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 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.

2-3 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.

2-4 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.

2-5 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.

2-6 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.

2-7 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.

2-8 *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.

2-9 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.

2-10 The main issue between variable costing and absorption costing is the proper timing of the release of fixed manufacturing costs as costs of the period:

a. at the time of incurrence, or
b. at the time the finished units to which the fixed overhead relates are sold.

Variable costing uses (a) and absorption costing uses (b).

2-11 (15 min.) **Computing and interpreting manufacturing unit costs**.

1.

	(in millions)			
	Supreme	**Deluxe**	**Regular**	**Total**
Direct material cost	$ 88.00	$ 53.00	$64.00	$205.00
Direct manuf. labor costs	11.00	20.00	19.00	50.00
Manufacturing overhead costs	41.00	88.00	61.00	190.00
Total manuf. costs	140.00	161.00	144.00	445.00
Fixed costs allocated at a rate of $25M ÷ $50M (direct mfg. labor) equal to $0.50 per dir. manuf. labor dollar (0.50 × $11; 20; 19)	5.50	10.00	9.50	25.00
Variable manufacturing costs	$134.50	$151.00	$134.50	$420.00
Units produced (millions)	50	100	80	
Cost per unit (Total manuf. costs ÷ units produced)	$2.80	$1.61	$1.80	
Variable manuf. cost per unit (Variable manuf. costs ÷ Units produced)	$2.69	$1.51	$1.68	

		(in millions)			
		Supreme	**Deluxe**	**Regular**	**Total**
2.	Based on total manuf. cost per unit ($2.80 × 90; $1.61 × 140; $1.80 × 160)	$252.00	$225.40	$288.00	$765.40
	Correct total manuf. costs based on variable manuf. costs plus fixed costs equal				
	Variable costs ($2.69 × 90; $1.51 × 140; $1.68 × 160)	$242.10	$211.40	$268.80	$722.30
	Fixed costs				25.00
	Total costs				$747.30

The total manufacturing cost per unit in requirement 1 includes $25 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 2013, 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 $765.40 million in August 2013 relative to the correct total manufacturing costs of $747.30 million calculated using variable manufacturing cost per unit times units produced plus the fixed costs of $25 million.

2-12 (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.

2-13 (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.

2-14 (15–20 min.) **Classification of costs, merchandising sector.**

Cost object: DVDs sold in movie section of BBE store
Cost variability: With respect to changes in the number of DVDs 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

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

Cost object: Type of car assembled (Teana or Murano)
Cost variability: With respect to changes in the number of cars assembled

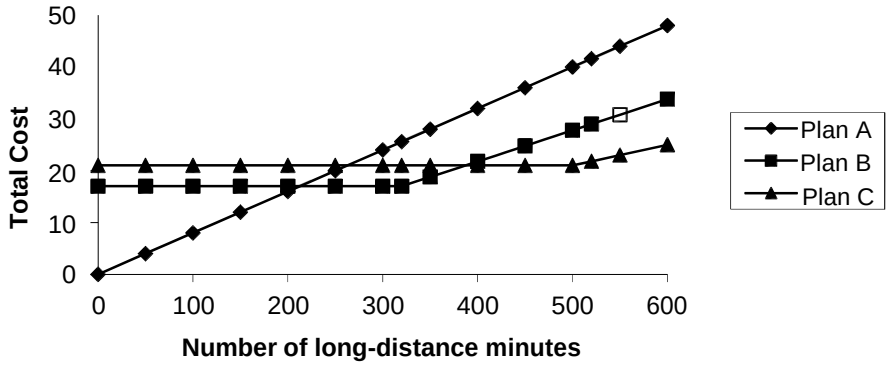
There may be some debate over classifications of individual items, especially with regard to cost variability.

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

2-16 (20 min.) **Variable costs, fixed costs, total costs.**

1.

Minutes/month	**0**	**50**	**100**	**150**	**200**	**250**	**300**	**320**	**350**	**400**	**450**	**500**	**520**	**550**	**600**
Plan A ($/month)	0	4	8	12	16	20	24	25.6	28	32	36	40	41.6	44	48
Plan B ($/month)	17	17	17	17	17	17	17	17	18.8	21.8	24.8	27.8	29	30.8	33.8
Plan C ($/month)	21	21	21	21	21	21	21	21	21	21	21	21	21.8	23	25



2. In each region, Jackson chooses the plan that has the lowest cost. From the graph (or from calculations)*, we can see that if Ashton expects to use 0–212.50 minutes of long-distance each month, she should buy Plan A; for 212.50–386.67 minutes, Plan B; and for over 386.67 minutes, Plan C. If Ashton plans to make 100 minutes of long-distance calls each month, she should choose Plan A; for 320 minutes, choose Plan B; for 520 minutes, choose Plan C.

