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 components 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 typically 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 No. Service sector companies have no inventories and, hence, no inventoriable costs.

2-13 *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.

2-14 *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.

2-15 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.

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

1.

	(in millions)			
	Supreme	**Deluxe**	**Regular**	**Total**
Direct material cost	$ 84.00	$ 54.00	$ 62.00	$200.00
Direct manuf. labor costs	14.00	28.00	8.00	50.00
Indirect manuf. costs	42.00	84.00	24.00	150.00
Total manuf. costs	$140.00	$166.00	$ 94.00	$400.00
Fixed costs allocated at a rate of $20M ÷ $50M (direct mfg. labor) equal to $0.40 per dir. manuf. labor dollar (0.40 × $14; 28; 8)	5.60	11.20	3.20	20.00
Variable costs	$134.40	$154.80	$ 90.80	$380.00
Units produced (millions)	80	120	100	
Cost per unit (Total manuf. costs ÷ units produced)	$1.7500	$1.3833	$0.9400	
Variable manuf. cost per unit (Variable manuf. costs ÷ Units produced)	$1.6800	$1.2900	$0.9080	

2.

	(in millions)			
	Supreme	**Deluxe**	**Regular**	**Total**
Based on total manuf. cost per unit ($1.75 × 120; $1.3833 × 160; $0.94 × 180)	$210.00	$221.33	$169.20	$600.53
Correct total manuf. costs based on variable manuf. costs plus fixed costs equal				
Variable costs ($1.68 × 120; $1.29 × 160; $0.908 × 180)	$201.60	$206.40	$163.44	$571.44
Fixed costs				20.00
Total costs				$591.44

The total manufacturing cost per unit in requirement 1 includes $20 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 2008, 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 yield incorrect estimates of total costs of $600.53 million in August 2008 relative to the correct total manufacturing costs of $591.44 million calculated using variable manufacturing cost per unit times units produced plus the fixed costs of $20 million.

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

1. Clay – Direct, variable
Paint- direct, variable
Packaging materials –direct (or could be indirect if small and not traced to each unit), variable
Depreciation on machinery and molds –indirect, fixed (unless "units of output" depreciation, which then would be variable)
Rent on factory – indirect, fixed
Insurance on factory –indirect, fixed
Factory utilities – indirect, probably some variable and some fixed (e.g. electricity may be variable but heating costs may be fixed)
Painters – direct, variable
Painting Department manager –indirect, fixed
Baking Department manager – indirect, fixed
Materials handlers –depends on how they are paid. Most likely indirect fixed if salaried
Custodian –indirect, fixed
Night guard –indirect, fixed
Machinist (running the baking machine) –depends on how they are paid. Most likely indirect fixed, if salaried
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 Baking Department, then anything directly associated with the Baking Department will be a direct cost. This will include:

- depreciation on machinery and molds
- Baking Department manager
- Materials handlers (of the Baking Department)
- Machinist
- Machine Maintenance personnel (of the Baking Department)
- Maintenance supplies (of the Baking Department)

Of course the clay will also be a direct cost of the Baking Department, but it is already a direct cost of each kind of figurine 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

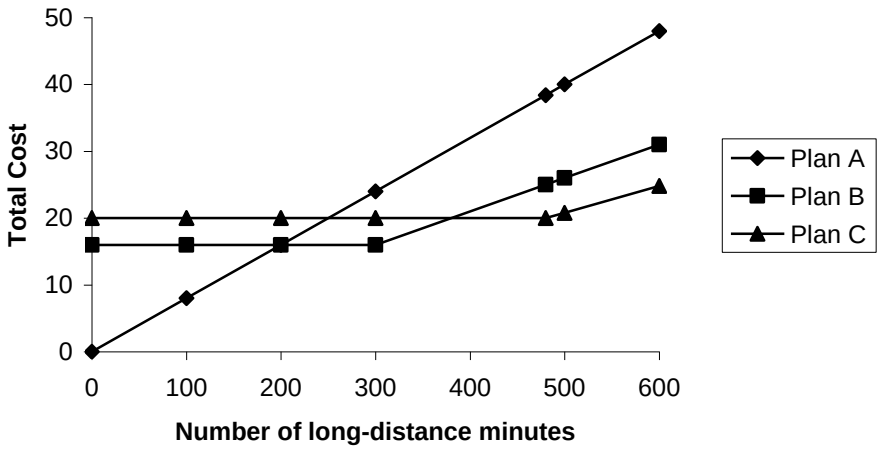
There may be some debate over classifications of individual items, especially with regard to cost variability.

