CHAPTER 2
AN INTRODUCTION TO COST TERMS AND PURPOSES

2-1 A *cost object* is anything for which a separate measurement of costs is desired. Examples include a product, a service, a project, a customer, a brand category, an activity, and a department.

2-2 Direct costs of a cost object are related to the particular cost object and can be traced to that cost object in an economically feasible (cost-effective) way.

Indirect costs of a cost object are related to the particular cost object but cannot be traced to that cost object in an economically feasible (cost-effective) way.

Cost assignment is a general term that encompasses the assignment of both direct costs and indirect costs to a cost object. Direct costs are *traced* to a cost object while indirect costs are *allocated* to a cost object.

2-3 Managers believe that direct costs that are traced to a particular cost object are more accurately assigned to that cost object than are indirect allocated costs. When costs are allocated, managers are less certain whether the cost allocation base accurately measures the resources demanded by a cost object. Managers prefer to use more accurate costs in their decisions.

2-4 Factors affecting the classification of a cost as direct or indirect include

- the materiality of the cost in question,
- available information-gathering technology,
- design of operations

2-5 A *variable cost* changes in total in proportion to changes in the related level of total activity or volume. An example is a sales commission that is a percentage of each sales revenue dollar.

A *fixed cost* remains unchanged in total for a given time period, despite wide changes in the related level of total activity or volume. An example is the leasing cost of a machine that is unchanged for a given time period (such as a year) regardless of the number of units of product produced on the machine.

2-6 A *cost driver* is a variable, such as the level of activity or volume, that causally affects total costs over a given time span. A change in the cost driver results in a change in the level of total costs. For example, the number of vehicles assembled is a driver of the costs of steering wheels on a motor-vehicle assembly line.

2-7 The *relevant range* is the band of normal activity level or volume in which there is a specific relationship between the level of activity or volume and the cost in question. Costs are described as variable or fixed with respect to a particular relevant range.

2-8 A unit cost is computed by dividing some amount of total costs (the numerator) by the related number of units (the denominator). In many cases, the numerator will include a fixed cost that will not change despite changes in the denominator. It is erroneous in those cases to multiply the unit cost by activity or volume change to predict changes in total costs at different activity or volume levels.

2-9 *Manufacturing-sector companies* purchase materials and Ashtonnents and convert them into various finished goods, for example automotive and textile companies.

Merchandising-sector companies purchase and then sell tangible products without changing their basic form, for example retailing or distribution.

Service-sector companies provide services or intangible products to their customers, for example, legal advice or audits.

2-10 Manufacturing companies have one or more of the following three types of inventory:

1. *Direct materials inventory*. Direct materials in stock and awaiting use in the manufacturing process.
2. *Work-in-process inventory*. Goods partially worked on but not yet completed. Also called *work in progress***.**
3. *Finished goods inventory*. Goods completed but not yet sold.

2-11 *Inventoriable costs* are all costs of a product that are considered as assets in the balance sheet when they are incurred and that become cost of goods sold when the product is sold. These costs are included in work-in-process and finished goods inventory (they are "inventoried") to accumulate the costs of creating these assets.

Period costs are all costs in the income statement other than cost of goods sold. These costs are treated as expenses of the accounting period in which they are incurred because they are expected not to benefit future periods (because there is not sufficient evidence to conclude that such benefit exists). Expensing these costs immediately best matches expenses to revenues.

2-12 *Direct material costs* are the acquisition costs of all materials that eventually become part of the cost object (work in process and then finished goods), and can be traced to the cost object in an economically feasible way.

Direct manufacturing labor costs include the compensation of all manufacturing labor that can be traced to the cost object (work in process and then finished goods) in an economically feasible way.

Manufacturing overhead costs are all manufacturing costs that are related to the cost object (work in process and then finished goods), but cannot be traced to that cost object in an economically feasible way.

Prime costs are all direct manufacturing costs (direct material and direct manufacturing labor).

Conversion costs are all manufacturing costs other than direct material costs.

2-13 *Overtime premium* is the wage rate paid to workers (for both direct labor and indirect labor) in excess of their straight-time wage rates.

Idle time is a subclassification of indirect labor that represents wages paid for unproductive time caused by lack of orders, machine breakdowns, material shortages, poor scheduling, and the like.

2-14 A product cost is the sum of the costs assigned to a product for a specific purpose. Purposes for computing a product cost include

- pricing and product mix decisions,
- contracting with government agencies, and
- preparing financial statements for external reporting under generally accepted accounting principles.

2-15 Three common features of cost accounting and cost management are:

- calculating the costs of products, services, and other cost objects
- obtaining information for planning and control and performance evaluation
- analyzing the relevant information for making decisions

2-16 (15 min.) **Computing and interpreting manufacturing unit costs**.

1.

	(in millions)			
	Supreme	**Deluxe**	**Regular**	**Total**
Direct material cost	$ 89.00	$ 57.00	$60.00	$206.00
Direct manuf. labor costs	16.00	26.00	8.00	50.00
Manufacturing overhead costs	48.00	78.00	24.00	150.00
Total manuf. costs	153.00	161.00	92.00	406.00
Fixed costs allocated at a rate of $15M ÷ $50M (direct mfg. labor) equal to $0.30 per dir. manuf. labor dollar (0.30 × $16; 26; 8)	4.80	7.80	2.40	15.00
Variable costs	$148.20	$153.20	$89.60	$391.00
Units produced (millions)	125	150	140	
Cost per unit (Total manuf. costs ÷ units produced)	$1.2240	$1.0733	$0.6571	
Variable manuf. cost per unit (Variable manuf. costs ÷ Units produced)	$1.1856	$1.0213	$0.6400	

2.

	(in millions)			
	Supreme	**Deluxe**	**Regular**	**Total**
Based on total manuf. cost per unit ($1.2240 × 150; $1.0733 × 190; $0.6571 × 220)	$183.60	$203.93	$144.56	$532.09
Correct total manuf. costs based on variable manuf. costs plus fixed costs equal				
Variable costs ($1.1856 × 150; $1.0213 × 190; $0.64 × 220)	$177.84	$194.05	$140.80	$512.69
Fixed costs				15.00
Total costs				$527.69

The total manufacturing cost per unit in requirement 1 includes $15 million of indirect manufacturing costs that are fixed irrespective of changes in the volume of output per month, while the remaining variable indirect manufacturing costs change with the production volume. Given the unit volume changes for August 2011, the use of total manufacturing cost per unit from the past month at a different unit volume level (both in aggregate and at the individual product level) will overestimate total costs of $532.09 million in August 2011 relative to the correct total manufacturing costs of $527.69 million calculated using variable manufacturing cost per unit times units produced plus the fixed costs of $15 million.

