$ 40,000	
Add: Cost of goods manufactured	310,000	
Goods available for sale	350,000	
Deduct: Finished goods inventory, August 31	60,000	290,000
Gross margin		160,000
Less operating expenses:		
Utilities (40% × $15,000)	6,000	
Depreciation, sales equipment	18,000	
Insurance (25% × $4,000)	1,000	
Rent on facilities (20% × $50,000)	10,000	
Selling and administrative salaries	32,000	
Advertising	75,000	142,000
Net operating income		$ 18,000

3. In preparing the income statement for August, Sam failed to distinguish between product costs and period costs, and he also failed to recognize the changes in inventories between the beginning and end of the month. Once these errors have been corrected, the financial condition of the company looks much better and selling the company may not be advisable.

Problem 2-27 (60 minutes)

1. Superior Company
Schedule of Cost of Goods Manufactured
For the Year Ended December 31

Direct materials:			
Raw materials inventory, beginning	$ 40,000		
Add: Purchases of raw materials	290,000		
Raw materials available for use	330,000		
Deduct: Raw materials inventory, ending	10,000		
Raw materials used in production		$320,000	
Direct labor		93,000	*
Manufacturing overhead:			
Insurance, factory	8,000		
Utilities, factory	45,000		
Indirect labor	60,000		
Cleaning supplies, factory	7,000		
Rent, factory building	120,000		
Maintenance, factory	30,000		
Total overhead costs		270,000	
Total manufacturing costs (given)		683,000	
Add: Work in process inventory, beginning		42,000	*
		725,000	
Deduct: Work in process inventory, ending		35,000	
Cost of goods manufactured		$690,000	

The cost of goods sold section of the income statement follows:

Finished goods inventory, beginning	$ 50,000	
Add: Cost of goods manufactured	690,000	*
Goods available for sale (given)	740,000	
Deduct: Finished goods inventory, ending	80,000	*
Cost of goods sold (given)	$660,000	

* These items must be computed by working backwards up through the statements.

Problem 2-27 (continued)

2. Direct materials: $320,000 ÷ 40,000 units = $8 per unit.
   Rent, factory building: $120,000 ÷ 40,000 units = $3 per unit.

3.

	Per Unit		*Total*	
Direct materials............	$8.00	(Same)	$400,000 **	(Changed)
Rent, factory building ...	$2.40 *	(Changed)	$120,000	(Same)

  * $120,000 ÷ 50,000 units = $2.40 per unit.
 ** $8 per unit × 50,000 units = $400,000.

4. The unit cost for rent dropped from $3.00 to $2.40, because of the increase in production between the two years. Since fixed costs do not change *in total* as the activity level changes, they will decrease on a unit basis as the activity level rises.

Problem 2-28 (60 minutes)

1.

Visic Corporation
Schedule of Cost of Goods Manufactured

Direct materials:		
Raw materials inventory, beginning	$ 20,000	
Add: Purchases of raw materials	480,000	
Raw materials available for use	500,000	
Deduct: Raw materials inventory, ending	30,000	
Raw materials used in production		$470,000
Direct labor		90,000
Manufacturing overhead:		
Indirect labor	85,000	
Building rent (80% × $40,000)	32,000	
Utilities, factory	108,000	
Royalty on patent ($1.50 per unit × 29,000 units)	43,500	
Maintenance, factory	9,000	
Rent on equipment $7,000 + ($0.30 per unit × 29,000 units)	15,700	
Other factory overhead costs	6,800	
Total overhead costs		300,000
Total manufacturing costs		860,000
Add: Work in process inventory, beginning		50,000
		910,000
Deduct: Work in process inventory, ending		40,000
Cost of goods manufactured		$870,000

Problem 2-28 (continued)

2. a. To compute the number of units in the finished goods inventory at the end of the year, we must first compute the number of units sold during the year.

$$\frac{\text{Total sales}}{\text{Unit selling price}} = \frac{\$1{,}300{,}000}{\$50 \text{ per unit sold}} = 26{,}000 \text{ units sold}$$

Units in the finished goods inventory, beginning	0
Units produced during the year	29,000
Units available for sale...	29,000
Units sold during the year (above)	26,000
Units in the finished goods inventory, ending..........	3,000

b. The average production cost per unit during the year would be:

$$\frac{\text{Cost of goods manufactured}}{\text{Number of units produced}} = \frac{\$870{,}000}{29{,}000 \text{ units}} = \$30 \text{ per unit}$$

Thus, the cost of the units in the finished goods inventory at the end of the year would be: 3,000 units × $30 per unit = $90,000.