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

$\$0.08x = \$17$

$x = \$17 \div \$0.08$ per minute = 212.50 minutes.

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

$\$17 + \$0.06\ (y - 320) = \$21$

$\$0.06\ (y - 320) = \$21 - \$17 = \$4$

$$y - 320 = \frac{\$4}{\$0.06} = 66.67$$

$y = 66.67 + 320 = 386.67$ minutes

2-17 (15–20 min.) **Variable costs and fixed costs.**

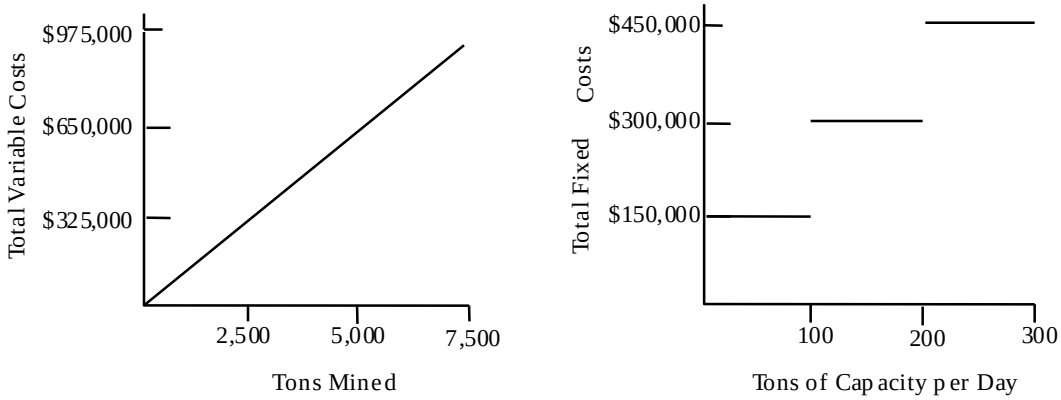
1. Variable cost per ton of beach sand mined

Subcontractor	$ 90 per ton
Government tax	30 per ton
Total	$120 per ton

Fixed costs per month

0 to 100 tons of capacity per day	=	$140,000
101 to 200 tons of capacity per day	=	$280,000
201 to 300 tons of capacity per day	=	$420,000

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	Tons Mined per Month	Fixed Unit Cost per Ton	Variable Unit Cost per Ton	Total Unit Cost per Ton
	(1)	(2) = (1) × 25	(3) = FC ÷ (2)	(4)	(5) = (3) + (4)
(a)	180	4,500	$280,000 ÷ 4,500 = $62.22	$120	$182.22
(b)	210	5,250	$420,000 ÷ 5,250 = $80.00	$120	$200.00

The unit cost for 210 tons mined per day is $200.00, while for 180 tons it is only $182.22. 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 10 tons.

2-18 (20 min.) **Variable costs, fixed costs, relevant range.**

1. The production capacity is 4,500 jaw-breakers per month. Therefore, the current annual relevant range of output is 0 to 4,500 jaw-breakers × 12 months = 0 to 54,000 jaw-breakers.

2. Current annual fixed manufacturing costs within the relevant range are $700 × 12 = $8,400 for rent and other overhead costs, plus $8,000 ÷ 10 = $800 for depreciation, totaling $9,200.

The variable costs, the materials, are 40 cents per jaw-breaker, or $14,880 ($0.40 per jaw-breaker × 3,100 jaw-breakers per month × 12 months) for the year.

3. If demand changes from 3,100 to 6,200 jaw-breakers per month, or from 3,100 × 12 = 37,200 to 6,200 × 12 = 74,400 jaw-breakers per year, Gumball will need a second machine. Assuming Gumball buys a second machine identical to the first machine, it will increase capacity from 4,500 jaw-breakers per month to 9,000. The annual relevant range will be between 4,500 × 12 = 54,000 and 9,000 × 12 = 108,000 jaw-breakers.

Assume the second machine costs $8,000 and is depreciated using straight-line depreciation over 10 years and zero residual value, just like the first machine. This will add $800 of depreciation per year.