2-17 (15 min.) **Direct, indirect, fixed and variable costs.**

1. Yeast – direct, variable
   Flour- direct, variable
   Packaging materials –direct (or could be indirect if small and not traced to each unit), variable
   Depreciation on ovens –indirect, fixed (unless "units of output" depreciation, which then would be variable)
   Depreciation on mixing machines–indirect, fixed (unless "units of output" depreciation, which then would be variable)
   Rent on factory building – indirect, fixed
   Fire Insurance on factory building–indirect, fixed
   Factory utilities – indirect, probably some variable and some fixed (e.g. electricity may be variable but heating costs may be fixed)
   Finishing department hourly laborers – direct, variable (or fixed if the laborers are under a union contract)
   Mixing department manager – indirect, fixed
   Materials handlers –depends on how they are paid. If paid hourly and not under union contract, then indirect, variable. If salaried or under union contract then indirect, fixed
   Custodian in factory –indirect, fixed
   Night guard in factory –indirect, fixed
   Machinist (running the mixing machine) –depends on how they are paid. If paid hourly and not under union contract, then indirect, variable. If salaried or under union contract then indirect, fixed
   Machine maintenance personnel – indirect, probably fixed, if salaried, but may be variable if paid only for time worked and maintenance increases with increased production
   Maintenance supplies – indirect, variable
   Cleaning supplies – indirect, most likely fixed since the custodians probably do the same amount of cleaning every night

2. If the cost object is Mixing Department, then anything directly associated with the Mixing Department will be a direct cost. This will include:

- Depreciation on mixing machines
- Mixing Department manager
- Materials handlers (of the Mixing Department)
- Machinist (running the mixing machines)
- Machine Maintenance personnel (of the Mixing Department)
- Maintenance supplies (if separately identified for the Mixing Department)

Of course the yeast and flour will also be a direct cost of the Mixing Department, but it is already a direct cost of each kind of bread produced.

2-18 (15–20 min.) **Classification of costs, service sector.**

Cost object: Each individual focus group
Cost variability: With respect to the number of focus groups

There may be some debate over classifications of individual items, especially with regard to cost variability.

Cost Item	D or I	V or F
A	D	V
B	I	F
C	I	V[a]
D	I	F
E	D	V
F	I	F
G	D	V
H	I	V[b]

[a]Some students will note that phone call costs are variable when each call has a separate charge. It may be a fixed cost if Consumer Focus has a flat monthly charge for a line, irrespective of the amount of usage.
[b]Gasoline costs are likely to vary with the number of focus groups. However, vehicles likely serve multiple purposes, and detailed records may be required to examine how costs vary with changes in one of the many purposes served.

2-19 (15–20 min.) **Classification of costs, merchandising sector.**

Cost object: Videos sold in video section of store
Cost variability: With respect to changes in the number of videos sold

There may be some debate over classifications of individual items, especially with regard to cost variability.

Cost Item	D or I	V or F
A	D	F
B	I	F
C	D	V
D	D	F
E	I	F
F	I	V
G	I	F
H	D	V

2-20 (15–20 min.) **Classification of costs, manufacturing sector.**

Cost object: Type of car assembled (Corolla or Geo Prism)
Cost variability: With respect to changes in the number of cars assembled

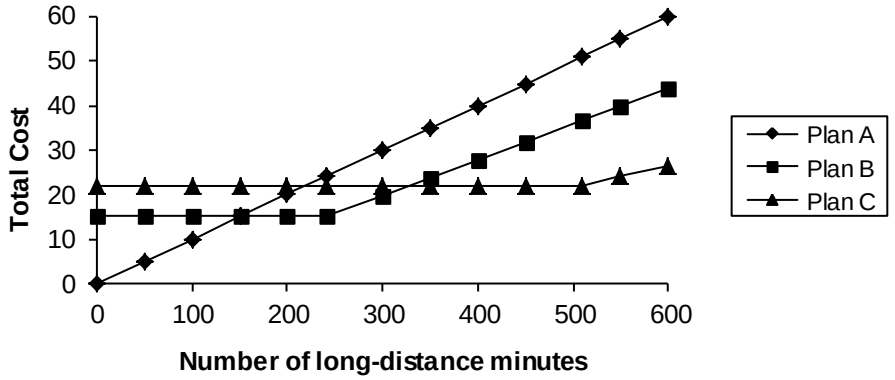
There may be some debate over classifications of individual items, especially with regard to cost variability.

Cost Item	D or I	V or F
A	D	V
B	I	F
C	D	F
D	D	F
E	D	V
F	I	V
G	D	V
H	I	F

2-21 (20 min.) **Variable costs, fixed costs, total costs.**

1.

Minutes/month	**0**	**50**	**100**	**150**	**200**	**240**	**300**	**327.5**	**350**	**400**	**450**	**510**	**540**	**600**	**650**
Plan A ($/month)	0	5	10	15	20	24	30	32.75	35	40	45	51	54	60	65
Plan B ($/month)	15	15	15	15	15	15	19.80	22	23.80	27.80	31.80	36.60	39	43.80	47.80
Plan C ($/month)	22	22	22	22	22	22	22	22	22	22	22	22	23.50	26.50	29



2. In each region, Ashton chooses the plan that has the lowest cost. From the graph (or from calculations)*, we can see that if Ashton expects to use 0–150 minutes of long-distance each month, she should buy Plan A; for 150–327.5 minutes, Plan B; and for over 327.5 minutes, Plan C. If Ashton plans to make 100 minutes of long-distance calls each month, she should choose Plan A; for 240 minutes, choose Plan B; for 540 minutes, choose Plan C.

*Let x be the number of minutes when Plan A and Plan B have equal cost

$\$0.10x = \$15$

$x = \$15 \div \$0.10$ per minute = 150 minutes.

Let y be the number of minutes when Plan B and Plan C have equal cost

$\$15 + \$0.08\,(y - 240) = \$22$

$\$0.08\,(y - 240) = \$22 - \$15 = \$7$

$$y - 240 = \frac{\$7}{\$0.08} = 87.5$$

$y = 87.5 + 240 = 327.5$ minutes

2-22 (15–20 min.) **Variable costs and fixed costs.**

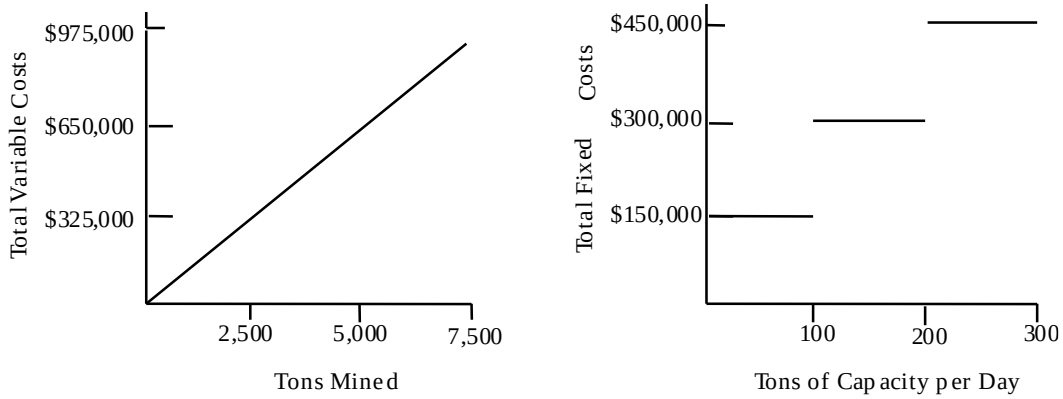
1. Variable cost per ton of beach sand mined

Subcontractor	$ 80 per ton
Government tax	50 per ton
Total	$130 per ton

Fixed costs per month

0 to 100 tons of capacity per day	=	$150,000
101 to 200 tons of capacity per day	=	$300,000
201 to 300 tons of capacity per day	=	$450,000

2.