Problem 2-28 (continued)

3. Visic Corporation
Income Statement

Sales		$1,300,000
Less cost of goods sold:		
Finished goods inventory, beginning	$ 0	
Add: Cost of goods manufactured	870,000	
Goods available for sale	870,000	
Finished goods inventory, ending	90,000	780,000
Gross margin		520,000
Less operating expenses:		
Advertising	105,000	
Entertainment and travel	40,000	
Building rent (20% × $40,000)	8,000	
Selling and administrative salaries	210,000	
Other selling and administrative expense	17,000	380,000
Net operating income		$ 140,000

Problem 2-29 (45 minutes)

	Case 1		Case 2		Case 3		Case 4	
Direct materials	$ 4,500		$ 6,000		$ 5,000		$ 3,000	
Direct labor	9,000	*	3,000		7,000		4,000	
Manufacturing overhead	5,000		4,000		8,000	*	9,000	
Total manufacturing costs	18,500		13,000	*	20,000		16,000	*
Beginning work in process inventory	2,500		2,000	*	3,000		4,500	*
Ending work in process inventory	(3,000)	*	(1,000)		(4,000)		(3,000)	
Cost of goods manufactured	$18,000		$14,000		$19,000	*	$17,500	
Sales	$30,000		$21,000		$36,000		$40,000	
Beginning finished goods inventory	1,000		2,500		3,500	*	2,000	
Cost of goods manufactured	18,000		14,000		19,000	*	17,500	
Goods available for sale	19,000	*	16,500	*	22,500	*	19,500	*
Ending finished goods inventory	(2,000)	*	(1,500)		(4,000)		(3,500)	
Cost of goods sold	17,000		15,000	*	18,500		16,000	*
Gross margin	13,000		6,000	*	17,500		24,000	*
Operating expenses	(9,000)	*	(3,500)		(12,500)	*	(15,000)	*
Net operating income	$ 4,000		$ 2,500	*	$ 5,000		$ 9,000	

* Missing data in the problem.

Case 2-30 (60 minutes)

The following cost items are needed before a schedule of cost of goods manufactured can be prepared:

Materials used in production:

Prime cost	$410,000
Less direct labor cost	180,000
Direct materials cost	$230,000

Manufacturing overhead cost:

$$\frac{\text{Direct labor cost}}{\text{Percentage of conversion cost}} = \frac{\$180,000}{30\%^*}$$

$$= \$600,000 \text{ total conversion cost}$$

*100% – 70% = 30%.

Conversion cost	$600,000
Less direct labor cost	180,000
Manufacturing overhead cost	$420,000

Cost of goods manufactured:

Goods available for sale	$810,000
Less finished goods inventory, beginning	45,000
Cost of goods manufactured	$765,000

The easiest way to proceed from this point is to place all known amounts in a partially completed schedule of cost of goods manufactured and a partially completed income statement. Then fill in the missing amounts by analysis of the available data.

Case 2-30 (continued)

Direct materials:	
Raw materials inventory, beginning	$ 18,000
Add: Purchases of raw materials	290,000
Raw materials available for use	308,000
Deduct: Raw materials inventory, ending	A
Raw materials used in production (see above)	230,000
Direct labor cost	180,000
Manufacturing overhead cost (see above)	420,000
Total manufacturing costs	830,000
Add: Work in process inventory, beginning	65,000
	895,000
Deduct: Work in process inventory, ending	B
Cost of goods manufactured (see above)	$765,000

Therefore, "A" (Raw materials inventory, ending) would be $78,000; and "B" (Work in process inventory, ending) would be $130,000.

Sales		$1,200,000
Less cost of goods sold:		
Finished goods inventory, beginning	$ 45,000	
Add: Cost of goods manufactured (see above)	765,000	
Goods available for sale	810,000	
Deduct: Finished goods inventory, ending	C	720,000
Gross margin		$ 480,000

*$1,200,000 × (100% – 40%) = $720,000.

Therefore, "C" (Finished goods inventory, ending) would be $90,000. The procedure outlined above is just one way in which the solution to the case can be approached. Some may wish to start at the bottom of the income statement (with gross margin) and work upwards from that point. Also, the solution can be obtained by use of T-accounts.