Fixed costs for next year will increase to $10,000 from $9,200 for the current year. Note that rent and other fixed overhead costs will remain the same at $8,400. So, total fixed costs for next year equal $800 (depreciation on first machine) + $800 (depreciation on second machine) + $8,400 (rent and other fixed overhead costs).

The variable cost per jaw-breaker next year will be 90% × $0.40 = $0.36. Total variable costs equal $0.36 per jaw-breaker × 74,400 jaw-breakers = $26,784.

If Gumball decides to not increase capacity and meet only that amount of demand for which it has available capacity (4,500 jaw-breakers per month or 4,500 × 12 = 54,000 jaw-breakers per year), the variable cost per unit will be the same at $0.40 per jaw-breaker. Annual total variable manufacturing costs will increase to $0.40 × 4,500 jaw-breakers per month × 12 months = $21,600. Annual total fixed manufacturing costs will remain the same, $9,200.

2-19 (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 RMC smartphone — Design of products and processes
   Market the new design to cell phone companies — Marketing
   Manufacture the RMC smartphone — Production
   Process orders from cell phone companies — Distribution
   Package the RMC smartphones — Production
   Deliver the RMC smartphones to the cell phone companies — Distribution
   Provide online assistance to cell phone users for use of the RMC smartphone — Customer Service
   Make design changes to the RMC 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 RMC 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 RMC smartphones	Machine hours required to run the production equipment
	Package the RMC smartphones	Number of smartphones shipped by RMC
Marketing	Market the new design to cell phone companies	Number of cell phone companies purchasing the RMC smartphone
Distribution	Process orders from cell phone companies	Number of smartphone orders processed Number of deliveries made to cell phone companies
	Deliver the RMC 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 RMC smartphone	Number of smartphones shipped by RMC Customer Service hours

2-20 (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

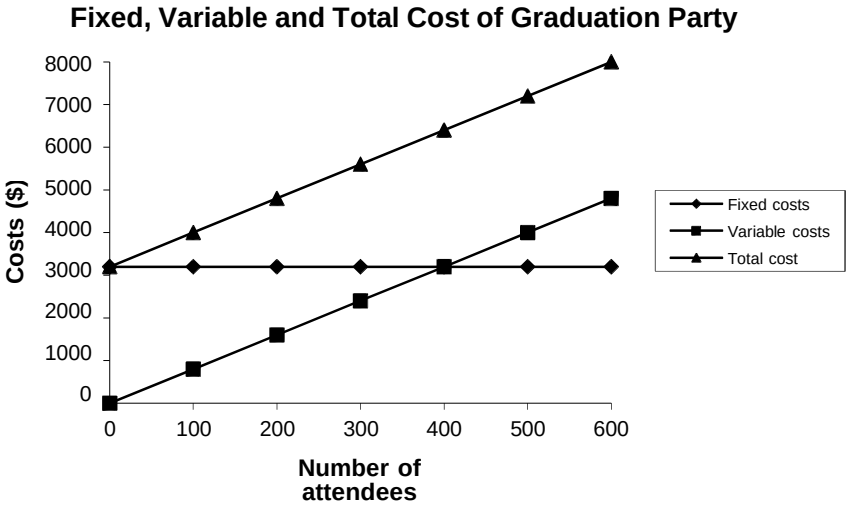
2.

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

2-21 (20 min.) **Total costs and unit costs**

1.

Number of attendees	0	100	200	300	400	500	600
Variable cost per person ($18 caterer charge – $10 student door fee)	$8	$8	$8	$8	$8	$8	$8
Fixed Costs	$3,200	$3,200	$3,200	$3,200	$3,200	$3,200	$3,200
Variable costs (number of attendees × variable cost per person)	0	800	1,600	2,400	3,200	4,000	4,800
Total costs (fixed + variable)	$3,200	$4,000	$4,800	$5,600	$6,400	$7,200	$8,000



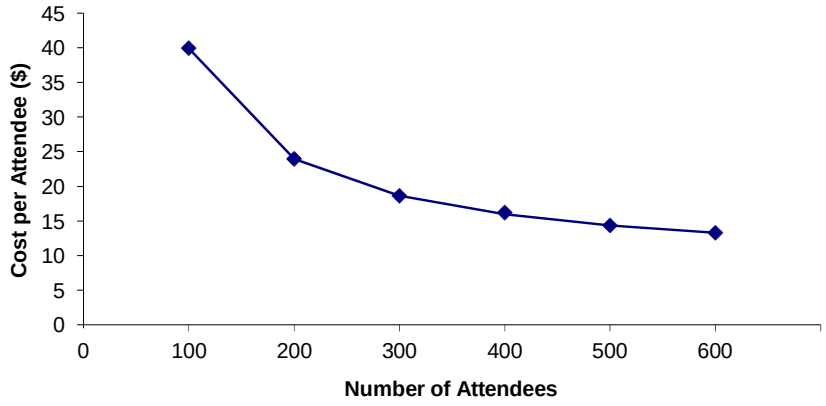
2.