The concept of relevant range is potentially relevant for both graphs. However, the question does not place restrictions on the unit variable costs. The relevant range for the total fixed costs is from 0 to 100 tons; 101 to 200 tons; 201 to 300 tons, and so on. Within these ranges, the total fixed costs do not change in total.

3.

	Tons Mined per Day (1)	Tons Mined per Month (2) = (1) × 25	Fixed Unit Cost per Ton (3) = FC ÷ (2)	Variable Unit Cost per Ton (4)	Total Unit Cost per Ton (5) = (3) + (4)
(a)	180	4,500	$300,000 ÷ 4,500 = $66.67	$130	$196.67
(b)	220	5,500	$450,000 ÷ 5,500 = $81.82	$130	$211.82

The unit cost for 220 tons mined per day is $211.82, while for 180 tons it is only $196.67. This difference is caused by the fixed cost increment from 101 to 200 tons being spread over an increment of 80 tons, while the fixed cost increment from 201 to 300 tons is spread over an increment of only 20 tons.

2-23 (20 min.) **Variable costs, fixed costs, relevant range.**

1. The production capacity is 4,100 jaw breakers per month. Therefore, the current annual relevant range of output is 0 to 4,100 jaw breakers × 12 months = 0 to 49,200 jaw breakers.

2. Current annual fixed manufacturing costs within the relevant range are $1,200 × 12 = $14,400 for rent and other overhead costs, plus $9,000 ÷ 10 = $900 for depreciation, totaling $15,300.

The variable costs, the materials, are 30 cents per jaw breaker, or $13,680 ($0.30 per jaw breaker × 3,800 jaw breakers per month × 12 months) for the year.

3. If demand changes from 3,800 to 7,600 jaw breakers per month, or from 3,800 × 12 = 45,600 to 7,600 × 12 = 91,200 jaw breakers per year, Sweetum will need a second machine. Assuming Sweetum buys a second machine identical to the first machine, it will increase capacity from 4,100 jaw breakers per month to 8,200. The annual relevant range will be between 4,100 × 12 = 49,200 and 8,200 × 12 = 98,400 jaw breakers.

Assume the second machine costs $9,000 and is depreciated using straight-line depreciation over 10 years and zero residual value, just like the first machine. This will add $900 of depreciation per year.

Fixed costs for next year will increase to $16,200 from $15,300 for the current year + $900 (because rent and other fixed overhead costs will remain the same at $14,400). That is, total fixed costs for next year equal $900 (depreciation on first machine) + $900 (depreciation on second machine) + $14,400 (rent and other fixed overhead costs).

The variable cost per jaw breaker next year will be 90% × $0.30 = $0.27. Total variable costs equal $0.27 per jaw breaker × 91,200 jaw breakers = $24,624.

If Sweetum decides to not increase capacity and meet only that amount of demand for which it has available capacity (4,100 jaw breakers per month or 4,100 × 12 = 49,200 jaw breakers per year), the variable cost per unit will be the same at $0.30 per jaw breaker. Annual total variable manufacturing costs will increase to $0.30 × 4,100 jaw breakers per month × 12 months = $14,760. Annual total fixed manufacturing costs will remain the same, $15,300.

2-24 (20 min.) **Cost drivers and value chain.**

1. Identify customer needs (what do smartphone users want?) — Design of products and processes
   Perform market research on competing brands — Design of products and processes
   Design a prototype of the HCP smartphone — Design of products and processes
   Market the new design to cell phone companies — Marketing
   Manufacture the HCP smartphone — Production
   Process orders from cell phone companies — Distribution
   Package the HCP smartphones — Production
   Deliver the HCP smartphones to the cell phone companies — Distribution
   Provide online assistance to cell phone users for use of the HCP smartphone — Customer Service
   Make design changes to the HCP smartphone based on customer feedback — Design of products and processes
2.

Value Chain Category	Activity	Cost driver
Design of products and processes	Identify customer needs	Number of surveys returned and processed from competing smartphone users
	Perform market research on competing brands	Hours spent researching competing market brands
		Number of surveys returned and processed from competing smartphone users
	Design a prototype of the HCP smartphone	Engineering hours spent on initial product design
	Make design changes to the smartphone based on customer feedback	Number of design changes
Production	Manufacture the HCP smartphones	Machine hours required to run the production equipment
	Package the HCP smartphones	Number of smartphones shipped by HCP
Marketing	Market the new design to cell phone companies	Number of cell phone companies purchasing the HCP smartphone
Distribution	Process orders from cell phone companies	Number of smartphone orders processed
		Number of deliveries made to cell phone companies
	Deliver the HCP smartphones to cell phone companies	Number of deliveries made to cell phone companies
Customer Service	Provide on-line assistance to cell phone users for use of the HCP smartphone	Number of smartphones shipped by HCP
		Customer Service hours

2-25 (10–15 min.) **Cost drivers and functions.**

1.

Function	Representative Cost Driver
1. Accounting	Number of transactions processed
2. Human Resources	Number of employees
3. Data processing	Hours of computer processing unit (CPU)
4. Research and development	Number of research scientists
5. Purchasing	Number of purchase orders
6. Distribution	Number of deliveries made
7. Billing	Number of invoices sent

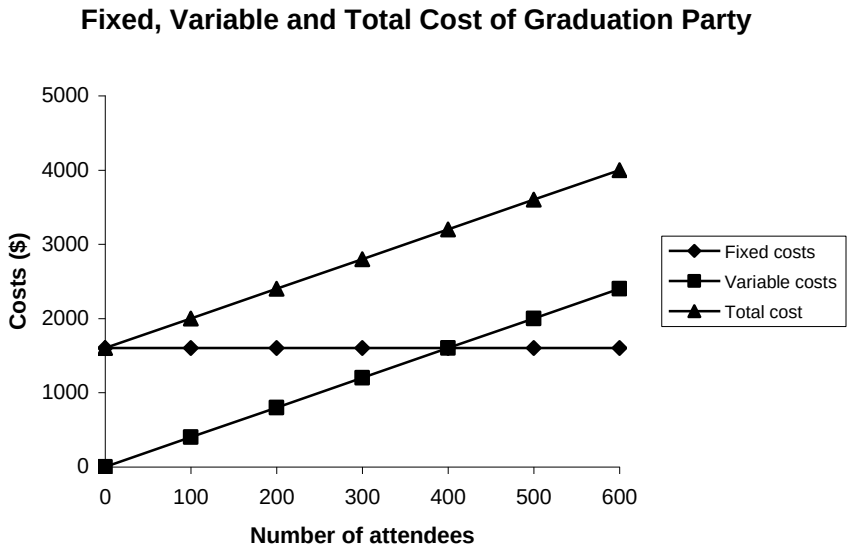
2.