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	250	300	350	400	450	480	500	550	600	650
Plan A ($/month)	0	4	8	12	16	20	24	28	32	36	38.40	40	44	48	52
Plan B ($/month)	16	16	16	16	16	16	16	18.50	21	23.50	25	26	28.50	31	33.50
Plan C ($/month)	20	20	20	20	20	20	20	20	20	20	20	20.80	22.80	24.80	26.80



2. In each region, Compo chooses the plan that has the lowest cost. From the graph (or from calculations), we can see that if Compo expects to use 0–200 minutes of long-distance each month, she should buy Plan A; for 200–380 minutes, Plan B; and for over 380 minutes, Plan C. If Compo plans to make 100 minutes of long-distance calls each month, she should choose Plan A; for 300 minutes, choose Plan B; for 500 minutes, choose Plan C.

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

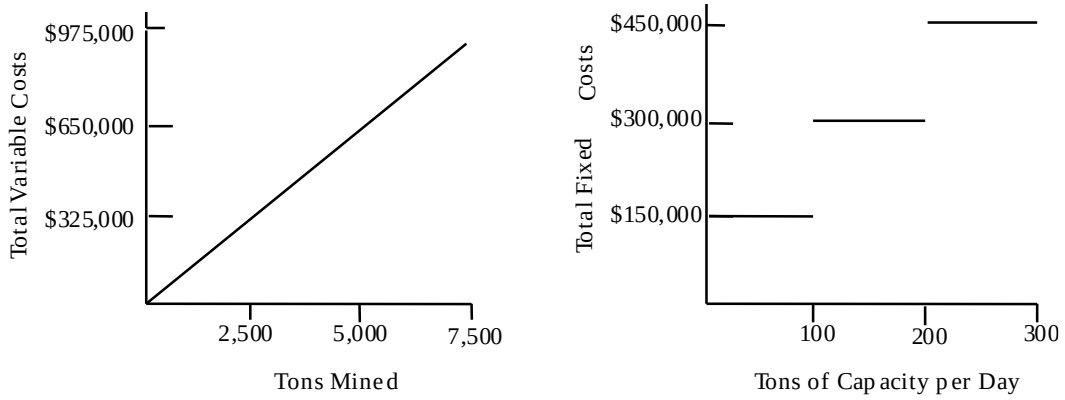
1. Variable cost per ton of beach sand mined

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. Since the production capacity is 4,000 jaw breakers per month, the current annual relevant range of output is 0 to 4,000 jaw breakers × 12 months = 0 to 48,000 jaw breakers.

2. Current annual fixed manufacturing costs within the relevant range are $1,000 × 12 = $12,000 for rent and other overhead costs, plus $6,000 ÷ 10 = $600 for depreciation, totaling $12,600.

The variable costs, the materials, are 10 cents per jaw breaker, or $3,600 ($0.10 per jaw breaker × 3,000 jaw breakers per month × 12 months) for the year.

3. If demand changes from 3,000 to 6,000 jaw breakers per month, or from 3,000 × 12 = 36,000 to 6,000 × 12 = 72,000 jaw breakers per year, Yumball will need a second machine. Assuming Yumball buys a second machine identical to the first machine, it will increase capacity from 4,000 jaw breakers per month to 8,000. The annual relevant range will be between 4,000 × 12 = 48,000 and 8,000 × 12 = 96,000 jaw breakers.

Assume the second machine costs $6,000 and is depreciated using straight-line depreciation over 10 years and zero residual value, just like the first machine. This will add $600 of depreciation per year.

Fixed costs for next year will increase to $13,200, $12,600 from the current year + $600 (because rent and other fixed overhead costs will remain the same at $12,000). That is, total fixed costs for next year equal $600 (depreciation on first machine) + $600 (depreciation on second machine) + $12,000 (rent and other fixed overhead costs).

The variable cost per jaw breaker next year will be 90% × $0.10 = $0.09. Total variable costs equal $0.09 per jaw breaker × 72,000 jaw breakers = $6,480.