Number of attendees	0	100	200	300	400	500	600
Total costs (fixed + variable)	$3,200	$4,000	$4,800	$5,600	$6,400	$7,200	$8,000
Costs per attendee (total costs ÷ number of attendees)		$40.00	$24.00	$18.67	$ 16.00	$ 14.40	$ 13.33

As shown in the table above, for 100 attendees the total cost will be $4,000 and the cost per attendee will be $40.

3. As shown in the table in requirement 2, for 500 attendees the total cost will be $7,200 and the cost per attendee will be $14.40.

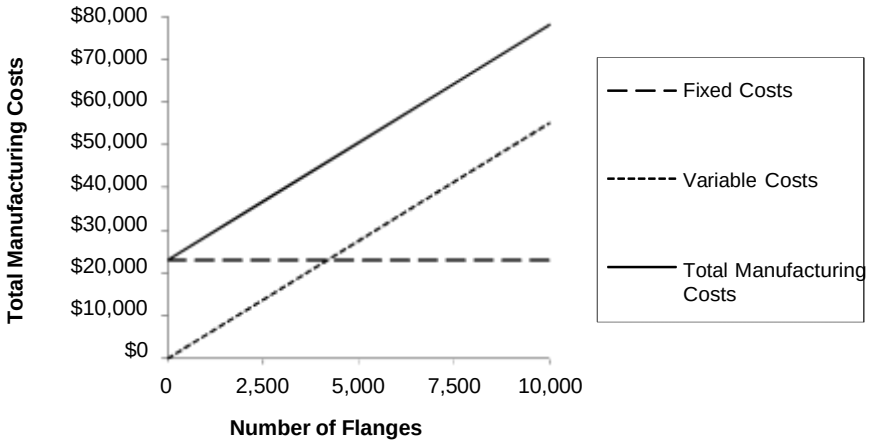
4. Using the calculations shown in the table in requirement 2, we can construct the cost-per-attendee graph shown below:



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 $14.40 per attendee to calculate the size of your grant. Instead, you should emphasize the fixed cost of $3,200 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 $8 variable cost to the student association for each person attending the party.

2-22 (25 min.) **Total and unit cost, decision making.**

1.



Note that the production costs include the $23,000 of fixed manufacturing costs but not the $17,000 of period costs. The variable cost is $3 per flange for materials, and $2.50 per flange ($25 per hour divided by 10 flanges per hour) for direct manufacturing labor for a total of $5.50 per flange.

2. The inventoriable (manufacturing) cost per unit for 4,000 flanges is
$5.50 × 4,000 + $23,000 = $45,000
Average manufacturing (unit) cost = $45,000 ÷ 4,000 units = $11.25 per unit.

In order to make a profit, Geoffrey's Glassworks also needs to cover the period (non-manufacturing) costs of $17,000, or $17,000 ÷ 4,000 = $4.25 per unit.
Thus total costs, both inventoriable (manufacturing) and period (non-manufacturing), for the flanges is $11.25 + $4.25 = $15.50. Geoffrey's Glassworks cannot sell below Flora's price of $10.50 and still make a profit on the flanges.

Alternatively,
At Flora's price of $10.50 per flange:

Revenue	$10.50	×	4,000	=	$42,000
Variable costs	$ 5.50	×	4,000	=	22,000
Fixed costs					40,000
Operating loss					$(20,000)

Geoffrey's Glassworks cannot sell below $10.50 per flange and make a profit. At Flora's price of $10.50 per flange, the company has an operating loss of $20,000.

3. If Geoffrey's Glassworks produces 10,000 units, then total inventoriable cost will be:
Variable cost ($5.50 × 10,000) + fixed manufacturing costs, $23,000 = total manufacturing costs, $78,000.

Average (unit) inventoriable (manufacturing) cost will be $78,000 ÷ 10,000 units = $7.80 per flange

Unit total cost including both inventoriable and period costs will be
($78,000 +$17,000) ÷ 10,000 = $9.50 per flange, and Geoffrey's Glassworks will be able to sell the flanges for less than Flora and still make a profit.