Function	Representative Cost Driver
1. Accounting	Number of journal entries made
2. Human Resources	Salaries and wages of employees
3. Data Processing	Number of computer transactions
4. Research and Development	Number of new products being developed
5. Purchasing	Number of different types of materials purchased
6. Distribution	Distance traveled to make deliveries
7. Billing	Number of credit sales transactions

2-26 (20 min.) **Total costs and unit costs**

1.

Number of attendees	0	100	200	300	400	500	600
Variable cost per person ($9 caterer charge – $5 student door fee)	$4	$4	$4	$4	$4	$4	$4
Fixed Costs	$1,600	$1,600	$1,600	$1,600	$1,600	$1,600	$1,600
Variable costs (number of attendees × variable cost per person)	0	400	800	1,200	1,600	2,000	2,400
Total costs (fixed + variable)	$1,600	$2,000	$2,400	$2,800	$3,200	$3,600	$4,000



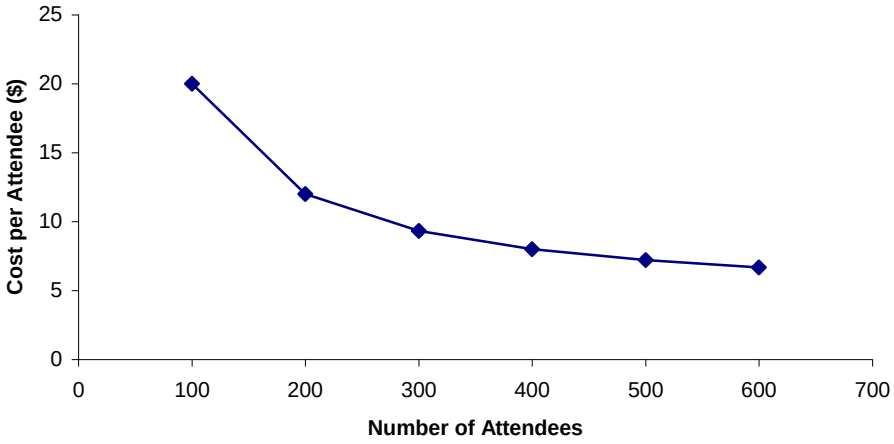
2.

Number of attendees	0	100	200	300	400	500	600
Total costs (fixed + variable)	$1,600	$2,000	$2,400	$2,800	$3,200	$3,600	$4,000
Costs per attendee (total costs ÷ number of attendees)		$20.00	$12.00	$9.33	$ 8.00	$ 7.20	$ 6.67

As shown in the table above, for 100 attendees the total cost will be $2,000 and the cost per attendee will be $20.

3. As shown in the table in requirement 2, for 500 attendees the total cost will be $3,600 and the cost per attendee will be $7.20.

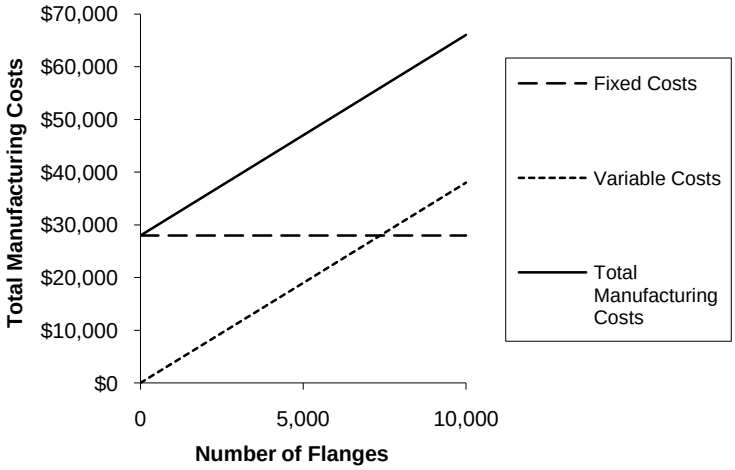
4. Using the calculations shown in the table in requirement 2, we can construct the cost-per-attendee graph shown below:



As president of the student association requesting a grant for the party, you should not use the per unit calculations to make your case. The person making the grant may assume an attendance of 500 students and use a low number like $7.20 per attendee to calculate the size of your grant. Instead, you should emphasize the fixed cost of $1,600 that you will incur even if no students or very few students attend the party, and try to get a grant to cover as much of the fixed costs as possible as well as a variable portion to cover as much of the $4 variable cost to the student association for each person attending the party.

2-27 (25 min.) **Total and unit cost, decision making.**

1.



Note that the production costs include the $28,000 of fixed manufacturing costs but not the $10,000 of period costs. The variable cost is $1 per flange for materials, and $2.80 per flange ($28 per hour divided by 10 flanges per hour) for direct manufacturing labor for a total of $3.80 per flange.

2. The inventoriable (manufacturing) cost per unit for 5,000 flanges is
$3.80 × 5,000 + $28,000 = $47,000
Average (unit) cost = $47,000 ÷ 5,000 units = $9.40 per unit.

This is below Flora's selling price of $10 per flange. However, in order to make a profit, Gayle's Glassworks also needs to cover the period (non-manufacturing) costs of $10,000, or $10,000 ÷ 5,000 = $2 per unit.

Thus total costs, both inventoriable (manufacturing) and period (non-manufacturing), for the flanges is $9.40 + $2 = $11.40. Gayle's Glassworks cannot sell below Flora's price of $10 and still make a profit on the flanges.

Alternatively,
At Flora's price of $10 per flange:

Revenue	$10	×	5,000	=	$50,000
Variable costs	$3.80	×	5,000	=	19,000
Fixed costs					38,000
Operating loss					$ (7,000)

Gayle's Glassworks cannot sell below $10 per flange and make a profit. At Flora's price of $10 per flange, the company has an operating loss of $7,000.

3. If Gayle's Glassworks produces 10,000 units, then total inventoriable cost will be:
Variable cost ($3.80 × 10,000) + fixed manufacturing costs, $28,000 = total manufacturing costs, $66,000.

Average (unit) inventoriable (manufacturing) cost will be $66,000 ÷ 10,000 units = $6.60 per flange

Unit total cost including both inventoriable and period costs will be
($66,000 +$10,000) ÷ 10,000 = $7.60 per flange, and Gayle's Glassworks will be able to sell the flanges for less than Flora and still make a profit.