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

1. Identify the customer need (what do faculty and students want in a book?) – Product development
   Find an author – Product development
   Market the book to faculty – Marketing
   Author writes book – Product development
   Process orders from bookstores – Distribution
   Editor edits book – Product development
   Receive unsold copies of book from bookstore – Distribution
   Author rewrites book– Product development
   Provide on-line assistance to faculty and students (study guides, test banks, etc.) – Customer service
   Print and bind the books – Production
   Deliver the book to bookstores – Distribution

2.

Value Chain Category	**Activity**	**Cost driver**
Product Development	Identify the customer need	Number of schools the marketing representative visits to discuss book ideas
	Find an author	Number of potential authors interviewed
	Author writes book	Number of pages of text Amount paid to the author (direct labor cost as cost driver)
	Editor edits book	Number of changes editor makes Number of pages of text
	Author rewrites book	Number of times author must do rewrites
Production	Print and bind the books	Machine hours for running the printing and binding equipment
Marketing	Market the book to faculty	Number of schools the marketing representative visits to market the book Hours spent with prospective customers to sell the book
Distribution	Process orders from bookstores	Number of deliveries made to bookstores Number of schools that adopt the new book Number of books ordered by bookstores (Note: Number of purchase orders would be a better driver, but it is not on the list of activities.)
	Deliver the book to bookstores	Number of deliveries made to bookstores
	Receive unsold copies of book from bookstores	Number of unsold books sent back from bookstores
Customer service	Provide on-line assistance to faculty and students	Number of faculty that adopt the new book Number of books ordered by bookstores (probably net of number of unsold books sent back from bookstores)

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

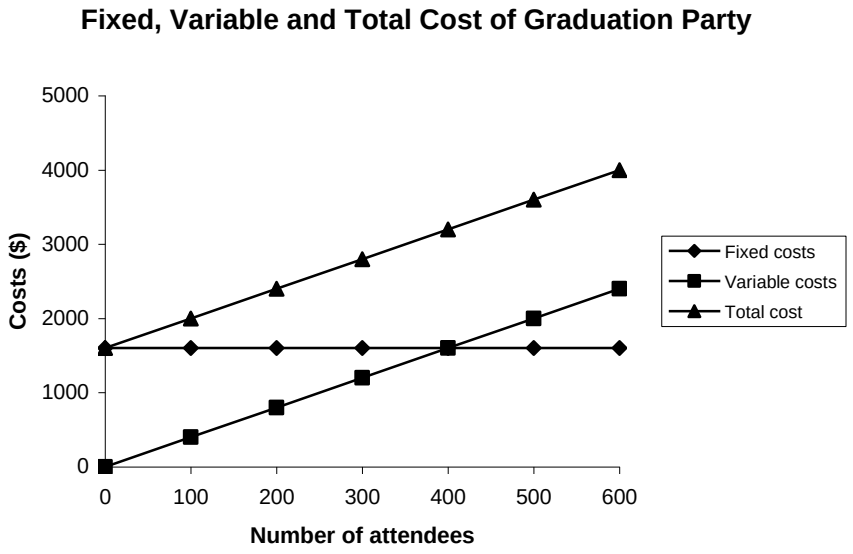
2.

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



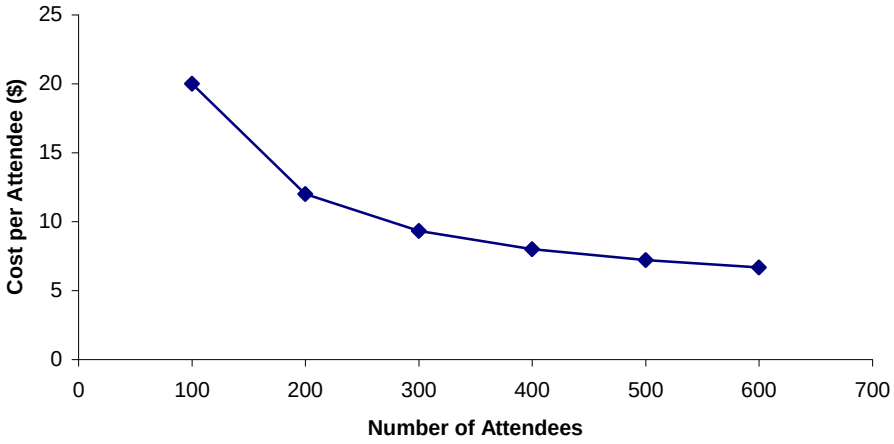
2.