Alternatively,
At Flora's price of $10.50 per flange:

Revenue	$10.50	×	10,000	=	$105,000
Variable costs	$ 5.50	×	10,000	=	55,000
Fixed costs					40,000
Operating income					$ 10,000

Geoffrey's Glassworks can sell at a price below $10.50 per flange and still make a profit. The company earns operating income of $10,000 at a price of $10.50 per flange. The company will earn operating income as long as the price exceeds $9.50 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 Geoffrey'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.

2-23 (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) Evian mineral water purchased for resale by Whole Foods—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 Whirlpool 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 Whole Foods' 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 Whirlpool'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 Whole Foods' 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.

2-24 (20 min.) **Computing cost of goods purchased and cost of goods sold.**

1a.

Maurice Department Store
Schedule of Cost of Goods Purchased
For the Year Ended December 31, 2013
(in thousands)

Purchases		$156,000
Add transportation-in		8,000
		164,000
Deduct:		
Purchase returns and allowances	$5,000	
Purchase discounts	9,000	14,000
Cost of goods purchased		$150,000

1b.

Maurice Department Store
Schedule of Cost of Goods Sold
For the Year Ended December 31, 2013
(in thousands)

Beginning merchandise inventory 1/1/2013	$ 25,000
Cost of goods purchased (see above)	150,000
Cost of goods available for sale	175,000
Ending merchandise inventory 12/31/2013	38,000
Cost of goods sold	$137,000

2.

Maurice Department Store
Income Statement
Year Ended December 31, 2013
(in thousands)

Revenues		$295,000
Cost of goods sold (see above)		137,000
Gross margin		158,000
Operating costs		
Marketing, distribution, and customer service costs	$30,000	
Utilities	10,000	
General and administrative costs	42,000	
Miscellaneous costs	6,000	
Total operating costs		88,000
Operating income		$ 70,000

2-25 (20 min.) **Cost of goods purchased, cost of goods sold, and income statement.**

1a.

Carolina Retail Outlet Stores
Schedule of Cost of Goods Purchased
For the Year Ended December 31, 2013
(in thousands)

Purchases		$195,000
Add freight—in		7,500
		202,500
Deduct:		
Purchase returns and allowances	$8,250	
Purchase discounts	6,750	15,000
Cost of goods purchased		$187,500

1b.

Carolina Retail Outlet Stores
Schedule of Cost of Goods Sold
For the Year Ended December 31, 2013
(in thousands)

Beginning merchandise inventory 1/1/2013	$ 33,750
Cost of goods purchased (see above)	187,500
Cost of goods available for sale	221,250
Ending merchandise inventory 12/31/2013	39,000
Cost of goods sold	$182,250

2.

Carolina Retail Outlet Stores
Income Statement
Year Ended December 31, 2013
(in thousands)

Revenues		$240,000
Cost of goods sold (see above)		182,250
Gross margin		57,750
Operating costs		
Marketing and advertising costs	$14,000	
Building depreciation	3,150	
Shipping of merchandise to customers	1,500	
General and administrative costs	24,000	
Total operating costs		42,650
Operating income		$ 15,100

2-26 (20 min.) **Flow of Inventoriable Costs.**

(All numbers below are in millions).

1.

Direct materials inventory 10/1/2013	$ 75
Direct materials purchased	335
Direct materials available for production	410
Direct materials used	(380)
Direct materials inventory 10/31/2013	$ 30

2.

Total manufacturing overhead costs	$ 495
Subtract: Variable manufacturing overhead costs	(260)
Fixed manufacturing overhead costs for October 2013	$ 235

3.

Total manufacturing costs	$ 1,580
Subtract: Direct materials used (from requirement 1)	(380)
Total manufacturing overhead costs	(495)
Direct manufacturing labor costs for October 2013	$ 705

4.

Work-in-process inventory 10/1/2013	$ 215
Total manufacturing costs	1,580
Work-in-process available for production	1,795
Subtract: Cost of goods manufactured (moved into FG)	(1,650)
Work-in-process inventory 10/31/2013	$ 145

5.

Finished goods inventory 10/1/2013	$ 165
Cost of goods manufactured (moved from WIP)	1,650
Cost of finished goods available for sale in October 2013	$ 1,815

6.