Alternatively,
At Flora's price of $10 per flange:

Revenue	$10	×	10,000	=	$100,000
Variable costs	$3.80	×	10,000	=	38,000
Fixed costs					38,000
Operating income					$ 24,000

Gayle's Glassworks can sell at a price below $10 per flange and still make a profit. The company earns operating income of $24,000 at a price of $10 per flange. The company will earn operating income as long as the price exceeds $7.60 per flange.

The reason the unit cost decreases significantly is that inventoriable (manufacturing) fixed costs and fixed period (nonmanufacturing) costs remain the same regardless of the number of units produced. So, as Gayle's Glassworks produces more units, fixed costs are spread over more units, and cost per unit decreases. This means that if you use unit costs to make decisions about pricing, and which product to produce, you must be aware that the unit cost only applies to a particular level of output.

2-28 (20–30 min.) **Inventoriable costs versus period costs.**

1. *Manufacturing-sector companies* purchase materials and components and convert them into different finished goods.

Merchandising-sector companies purchase and then sell tangible products without changing their basic form.

Service-sector companies provide services or intangible products to their customers—for example, legal advice or audits.

Only manufacturing and merchandising companies have inventories of goods for sale.

2. *Inventoriable costs* are all costs of a product that are regarded as an asset when they are incurred and then become cost of goods sold when the product is sold. These costs for a manufacturing company are included in work-in-process and finished goods inventory (they are "inventoried") to build up the costs of creating these assets.

Period costs are all costs in the income statement other than cost of goods sold. These costs are treated as expenses of the period in which they are incurred because they are presumed not to benefit future periods (or because there is not sufficient evidence to conclude that such benefit exists). Expensing these costs immediately best matches expenses to revenues.

3. (a) Perrier mineral water purchased for resale by Safeway—inventoriable cost of a merchandising company. It becomes part of cost of goods sold when the mineral water is sold.

(b) Electricity used for lighting at GE refrigerator assembly plant—inventoriable cost of a manufacturing company. It is part of the manufacturing overhead that is included in the manufacturing cost of a refrigerator finished good.

(c) Depreciation on Google's computer equipment used to update directories of web sites—period cost of a service company. Google has no inventory of goods for sale and, hence, no inventoriable cost.

(d) Electricity used to provide lighting for Safeway's store aisles—period cost of a merchandising company. It is a cost that benefits the current period and it is not traceable to goods purchased for resale.

(e) Depreciation on GE's assembly testing equipment—inventoriable cost of a manufacturing company. It is part of the manufacturing overhead that is included in the manufacturing cost of a refrigerator finished good.

(f) Salaries of Safeway's marketing personnel—period cost of a merchandising company. It is a cost that is not traceable to goods purchased for resale. It is presumed not to benefit future periods (or at least not to have sufficiently reliable evidence to estimate such future benefits).

(g) Perrier mineral water consumed by Google's software engineers—period cost of a service company. Google has no inventory of goods for sale and, hence, no inventoriable cost.

(h) Salaries of Google's marketing personnel—period cost of a service company. Google has no inventory of goods for sale and, hence, no inventoriable cost.

2-29 (20 min.) **Computing cost of goods purchased and cost of goods sold.**

1a.

Marvin Department Store
Schedule of Cost of Goods Purchased
For the Year Ended December 31, 2011
(in thousands)

Purchases		$155,000
Add transportation-in		7,000
		162,000
Deduct:		
Purchase returns and allowances	$4,000	
Purchase discounts	6,000	10,000
Cost of goods purchased		$152,000

1b.

Marvin Department Store
Schedule of Cost of Goods Sold
For the Year Ended December 31, 2011
(in thousands)

Beginning merchandise inventory 1/1/2011	$ 27,000
Cost of goods purchased (see above)	152,000
Cost of goods available for sale	179,000
Ending merchandise inventory 12/31/2011	34,000
Cost of goods sold	$145,000

2.

Marvin Department Store
Income Statement
Year Ended December 31, 2011
(in thousands)

Revenues		$280,000
Cost of goods sold (see above)		145,000
Gross margin		135,000
Operating costs		
Marketing, distribution, and customer service costs	$37,000	
Utilities	17,000	
General and administrative costs	43,000	
Miscellaneous costs	4,000	
Total operating costs		101,000
Operating income		$ 34,000

2-30 (20 min.) **Cost of goods purchased, cost of goods sold, and income statement.**

1a.

Montgomery Retail Outlet Stores
Schedule of Cost of Goods Purchased
For the Year Ended December 31, 2011
(in thousands)

Purchases		$260,000
Add freight—in		10,000
		270,000
Deduct:		
Purchase returns and allowances	$11,000	
Purchase discounts	9,000	20,000
Cost of goods purchased		$250,000

1b.

Montgomery Retail Outlet Stores
Schedule of Cost of Goods Sold
For the Year Ended December 31, 2011
(in thousands)

Beginning merchandise inventory 1/1/2011	$ 45,000
Cost of goods purchased (see above)	250,000
Cost of goods available for sale	295,000
Ending merchandise inventory 12/31/2011	52,000
Cost of goods sold	$243,000

2.

Montgomery Retail Outlet Stores
Income Statement
Year Ended December 31, 2011
(in thousands)

Revenues		$320,000
Cost of goods sold (see above)		243,000
Gross margin		77,000
Operating costs		
Marketing and advertising costs	$24,000	
Building depreciation	4,200	
Shipping of merchandise to customers	2,000	
General and administrative costs	32,000	
Total operating costs		62,200
Operating income		$ 14,800

2-31 (20 min.) **Flow of Inventoriable Costs.**

(All numbers below are in millions).

1.

Direct materials inventory 10/1/2011	$ 105
Direct materials purchased	365
Direct materials available for production	470
Direct materials used	(385)
Direct materials inventory 10/31/2011	$ 85

2.

Total manufacturing overhead costs	$ 450
Subtract: Variable manufacturing overhead costs	(265)
Fixed manufacturing overhead costs for October 2011	$ 185

3.

Total manufacturing costs	$ 1,610
Subtract: Direct materials used (from requirement 1)	(385)
Total manufacturing overhead costs	(450)
Direct manufacturing labor costs for October 2011	$ 775

4.

Work-in-process inventory 10/1/2011	$ 230
Total manufacturing costs	1,610
Work-in-process available for production	1,840
Subtract: Cost of goods manufactured (moved into FG)	(1,660)
Work-in-process inventory 10/31/2011	$ 180

5.

Finished goods inventory 10/1/2011	$ 130
Cost of goods manufactured (moved from WIP)	1,660
Cost of finished goods available for sale in October 2011	$ 1,790

6.

Finished goods available for sale in October 2011 (from requirement 5)	$ 1,790
Subtract: Cost of goods sold	(1,770)
Finished goods inventory 10/31/2011	$ 20

2-32 (30–40 min.) **Cost of goods manufactured.**

1.