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.

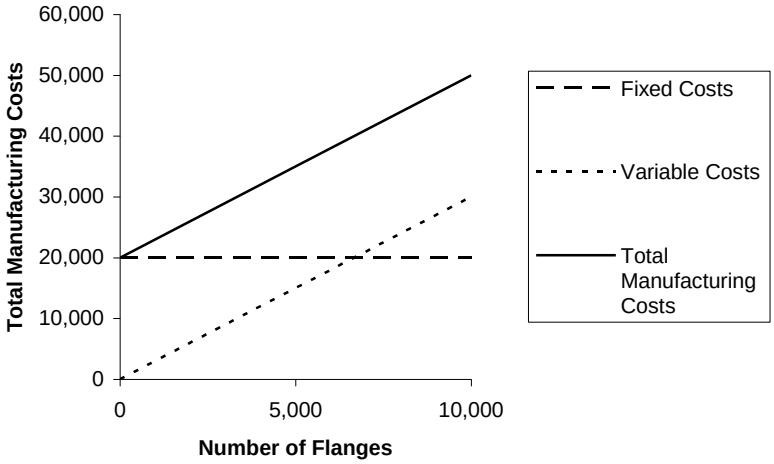
4. Using the calculations shown in the table in requirement 2, we can construct the cost-per-attendee graph shown below:



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 $5 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 $20,000 of fixed manufacturing costs but not the $10,000 of period costs. The variable cost is $1 per flange for materials, and $2 per flange ($20 per hour divided by 10 flanges per hour) for direct manufacturing labor.

2. The inventoriable (manufacturing) cost per unit for 5,000 flanges is
$3 × 5,000 + $20,000 = $35,000.
Average (unit) cost = $35,000 ÷ 5,000 units = $7 per unit.

This is below Fred's selling price of $8.25 per flange. However, in order to make a profit, Graham'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 $7 + $2 = $9. Graham's Glassworks cannot sell below Fred's price of $8.25 and still make a profit on the flanges.

Alternatively,
At Fred's price of $8.25 per flange:

Revenue	$8.25	×	5,000	=	$41,250
Variable costs	$3.00	×	5,000	=	15,000
Fixed costs					30,000
Operating Loss					$ (3,750)

Graham's Glassworks cannot sell below $8.25 per flange and make a profit. At Fred's price of $8.25 per flange, the company has an operating loss of $3,750.

3. If Graham's Glassworks produces 10,000 units, then total inventoriable cost will be:
Variable cost ($3 × $10,000) + fixed manufacturing costs, $20,000 = total manufacturing costs, $50,000.

Average (unit) inventoriable (manufacturing) cost will be $50,000 ÷ 10,000 units = $5 per flange

Unit total cost including both inventoriable and period costs will be
($50,000 +$10,000) ÷ 10,000 = $6 per flange, and Graham's Glassworks will be able to sell the flanges for less than Fred and still make a profit.

Alternatively,
At Fred's price of $8.25 per flange:

Revenue	$8.25	×	10,000	=	$ 82,500
Variable costs	$3.00	×	10,000	=	30,000
Fixed costs					30,000
Operating income					$ 22,500

Graham's Glassworks can sell at a price below $8.25 per flange and still make a profit. The company earns operating income of $22,500 at a price of $8.25 per flange. The company will earn operating income as long as the price exceeds $6.00 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 Graham'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) 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 at GE 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—period cost of a service company. Google has no inventory of goods for sale and, hence, no inventoriable cost.

(d) Electricity 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) Bottled water consumed by Google's 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.) **Flow of Inventoriable Costs.**

(All numbers below are in millions).

1.

Direct materials inventory 8/1/2008	$ 90
Direct materials purchased	360
Direct materials available for production	450
Direct materials used	375
Direct materials inventory 8/31/2008	$ 75

2.

Total manufacturing overhead costs	$ 480
Subtract: Variable manufacturing overhead costs	(250)
Fixed manufacturing overhead costs for August	$ 230

3.