Finished goods available for sale in October 2013 (from requirement 5)	$ 1,815
Subtract: Cost of goods sold	(1,760)
Finished goods inventory 10/31/2013	$ 55

2-27 (30–40 min.) **Cost of goods manufactured, income statement, manufacturing company.**

1.

Rouse Company
Schedule of Cost of Goods Manufactured
Year Ended December 31, 2013
(in thousands)

Direct materials cost		
Beginning inventory, January 1, 2013	$ 27,000	
Purchases of direct materials	73,000	
Cost of direct materials available for use	100,000	
Ending inventory, December 31, 2013	28,000	
Direct materials used		$ 72,000
Direct manufacturing labor costs		24,000
Indirect manufacturing costs		
Indirect manufacturing labor	18,000	
Plant insurance	6,000	
Depreciation—plant building & equipment	17,000	
Repairs and maintenance—plant	2,000	
Total indirect manufacturing costs		43,000
Manufacturing costs incurred during 2013		139,000
Add beginning work-in-process inventory, January 1, 2013		29,000
Total manufacturing costs to account for		168,000
Deduct ending work-in-process inventory, December 31, 2013		22,000
Cost of goods manufactured (to Income Statement)		$146,000

2.

Rouse Company
Income Statement
Year Ended December 31, 2013
(in thousands)

Revenues		$265,000
Cost of goods sold:		
Beginning finished goods, January 1, 2013	$ 16,000	
Cost of goods manufactured	146,000	
Cost of goods available for sale	162,000	
Ending finished goods, December 31, 2013	25,000	
Cost of goods sold		137,000
Gross margin		128,000
Operating costs:		
Marketing, distribution, and customer-service costs	111,000	
General and administrative costs	36,000	
Total operating costs		147,000
Operating income/(loss)		$ (19,000)

2-28 (25–30 min.) **Income statement and schedule of cost of goods manufactured.**

Alderman Corporation
Income Statement for the Year Ended December 31, 2013
(in millions)

Revenues		$925
Cost of goods sold		
Beginning finished goods, Jan. 1, 2013	$ 70	
Cost of goods manufactured (below)	627	
Cost of goods available for sale	697	
Ending finished goods, Dec. 31, 2013	54	643
Gross margin		282
Marketing, distribution, and customer-service costs		235
Operating income		$ 47

Alderman Corporation
Schedule of Cost of Goods Manufactured
for the Year Ended December 31, 2013
(in millions)

Direct materials costs		
Beginning inventory, Jan. 1, 2013	$ 19	
Purchases of direct materials	305	
Cost of direct materials available for use	324	
Ending inventory, Dec. 31, 2013	24	
Direct materials used		$300
Direct manufacturing labor costs		115
Indirect manufacturing costs		
Indirect manufacturing labor	68	
Plant supplies used	10	
Plant utilities	34	
Depreciation—plant and equipment	60	
Plant supervisory salaries	6	
Miscellaneous plant overhead	30	208
Manufacturing costs incurred during 2013		623
Add beginning work-in-process inventory, Jan. 1, 2013		10
Total manufacturing costs to account for		633
Deduct ending work-in-process, Dec. 31, 2013		6
Cost of goods manufactured		$627

2-29 (15–20 min.) **Interpretation of statements (continuation of 2-28).**

1. The schedule in 2-28 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 2013.

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 = $300,000,000 ÷ 1,000,000 units = $300 per unit
Depreciation on plant equipment = $60,000,000 ÷ 1,000,000 units = $60 per unit

5. Direct materials unit cost would be unchanged at $300 per unit. Depreciation cost per unit would be $60,000,000 ÷ 1,200,000 = $50 per unit. Total direct materials costs would rise by 20% to $360,000,000 ($300 per unit × 1,200,000 units), whereas total depreciation would be unchanged at $60,000,000.

6. Unit costs are averages, and they must be interpreted with caution. The $300 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.