Canseco Company
Schedule of Cost of Goods Manufactured
Year Ended December 31, 2011
(in thousands)

Direct materials cost		
Beginning inventory, January 1, 2011	$ 22,000	
Purchases of direct materials	75,000	
Cost of direct materials available for use	97,000	
Ending inventory, December 31, 2011	26,000	
Direct materials used		$ 71,000
Direct manufacturing labor costs		25,000
Indirect manufacturing costs		
Indirect manufacturing labor	15,000	
Plant insurance	9,000	
Depreciation—plant building & equipment	11,000	
Repairs and maintenance—plant	4,000	
Total indirect manufacturing costs		39,000
Manufacturing costs incurred during 2011		135,000
Add beginning work-in-process inventory, January 1, 2011		21,000
Total manufacturing costs to account for		156,000
Deduct ending work-in-process inventory, December 31, 2011		20,000
Cost of goods manufactured (to Income Statement)		$136,000

2.

Canseco Company
Income Statement
Year Ended December 31, 2011
(in thousands)

Revenues		$300,000
Cost of goods sold:		
Beginning finished goods, January 1, 2011	$ 18,000	
Cost of goods manufactured	136,000	
Cost of goods available for sale	154,000	
Ending finished goods, December 31, 2011	23,000	
Cost of goods sold		131,000
Gross margin		169,000
Operating costs:		
Marketing, distribution, and customer-service costs	93,000	
General and administrative costs	29,000	
Total operating costs		122,000
Operating income		$ 47,000

2-33 (30–40 min.) **Cost of goods manufactured, income statement, manufacturing company.**

Piedmont Corporation
Schedule of Cost of Goods Manufactured
Year Ended December 31, 2011
(in thousands)

Direct materials costs		
Beginning inventory, January 1, 2011	$ 65,000	
Purchases of direct materials	128,000	
Cost of direct materials available for use	193,000	
Ending inventory, December 31, 2011	34,000	
Direct materials used		$159,000
Direct manufacturing labor costs		106,000
Indirect manufacturing costs		
Indirect manufacturing labor	48,000	
Indirect materials	14,000	
Plant insurance	2,000	
Depreciation—plant building & equipment	21,000	
Plant utilities	12,000	
Repairs and maintenance—plant	8,000	
Equipment lease costs	32,000	
Total indirect manufacturing costs		137,000
Manufacturing costs incurred during 2011		402,000
Add beginning work-in-process inventory, January 1, 2011		83,000
Total manufacturing costs to account for		485,000
Deduct ending work-in-process inventory, December 31, 2011		72,000
Cost of goods manufactured (to Income Statement)		$413,000

Piedmont Corporation
Income Statement
Year Ended December 31, 2011
(in thousands)

Revenues		$600,000
Cost of goods sold:		
Beginning finished goods, January 1, 2011	$123,000	
Cost of goods manufactured	413,000	
Cost of goods available for sale	536,000	
Ending finished goods, December 31, 2011	102,000	
Cost of goods sold		434,000
Gross margin		166,000
Operating costs:		
Marketing, distribution, and customer-service costs	62,000	
General and administrative costs	34,000	
Total operating costs		96,000
Operating income		$ 70,000

2-34 (25–30 min.) **Income statement and schedule of cost of goods manufactured.**

Howell Corporation
Income Statement for the Year Ended December 31, 2011
(in millions)

Revenues		$950
Cost of goods sold		
Beginning finished goods, Jan. 1, 2011	$ 70	
Cost of goods manufactured (below)	645	
Cost of goods available for sale	715	
Ending finished goods, Dec. 31, 2011	55	660
Gross margin		290
Marketing, distribution, and customer-service costs		240
Operating income		$ 50

Howell Corporation
Schedule of Cost of Goods Manufactured
for the Year Ended December 31, 2011
(in millions)

Direct materials costs		
Beginning inventory, Jan. 1, 2011	$ 15	
Purchases of direct materials	325	
Cost of direct materials available for use	340	
Ending inventory, Dec. 31, 2011	20	
Direct materials used		$320
Direct manufacturing labor costs		100
Indirect manufacturing costs		
Indirect manufacturing labor	60	
Plant supplies used	10	
Plant utilities	30	
Depreciation—plant and equipment	80	
Plant supervisory salaries	5	
Miscellaneous plant overhead	35	220
Manufacturing costs incurred during 2011		640
Add beginning work-in-process inventory, Jan. 1, 2011		10
Total manufacturing costs to account for		650
Deduct ending work-in-process, Dec. 31, 2011		5
Cost of goods manufactured		$645

2-35 (15–20 min.) **Interpretation of statements (continuation of 2-32).**

1. The schedule in 2-34 can become a Schedule of Cost of Goods Manufactured and Sold simply by including the beginning and ending finished goods inventory figures in the supporting schedule, rather than directly in the body of the income statement. Note that the term *cost of goods manufactured* refers to the cost of goods brought to completion (finished) during the accounting period, whether they were started before or during the current accounting period. Some of the manufacturing costs incurred are held back as costs of the ending work in process; similarly, the costs of the beginning work in process inventory become a part of the cost of goods manufactured for 2011.

2. The sales manager's salary would be charged as a marketing cost as incurred by both manufacturing and merchandising companies. It is basically an operating cost that appears below the gross margin line on an income statement. In contrast, an assembler's wages would be assigned to the products worked on. Thus, the wages cost would be charged to Work-in-Process and would not be expensed until the product is transferred through Finished Goods Inventory to Cost of Goods Sold as the product is sold.

3. The direct-indirect distinction can be resolved only with respect to a particular cost object. For example, in defense contracting, the cost object may be defined as a contract. Then, a plant supervisor working only on that contract will have his or her salary charged directly and wholly to that single contract.

4. Direct materials used = $320,000,000 ÷ 1,000,000 units = $320 per unit
Depreciation on plant equipment = $80,000,000 ÷ 1,000,000 units = $80 per unit

5. Direct materials unit cost would be unchanged at $320 per unit. Depreciation cost per unit would be $80,000,000 ÷ 1,200,000 = $66.67 per unit. Total direct materials costs would rise by 20% to $384,000,000 ($320 per unit × 1,200,000 units), whereas total depreciation would be unaffected at $80,000,000.

6. Unit costs are averages, and they must be interpreted with caution. The $320 direct materials unit cost is valid for predicting total costs because direct materials is a variable cost; total direct materials costs indeed change as output levels change. However, fixed costs like depreciation must be interpreted quite differently from variable costs. A common error in cost analysis is to regard all unit costs as one—as if all the total costs to which they are related are variable costs. Changes in output levels (the denominator) will affect *total variable costs*, but not *total fixed costs*. Graphs of the two costs may clarify this point; it is safer to think in terms of total costs rather than in terms of unit costs.