Case 2-31 (60 minutes)

1. No distinction has been made between period expenses and product costs on the income statement filed by the company's accountant. Product costs (e.g., direct materials, direct labor, and manufacturing overhead) should be assigned to inventory accounts and flow through to the income statement as cost of goods sold only when finished products are sold. Since there were ending inventories, some of the product costs should appear on the balance sheet as assets rather than on the income statement as expenses.

2. Solar Technology, Inc.
Schedule of Cost of Goods Manufactured
For the Quarter Ended March 31

Direct materials:		
Raw materials inventory, beginning	$ 0	
Add: Purchases of raw materials	360,000	
Raw materials available for use	360,000	
Deduct: Raw materials inventory, ending	10,000	
Raw materials used in production		$350,000
Direct labor		70,000
Manufacturing overhead:		
Maintenance, production	43,000	
Indirect labor	120,000	
Cleaning supplies, production	7,000	
Rental cost, facilities (80% × $75,000)	60,000	
Insurance, production	8,000	
Utilities (90% × $80,000)	72,000	
Depreciation, production equipment	100,000	
Total overhead costs		410,000
Total manufacturing costs		830,000
Add: Work in process inventory, beginning		0
		830,000
Deduct: Work in process inventory, ending		50,000
Cost of goods manufactured		$780,000

Case 2-31 (continued)

3. Before an income statement can be prepared, the cost of the 8,000 batteries in the ending finished goods inventory must be determined. Altogether, the company produced 40,000 batteries during the quarter; thus, the production cost per battery would be:

$$\frac{\text{Cost of goods manufactured}}{\text{Batteries produced during the quarter}} = \frac{\$780{,}000}{40{,}000 \text{ units}} = \$19.50 \text{ per unit}$$

Since 8,000 batteries (40,000 – 32,000 = 8,000) were in the finished goods inventory at the end of the quarter, the total cost of this inventory would be:

8,000 units × $19.50 per unit = $156,000.

With this figure and other data from the case, the company's income statement for the quarter can be prepared as follows:

Solar Technology, Inc.
Income Statement
For the Quarter Ended March 31

Sales (32,000 batteries)		$960,000
Less cost of goods sold:		
Finished goods inventory, beginning	$ 0	
Add: Cost of goods manufactured	780,000	
Goods available for sale	780,000	
Deduct: Finished goods inventory, ending	156,000	624,000
Gross margin		336,000
Less operating expenses:		
Selling and administrative salaries	110,000	
Advertising	90,000	
Rental cost, facilities (20% × $75,000)	15,000	
Depreciation, office equipment	27,000	
Utilities (10% × $80,000)	8,000	
Travel, salespersons	40,000	290,000
Net operating income		$ 46,000

Case 2-31 (continued)

4. No, the insurance company probably does not owe Solar Technology $226,000. The key question is how "cost" was defined in the insurance contract. It is most likely that the insurance contract limits reimbursement for losses to those costs that would normally be considered product costs—in other words, direct materials, direct labor, and manufacturing overhead. The $226,000 figure is overstated since it includes elements of selling and administrative expenses as well as all of the product costs. The $226,000 figure also does not recognize that some costs incurred during the period are in the ending Raw Materials and Work in Process inventory accounts, as explained in part (1) above. The insurance company's liability is probably just $156,000, which is the amount of cost associated with the ending Finished Goods inventory as shown in part (3) above.

Group Exercise 2-32

1. This statement reflects Ford's focus on reducing costs. Producing cars in different colors adds to costs and reduces output in a variety of ways. First, changing colors on the production line involves considerable set-ups, during which time nothing can be painted. The old color must be purged from paint lines before the new color can be applied. And different colors mean larger paint inventories and—perhaps most importantly—larger inventories of finished autos. By producing the Model T in only one color, Ford was able to keep costs low and to keep throughput up—thus keeping its costs low. However, the market was eventually willing to pay for more colors and Ford was slow to adapt to this change.

2. As stated in the problem, further efficiencies could be achieved by implementing standardized work procedures, specializing work, and using machines to enhance the productivity of individual workers.

3. There are indeed limits to lowering costs—they can't go below zero. One might think that the lowest limit is the cost of raw materials used in production. However, even this cost can be pushed down over time as more efficient means of producing raw materials are developed.

4. The most obvious application of mass production concepts to university education has been the increase in the number of students in classes—with large lecture classes now being the norm in many introductory courses. Hospitals have applied the concepts of mass production by developing standardized procedures and by specializing in certain areas such as cardiac care or cancer treatment. Airlines have applied mass production concepts by increasing the size of the jets they fly and by reducing the time required to service a jet between flights.