Total manufacturing costs	$ 1,600
Subtract: Direct materials used (from requirement 1)	(375)
Total manufacturing overhead costs	(480)
Direct manufacturing labor costs for August	$ 745

4.

Work-in-process inventory 8/1/2008	$ 200
Total manufacturing costs	1,600
Work-in-process available for production	1,800
Subtract: Cost of goods manufactured (moved into FG)	(1,650)
Work-in-process inventory 8/31/2008	$ 150

5.

Finished goods inventory 8/1/2008	$ 125
Cost of goods manufactured (moved from WIP)	1,650
Finished goods available for sale in August	$ 1,775

6.

Finished goods available for sale in August (from requirement 5)	$ 1,775
Subtract: Cost of goods sold	(1,700)
Finished goods inventory 8/31/2008	$ 75

2-30 (20 min.) **Computing cost of goods purchased and cost of goods sold.**

(1)

Marvin Department Store
Schedule of Cost of Goods Purchased
For the Year Ended December 31, 2008
(in thousands)

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

(2)

Marvin Department Store
Schedule of Cost of Goods Sold
For the Year Ended December 31, 2008
(in thousands)

Beginning merchandise inventory 1/1/2008	$ 27,000
Cost of goods purchased (above)	152,000
Cost of goods available for sale	179,000
Ending merchandise inventory 12/31/2008	34,000
Cost of goods sold	$145,000

2-31 (30–40 min.) **Cost of goods manufactured.**

1.

Canseco Company
Schedule of Cost of Goods Manufactured
Year Ended December 31, 2009
(in thousands)

Direct materials:		
Beginning inventory, January 1, 2009	$ 22,000	
Purchases of direct materials	75,000	
Cost of direct materials available for use	97,000	
Ending inventory, December 31, 2009	26,000	
Direct materials used		$ 71,000
Direct manufacturing labor		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 2009		135,000
Add beginning work-in-process inventory, January 1, 2009		21,000
Total manufacturing costs to account for		156,000
Deduct ending work-in-process inventory, December 31, 2009		20,000
Cost of goods manufactured (to Income Statement)		$136,000

2.

Canseco Company
Income Statement
Year Ended December 31, 2009
(in thousands)

Revenues		$300,000
Cost of goods sold:		
Beginning finished goods, January 1, 2009	$ 18,000	
Cost of goods manufactured	136,000	
Cost of goods available for sale	154,000	
Ending finished goods, December 31, 2009	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

2-32 (25–30 min.) **Income statement and schedule of cost of goods manufactured.**

Howell Corporation
Income Statement for the Year Ended December 31, 2009
(in millions)

Revenues		$950
Cost of goods sold:		
Beginning finished goods, Jan. 1, 2009	$ 70	
Cost of goods manufactured (below)	645	
Cost of goods available for sale	715	
Ending finished goods, Dec. 31, 2009	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, 2009
(in millions)

Direct materials costs:		
Beginning inventory, Jan. 1, 2009	$ 15	
Purchases of direct materials	325	
Cost of direct materials available for use	340	
Ending inventory, Dec. 31, 2009	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 2009		640
Add beginning work-in-process inventory, Jan. 1, 2009		10
Total manufacturing costs to account for		650
Deduct ending work-in-process, Dec. 31, 2009		5
Cost of goods manufactured		$645

2-33 (15–20 min.) **Interpretation of statements (continuation of 2-32).**

1. The schedule in 2-32 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 2009.

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.

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

Chan Corporation
Income Statement
for the Year Ended December 31, 2009
(in millions)

Revenues		$350
Cost of goods sold:		
Beginning finished goods, Jan. 1, 2009	$ 40	
Cost of goods manufactured (below)	204	
Cost of goods available for sale	244	
Ending finished goods, Dec. 31, 2009	12	232
Gross margin		118
Marketing, distribution, and customer-service costs		90
Operating income		$ 28

Chan Corporation
Schedule of Cost of Goods Manufactured
for the Year Ended December 31, 2009
(in millions)

Direct material costs:		
Beginning inventory, Jan. 1, 2009	$ 30	
Direct materials purchased	80	
Cost of direct materials available for use	110	
Ending inventory, Dec. 31, 2009	5	
Direct materials used		$105
Direct manufacturing labor costs		40
Indirect manufacturing costs:		
Plant supplies used	6	
Property taxes on plant	1	
Plant utilities	5	
Indirect manufacturing labor costs	20	
Depreciation—plant and equipment	9	
Miscellaneous manufacturing overhead costs	10	51
Manufacturing costs incurred during 2009		196
Add beginning work-in-process inventory, Jan. 1, 2009		10
Total manufacturing costs to account for		206
Deduct ending work-in-process inventory, Dec. 31, 2009		2
Cost of goods manufactured (to income statement)		$204

2-35 (15–20 min.)**Terminology, interpretation of statements (continuation of 2-34)**.