2-36 (25–30 min.) **Income statement and schedule of cost of goods manufactured.**

Calendar Corporation
Income Statement
for the Year Ended December 31, 2011
(in millions)

Revenues		$355	
Cost of goods sold			
Beginning finished goods, Jan. 1, 2011	$ 47		
Cost of goods manufactured (below)	228		
Cost of goods available for sale	275		
Ending finished goods, Dec. 31, 2011	11	264	
Gross margin		91	
Marketing, distribution, and customer-service costs		94	
Operating income (loss)			$ (3)

Calendar Corporation
Schedule of Cost of Goods Manufactured
for the Year Ended December 31, 2011
(in millions)

Direct material costs		
Beginning inventory, Jan. 1, 2011	$ 32	
Direct materials purchased	84	
Cost of direct materials available for use	116	
Ending inventory, Dec. 31, 2011	8	
Direct materials used		$108
Direct manufacturing labor costs		42
Indirect manufacturing costs		
Plant supplies used	4	
Property taxes on plant	2	
Plant utilities	9	
Indirect manufacturing labor costs	27	
Depreciation—plant and equipment	6	
Miscellaneous manufacturing overhead costs	15	63
Manufacturing costs incurred during 2011		213
Add beginning work-in-process inventory, Jan. 1, 2011		18
Total manufacturing costs to account for		231
Deduct ending work-in-process inventory, Dec. 31, 2011		3
Cost of goods manufactured (to income statement)		$228

2-37 (15–20 min.)**Terminology, interpretation of statements (continuation of 2-34)**.

1.	Direct materials used	$108 million
	Direct manufacturing labor costs	42 million
	Prime costs	$150 million
	Direct manufacturing labor costs	$ 42 million
	Indirect manufacturing costs	63 million
	Conversion costs	$105 million

2.	Inventoriable costs (in millions) for Year 2011	
	Plant utilities	$ 9
	Indirect manufacturing labor	27
	Depreciation—plant and equipment	6
	Miscellaneous manufacturing overhead	15
	Direct materials used	108
	Direct manufacturing labor	42
	Plant supplies used	4
	Property tax on plant	2
	Total inventoriable costs	$213
	Period costs (in millions) for Year 2011	
	Marketing, distribution, and customer-service costs	$ 94

3. Design costs and R&D costs may be regarded as product costs in case of contracting with a governmental agency. For example, if the Air Force negotiated to contract with Lockheed to build a new type of supersonic fighter plane, design costs and R&D costs may be included in the contract as product costs.

4. Direct materials used = $108,000,000 ÷ 2,000,000 units = $54 per unit
Depreciation on plant and equipment = $6,000,000 ÷ 2,000,000 units = $3 per unit

5. Direct materials unit cost would be unchanged at $108. Depreciation unit cost would be $6,000,000 ÷ 3,000,000 = $2 per unit. Total direct materials costs would rise by 50% to $162,000,000 ($54 per unit × 3,000,000 units). Total depreciation cost of $6,000,000 would remain unchanged.

6. In this case, equipment depreciation is a variable cost in relation to the unit output. The amount of equipment depreciation will change in direct proportion to the number of units produced.

(a) Depreciation will be $2 million (2 million × $1) when 2 million units are produced.
(b) Depreciation will be $3 million (3 million × $1) when 3 million units are produced.

2-38 (20 min.) **Labor cost, overtime and idle time.**

1.(a) Total cost of hours worked at regular rates	
44 hours × $20 per hour	$ 880
43 hours × $20 per hour	860
48 hours × $20 per hour	960
46 hours × $20 per hour	920
	3,620
Minus idle time	
(3.5 hours × $20 per hour)	70
(6.4 hours × $20 per hour)	128
(5.8 hours × $20 per hour)	116
(2 hours × $20 per hour)	40
Total idle time	354
Direct manufacturing labor costs	$3,266
(b) Idle time = 17.7 hours × $20 per hour =	$ 354
(c) Overtime and holiday premium.	
Week 1: Overtime (44 – 40) hours × Premium, $10 per hour	$ 40
Week 2: Overtime (43 – 40) hours × Premium, $10 per hour	30
Week 3: Overtime (48 – 40) hours × Premium, $20 per hour	160
Week 4: Overtime (46 – 40) hours × Premium, $10 per hour	60
Week 4: Holiday 8 hours × 2 days × Premium, $20 per hour	320
Total overtime and holiday premium	$ 610
(d) Total earnings in December	
Direct manufacturing labor costs	$3,266
Idle time	354
Overtime and holiday premium	610
Total earnings	$4,230

2. Idle time caused by regular machine maintenance, slow order periods, or unexpected mechanical problems is an indirect cost of the product because it is not related to a specific product.

Overtime premium caused by the heavy overall volume of work is also an indirect cost because it is not related to a particular job that happened to be worked on during the overtime hours. If, however, the overtime is the result of a demanding "rush job," the overtime premium is a direct cost of that job.

2-39 (30–40 min.) **Missing records, computing inventory costs.**

1. Finished goods inventory, 3/31/2011 = $210,000
2. Work-in-process inventory, 3/31/2011 = $190,000
3. Direct materials inventory, 3/31/2011 = $85,000

This problem is not as easy as it first appears. These answers are obtained by working from the known figures to the unknowns in the schedule below. The basic relationships between categories of costs are:

Manufacturing costs added during the period (given)	$840,000
Conversion costs (given)	$660,000

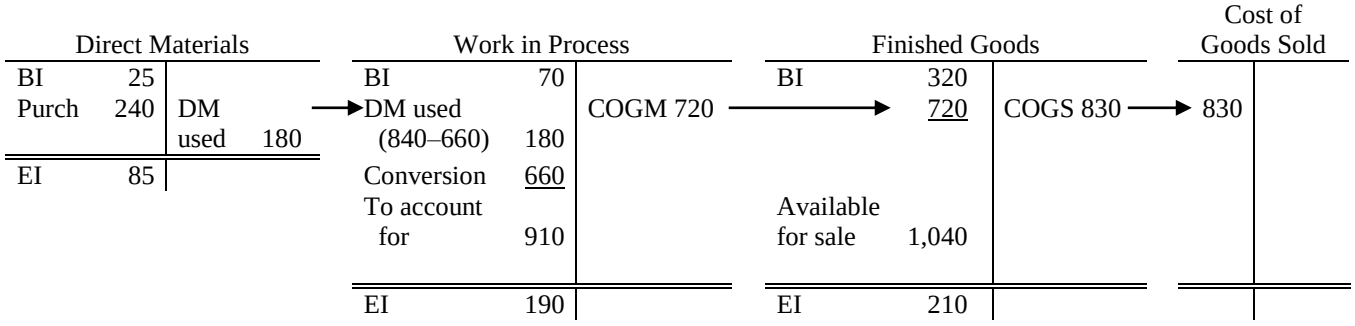
Direct materials used = Manufacturing costs added – Conversion costs
= $840,000 – $660,000 = $180,000