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

Chester Corporation
Income Statement
for the Year Ended December 31, 2013
(in millions)

Revenues		$354	
Cost of goods sold			
Beginning finished goods, Jan. 1, 2013	$ 43		
Cost of goods manufactured (below)	227		
Cost of goods available for sale	270		
Ending finished goods, Dec. 31, 2013	19	251	
Gross margin		103	
Marketing, distribution, and customer-service costs		97	
Operating income (loss)			$ 6

Chester Corporation
Schedule of Cost of Goods Manufactured
for the Year Ended December 31, 2013
(in millions)

Direct material costs		
Beginning inventory, Jan. 1, 2013	$ 30	
Direct materials purchased	88	
Cost of direct materials available for use	118	
Ending inventory, Dec. 31, 2013	7	
Direct materials used		$111
Direct manufacturing labor costs		40
Indirect manufacturing costs		
Plant supplies used	9	
Property taxes on plant	3	
Plant utilities	6	
Indirect manufacturing labor costs	26	
Depreciation—plant and equipment	8	
Miscellaneous manufacturing overhead costs	17	69
Manufacturing costs incurred during 2013		220
Add beginning work-in-process inventory, Jan. 1, 2013		12
Total manufacturing costs to account for		232
Deduct ending work-in-process inventory, Dec. 31, 2013		5
Cost of goods manufactured (to income statement)		$227

2-31 (15–20 min.) **Terminology, interpretation of statements (continuation of 2-30)**.

1.	Direct materials used	$111 million
	Direct manufacturing labor costs	40 million
	Prime costs	$151 million
	Direct manufacturing labor costs	$ 40 million
	Indirect manufacturing costs	69 million
	Conversion costs	$109 million

2.	Inventoriable costs (in millions) for Year 2013	
	Plant utilities	$ 6
	Indirect manufacturing labor	26
	Depreciation—plant and equipment	8
	Miscellaneous manufacturing overhead	17
	Direct materials used	111
	Direct manufacturing labor	40
	Plant supplies used	9
	Property tax on plant	3
	Total inventoriable costs	$220
	Period costs (in millions) for Year 2013	
	Marketing, distribution, and customer-service costs	$ 97

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 Martin to build a new type of fighter aircraft, design costs and R&D costs may be included in the contract as product costs.

4. Direct materials used = $111,000,000 ÷ 1,000,000 units = $111 per unit
Depreciation on plant and equipment = $8,000,000 ÷ 1,000,000 units = $8 per unit

5. Direct materials unit cost would be unchanged at $111. Depreciation unit cost would be $8,000,000 ÷ 2,000,000 = $4 per unit. Total direct materials costs would double to $222,000,000 ($111 per unit × 2,000,000 units). Total depreciation cost of $8,000,000 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 (1 million × $2) when 1 million units are produced.
(b) Depreciation will be $4 million (2 million × $2) when 2 million units are produced.

2-32 (20 min.) **Labor cost, overtime and idle time.**

1.(a) Total cost of hours worked at regular rates	
48 hours × $40 per hour	$ 1,920
46 hours × $40 per hour	1,840
54 hours × $40 per hour	2,160
51 hours × $40 per hour	2,040
	7,960
Minus idle time	
(3.9 hours × $40 per hour)	156
(6.6 hours × $40 per hour)	264
(6.1 hours × $40 per hour)	244
(2.8 hours × $40 per hour)	112
Total idle time	776
Direct manufacturing labor costs	$7,184

(b) Idle time = 19.4 hours × $40 per hour =	$ 776

(c) Overtime and holiday premium.	
Week 1: Overtime (48 – 40) hours × Premium, $20 per hour	$ 160
Week 2: Overtime (46 – 40) hours × Premium, $20 per hour	120
Week 3: Overtime (54 – 40) hours × Premium, $40 per hour	560
Week 4: Overtime (51 – 40) hours × Premium, $20 per hour	220
Week 4: Holiday 8 hours × 2 days × Premium, $40 per hour	640
Total overtime and holiday premium	$ 1,700

(d) Total earnings in December	
Direct manufacturing labor costs	$7,184
Idle time	776
Overtime and holiday premium	1,700
Total earnings	$9,660

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.

2-33 (30–40 min.) **Missing records, computing inventory costs.**

1. Finished goods inventory, 3/31/2013 = $105,000
2. Work-in-process inventory, 3/31/2013 = $95,000
3. Direct materials inventory, 3/31/2013 = $42,500