1.	Direct materials used	$105 million
	Direct manufacturing labor costs	40 million
	Prime costs	$145 million
	Direct manufacturing labor costs	$ 40 million
	Indirect manufacturing costs	51 million
	Conversion costs	$ 91 million

2.	Inventoriable costs (in millions) for Year 2009	
	Plant utilities	$ 5
	Indirect manufacturing labor	20
	Depreciation—plant and equipment	9
	Miscellaneous manufacturing overhead	10
	Direct materials used	105
	Direct manufacturing labor	40
	Plant supplies used	6
	Property tax on plant	1
	Total inventoriable costs	$196
	Period costs (in millions) for Year 2009	
	Marketing, distribution, and customer-service costs	$ 90

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 = $105,000,000 ÷ 1,000,000 units = $105 per unit
Depreciation on plant and equipment = $9,000,000 ÷ 1,000,000 units = $9 per unit

5. Direct materials unit cost would be unchanged at $105. Depreciation unit cost would be $9,000,000 ÷ 1,500,000 = $6 per unit. Total direct materials costs would rise by 50% to $157,500,000 ($105 per unit × 1,500,000 units). Total depreciation cost of $9,000,000 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 $4 million (1 million × $4) when 1 million units are produced.
(b) Depreciation will be $6 million (1.5 million × $4) when 1.5 million units are produced.

2-36 (20 min.) **Labor cost, overtime and idle time.**

1.(a) Total cost of hours worked at regular rates	
42 hours × 12 per hour	$ 504.00
42 hours × 12 per hour	504.00
43 hours × 12 per hour	516.00
40 hours × 12 per hour	480.00
	2,004.00
Minus idle time (5.2 hours × $12 per hour)	62.40
Direct manufacturing labor costs	$1,941.60
(b) Idle time = 5.2 hours × 12 per hour =	$62.40
(c) Overtime and holiday premium.	
Week 1: Overtime (42-40) hours × Premium, $6 per hour	$ 12.00
Week 2: Overtime (42-40) hours ×Premium, $6 per hour	12.00
Week 3: Overtime (43-40) hours × Premium, $6 per hour	18.00
Week 4: Holiday 8 hours × Premium, $12 per hour	96.00
Total overtime and holiday premium	$138.00
(d) Total earnings in May	
Direct manufacturing labor costs	$1,941.60
Idle time	62.40
Overtime and holiday premium	138.00
Total earnings	$2,142.00

2. Idle time caused by equipment breakdowns and scheduling mixups is an indirect cost of the job because it is not related to a specific job.

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.

2-37 (30–40 min.) **Fire loss, computing inventory costs.**

1. Finished goods inventory, 2/26/2009 = $50,000
2. Work-in-process inventory, 2/26/2009 = $28,000
3. Direct materials inventory, 2/26/2009 = $62,000

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:

Prime costs (given)	=	$294,000
Direct materials used	=	$294,000 – Direct manufacturing labor costs
	=	$294,000 – $180,000 = $114,000
Conversion costs	=	Direct manufacturing labor costs ÷ 0.6
		$180,000 ÷ 0.6 = $300,000
Indirect manuf. costs	=	$300,000 – $180,000 = $120,000 (or 0.40 × $300,000)

Schedule of Computations

Direct materials, 1/1/2009		$ 16,000
Direct materials purchased		160,000
Direct materials available for use		176,000
Direct materials, 2/26/2009	3 =	62,000
Direct materials used ($294,000 – $180,000)		114,000
Direct manufacturing labor costs		180,000
Prime costs		294,000
Indirect manufacturing costs		120,000
Manufacturing costs incurred during the current period		414,000
Add work in process, 1/1/2009		34,000
Manufacturing costs to account for		448,000
Deduct work in process, 2/26/2009	2 =	28,000
Cost of goods manufactured		420,000
Add finished goods, 1/1/2009		30,000
Cost of goods available for sale (given)		450,000
Deduct finished goods, 2/26/2009	1 =	50,000
Cost of goods sold (80% of $500,000)		$400,000