Cost of goods manufactured = Direct Materials Used × 4
= $180,000 × 4 = $720,000

Schedule of Computations

Direct materials, 3/1/2011 (given)		$ 25,000
Direct materials purchased (given)		240,000
Direct materials available for use		265,000
Direct materials, 3/31/2011	3 =	85,000
Direct materials used		180,000
Conversion costs (given)		660,000
Manufacturing costs added during the period (given)		840,000
Add work in process, 3/1/2011 (given)		70,000
Manufacturing costs to account for		910,000
Deduct work in process, 3/31/2011	2 =	190,000
Cost of goods manufactured (4 × $180,000)		720,000
Add finished goods, 3/1/2011		320,000
Cost of goods available for sale		1,040,000
Deduct finished goods, 3/31/2011	1 =	210,000
Cost of goods sold (80% × $1,037,500)		$830,000

Some instructors may wish to place the key amounts in a Work in Process T-account. This problem can be used to introduce students to the flow of costs through the general ledger (amounts in thousands):



2-40 (30 min.) **Comprehensive problem on unit costs, product costs.**

1. If 2 pounds of direct materials are used to make each unit of finished product, 123,000 units × 2 lbs., or 246,000 lbs. were used at $0.60 per pound of direct materials ($147,600 ÷ 246,000 lbs.). (The direct material costs of $147,600 are direct materials used, not purchased.) Therefore, the ending inventory of direct materials is 2,400 lbs. × $0.60 = $1,440.

2.

	Manufacturing Costs for 123,000 units		
	Variable	Fixed	Total
Direct materials costs	$147,600	$ –	$147,600
Direct manufacturing labor costs	38,400	–	38,400
Plant energy costs	2,000	–	2,000
Indirect manufacturing labor costs	14,000	19,000	33,000
Other indirect manufacturing costs	11,000	14,000	25,000
Cost of goods manufactured	$213,000	$33,000	$246,000

Average unit manufacturing cost: $246,000 ÷ 123,000 units
= $2.00 per unit

Finished goods inventory in units: $= \frac{\$26{,}000 \text{ (given)}}{\$2.00 \text{ per unit}}$
= 13,000 units

3. Units sold in 2011 = Beginning inventory + Production – Ending inventory
= 0 + 123,000 –13,000 = 110,000 units
Selling price in 2011 = $594,000 ÷ 110,000
= $5.40 per unit

4.

Denver Office Equipment
Income Statement
Year Ended December 31, 2011
(in thousands)

Revenues (110,000 units sold × $5.40)		$594,000
Cost of units sold:		
Beginning finished goods, Jan. 1, 2011	$ 0	
Cost of goods manufactured	246,000	
Cost of goods available for sale	246,000	
Ending finished goods, Dec. 31, 2011	26,000	220,000
Gross margin		374,000
Operating costs:		
Marketing, distribution, and customer-service costs	176,000	
Administrative costs	56,000	232,000
Operating income		$142,000

Note: Although not required, the full set of unit variable costs is:

Direct materials cost	$1.200	
Direct manufacturing labor cost	0.312	
Plant energy cost	0.016	= $1.731 per unit manufactured
Indirect manufacturing labor cost	0.114	
Other indirect manufacturing cost	0.089	
Marketing, distribution, and customer-service costs	$1.041	per unit sold

2-41 (20-25 min.) **Classification of costs; ethics.**

1. $$\text{Warehousing costs per unit} = \frac{\text{Warehousing costs}}{\text{Units produced}}$$
$$= \frac{\$3,250,000}{200,000 \text{ units}} = \$16.25 \text{ per unit.}$$

If the $3,250,000 is treated as period costs, the entire amount would be expensed during the year as incurred. If it is treated as a product cost, it would be "unitized" at $16.25 per unit and expensed as each unit of the product is sold. Therefore, if only 180,000 of the 200,000 units are sold, only $2,925,000 ($16.25 per unit × 180,000 units) of the $3,250,000 would be expensed in the current period. The remaining $3,250,000 – $2,925,000 = $325,000 would be inventoried on the balance sheet until a later period when the units are sold. The value of finished goods inventory can also be calculated directly to be $325,000 ($16.25 per unit × 20,000 units).

2. No. With respect to classifying costs as product or period costs, this determination is made by Generally Accepted Accounting Principles (GAAP). It is not something that can be justified by the plant manager or plant controller. Even though these costs are in fact related to the product, they are not direct costs of manufacturing the product. GAAP requires that research and development, as well as all costs related to warehousing and distribution of goods be classified as period costs, and be expensed in the period they are incurred.

3. Scott Hewitt would improve his personal bonus and take-home pay by
10% × $325,000 = $32,500

4. The controller should not reclassify costs as product costs just so the plant can reap short-term benefits, including the increase in Hewitt's personal year-end bonus. Research and development costs, costs related to the shipping of finished goods and costs related to warehousing finished goods are all period costs under generally accepted accounting principles, and must be treated as such. Changing this classification on Old World's financial statements would violate generally accepted accounting principles and would likely be considered fraudulent. The idea of costs being classified as product costs versus period costs is to properly reflect on the income statement those costs that are directly related to manufacturing (costs incurred to transform one asset, direct materials into another asset, finished goods) and to properly reflect on the balance sheet those costs that will provide a future benefit (inventory). The controller should not be intimidated by Hewitt. Hewitt stands to personally benefit from the reclassification of costs. The controller should insist that he must adhere to generally accepted accounting principles so as not to submit fraudulent financial statements to corporate headquarters. If Hewitt insists on the reclassification, the controller should raise the issue with the chief financial officer after informing Hewitt that he is doing so. If, after taking all these steps, there is continued pressure to modify the numbers, the controller should consider resigning from the company rather than engage in unethical behavior.

2-42 (20–25 min.) **Finding unknown amounts.**

Let G = given, I = inferred

Step 1: Use gross margin formula	Case 1	Case 2
Revenues	$ 32,000 G	$31,800 G
Cost of goods sold	**A** 20,700 I	20,000 G
Gross margin	$ 11,300 G	**C** $11,800 I
Step 2: Use schedule of cost of goods manufactured formula		
Direct materials used	$ 8,000 G	$ 12,000 G
Direct manufacturing labor costs	3,000 G	5,000 G
Indirect manufacturing costs	7,000 G	**D** 6,500 I
Manufacturing costs incurred	18,000 I	23,500 I
Add beginning work in process, 1/1	0 G	800 G
Total manufacturing costs to account for	18,000 I	24,300 I
Deduct ending work in process, 12/31	0 G	3,000 G
Cost of goods manufactured	$ 18,000 I	$ 21,300 I
Step 3: Use cost of goods sold formula		
Beginning finished goods inventory, 1/1	$ 4,000 G	$ 4,000 G
Cost of goods manufactured	18,000 I	21,300 I
Cost of goods available for sale	22,000 I	25,300 I
Ending finished goods inventory, 12/31	**B** 1,300 I	5,300 G
Cost of goods sold	$ 20,700 I	$ 20,000 G

For case 1, do steps 1, 2, and 3 in order.
For case 2, do steps 1, 3, and then 2.