Group Exercise 2-33

1. A fixed cost is normally defined as a cost that remains constant, in total, regardless of changes in the level of activity. A variable cost is normally defined as a cost that varies, in total, in direct proportion to changes in the level of activity.

2. The relevant measure of activity for a steel company is probably the volume of steel produced. Fixed costs for a steel company include factory rent and depreciation, property taxes, many administrative costs, salaries, and periodic depreciation of equipment. Variable costs include the cost of raw materials, some energy costs, some labor costs, and some supply costs.

3. A number of different measures of activity could be used at a hospital. Some hospitals use a measure called patient-days, which counts a patient in the hospital for one day as a patient-day. Fixed costs at a hospital include the rental and depreciation of buildings, administrative salaries, utilities, insurance, and the costs of equipment. Variable costs include the costs of drugs and supplies and some labor costs.

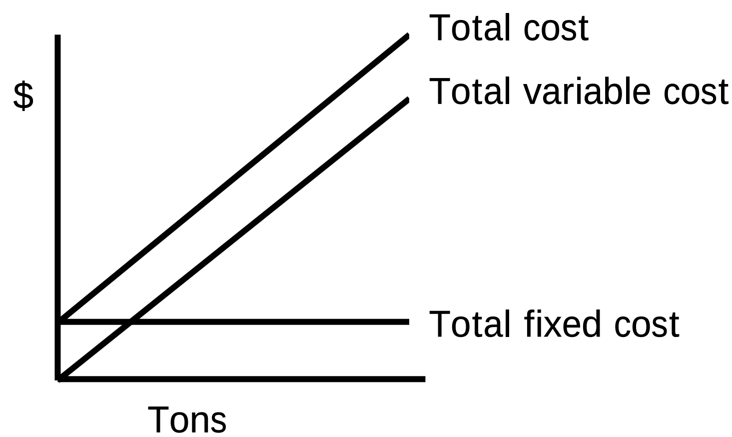
   Universities often use credit-hours or the total number of students enrolled as the measure of activity. Fixed costs for a university include the costs of buildings, salaries, utilities, grounds maintenance, and so on. Variable costs are minimal.

   A measure of activity at an auto manufacturer might be the number of cars produced. Fixed costs for an auto manufacturer include the costs of buildings and equipment, insurance, salaries, and utilities. Variable costs include raw materials and perhaps some labor.

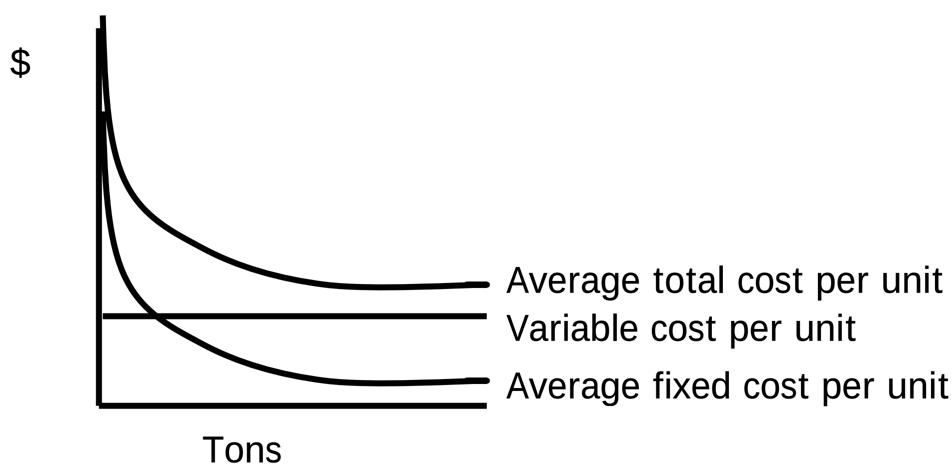
4. As the volume of steel produced increases, total fixed costs remain the same; the fixed cost per unit decreases; total variable costs increase; the variable cost per unit remains the same; total cost increases (due to the increase in total variable cost); and the average unit cost decreases (because of the decline in the fixed cost per unit).

Group Exercise 2-33 (continued)

5. The following graph depicts how total costs behave as a function of how many tons of steel are produced.



6. The following graph depicts how average costs per unit behave as a function of how many tons of steel are produced.



7. Once capacity has been set, total fixed costs and variable costs per unit remain the same while the average fixed cost per unit drops and the total variable cost increases as demand (output) increases.