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):

Work in Process			Finished Goods			Cost of Goods Sold	
BI	34		BI	30			
DM used	114	COGM 420 ------->		420	COGS 400 ---->	400	
DL	180						
OH	120		Available				
To account for	448		for sale	450			
EI	28		EI	50			

2-38 (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, 100,000 units × 2 lbs., or 200,000 lbs. were used at $0.70 per pound of direct materials ($140,000 ÷ 200,000 lbs.). (The direct material costs of $140,000 are direct materials used, not purchased.) Therefore, the ending inventory of direct materials is 2,000 lbs. × $0.70 = $1,400.

2.

	Manufacturing Costs for 100,000 units		
	Variable	**Fixed**	**Total**
Direct materials costs	$140,000	$ –	$140,000
Direct manufacturing labor costs	30,000	–	30,000
Plant energy costs	5,000	–	5,000
Indirect manufacturing labor costs	10,000	16,000	26,000
Other indirect manufacturing costs	8,000	24,000	32,000
Cost of goods manufactured	$193,000	$40,000	$233,000

Average unit manufacturing cost: $233,000 ÷ 100,000 units
= $2.33 per unit

Finished goods inventory in units: $= \frac{\$20{,}970 \text{ (given)}}{\$2.33 \text{ per unit}}$
= 9,000 units

3. Units sold in 2009 = Beginning inventory + Production – Ending inventory
= 0 + 100,000 – 9,000 = 91,000 units
Selling price in 2009 = $436,800 ÷ 91,000
= $4.80 per unit

4.

Revenues (91,000 units sold × $4.80)		$436,800
Cost of units sold:		
Beginning finished goods, Jan. 1, 2009	$ 0	
Cost of goods manufactured	233,000	
Cost of goods available for sale	233,000	
Ending finished goods, Dec. 31, 2009	20,970	212,030
Gross margin		224,770
Operating costs:		
Marketing, distribution, and customer-service costs	162,850	
Administrative costs	50,000	212,850
Operating income		$ 11,920

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

Direct materials cost	$1.40	= $1.93 per unit manufactured
Direct manufacturing labor cost	0.30	
Plant energy cost	0.05	
Indirect manufacturing labor cost	0.10	
Other indirect manufacturing cost	0.08	

Marketing, distribution, and customer-service costs $1.35 per unit sold

2-39 (20-25 min.) **Labor cost classification; ethics.**

1. No. The direct manufacturing labor costs are not 20% or greater of total manufacturing costs. Direct manufacturing labor costs are $410,000 which are 16.4% of total manufacturing costs, $410,000 ÷ $2,500,000 = 16.4%

2. Bob Zixson can ask the controller to reclassify at least two of the costs that are currently reported as indirect manufacturing costs to direct manufacturing labor costs. The most logical are the fringe benefits and some of the overtime costs, particularly if it can be argued that some of the overtime was directly caused by jobs. The fringe benefits are logical because they are not only the largest, but can be argued to be a part of normal cost of manufacturing labor. Fringe benefits related to direct manufacturing labor costs together with some of the overtime premium could bring the total direct manufacturing labor cost over the minimum $500,000.

   Justification for reclassifying vacation and sick time is similar to that of fringe benefits—that it is a normal cost of labor since it is part of and can be traced to the direct manufacturing laborer's payment. It is harder to justify reclassifying idle time, since it is difficult to identify a specific job that the idle time relates to. Idle time is also the smallest cost item.

3. The controller should not reclassify overhead costs as direct manufacturing labor costs just so the firm can reap tax benefits particularly if the changes would violate the company's policy of computing direct manufacturing labor costs. The idea of cost classification is to allow internal (and external) decision making by clarifying what each cost item represents. Also, if costs in only the Costa Melon plant are reclassified, it will be harder for Zix to evaluate the Costa Melon plant, when compared to Zix's other plants. Nevertheless, some of the arguments presented in requirement 2 can be justified and could prompt a reevaluation of Zix's direct manufacturing labor classifications.

2-40 (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.