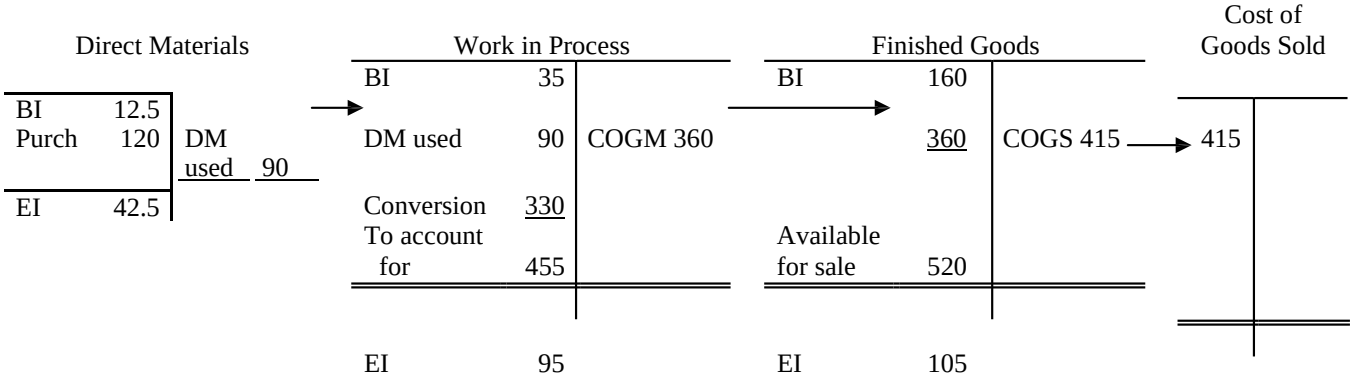
This problem is not as easy as it first appears. These answers are obtained by working from the known figures to the unknowns in the schedule below. The basic relationships between categories of costs are:

Manufacturing costs added during the period (given)	$420,000
Conversion costs (given)	$330,000
Direct materials used = Manufacturing costs added – Conversion costs	
= $420,000 – $330,000 = $90,000	
Cost of goods manufactured = Direct Materials Used × 4	
= $90,000 × 4 = $360,000	

Schedule of Computations

Direct materials, 3/1/2013 (given)		$ 12,500
Direct materials purchased (given)		120,000
Direct materials available for use		132,500
Direct materials, 3/31/2013	3 =	42,500
Direct materials used		90,000
Conversion costs (given)		330,000
Manufacturing costs added during the period (given)		420,000
Add work in process, 3/1/2013 (given)		35,000
Manufacturing costs to account for		455,000
Deduct work in process, 3/31/2013	2 =	95,000
Cost of goods manufactured (4 × $180,000)		360,000
Add finished goods, 3/1/2013		160,000
Cost of goods available for sale		520,000
Deduct finished goods, 3/31/2013	1 =	105,000
Cost of goods sold (80% × $518,750)		$415,000

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):



2-34 (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, 106,250 units × 2 lbs., or 212,500 lbs. were used at $0.68 per pound of direct materials ($144,500 ÷ 212,500 lbs.). (The direct material costs of $144,500 are direct materials used, not purchased.) Therefore, the ending inventory of direct materials is 1,900 lbs. × $0.68 = $1,292.

2.

	Manufacturing Costs for 106,250 units		
	Variable	Fixed	Total
Direct materials costs	$144,500	$ –	$144,500
Direct manufacturing labor costs	23,500	–	23,500
Plant energy costs	5,000	–	5,000
Indirect manufacturing labor costs	18,000	16,000	34,000
Other indirect manufacturing costs	8,000	23,000	31,000
Cost of goods manufactured	$199,000	$39,000	$238,000

Average unit manufacturing cost: $238,000 ÷ 106,250 units
= $2.24 per unit

Finished goods inventory in units: = $\frac{\$22,400 \text{ (given)}}{\$2.24 \text{ per unit}}$
= 10,000 units

3. Units sold in 2013 = Beginning inventory + Production – Ending inventory
= 0 + 106,250 –10,000 = 96,250 units

Selling price in 2013 = $481,250 ÷ 96,250
= $5.00 per unit

4.

Tampa Office Equipment
Income Statement
Year Ended December 31, 2013
(in thousands)

Revenues (96,250 units sold × $5.00)		$481,250
Cost of units sold:		
Beginning finished goods, Jan. 1, 2013	$ 0	
Cost of goods manufactured	238,000	
Cost of goods available for sale	238,000	
Ending finished goods, Dec. 31, 2013	22,400	215,600
Gross margin		265,650
Operating costs:		
Marketing, distribution, and customer-service costs	166,000	
Administrative costs	54,000	220,000
Operating income		$ 45,650

2-35 (40 min) **Absorption versus variable costing.**

1. The variable manufacturing cost per unit is $30 + $25 + $60 = $115.

2013 Variable-Costing Based Income Statement		
Revenues (17,500 × $425 per unit)		$7,437,500
Variable costs		
Beginning inventory	$ 0	
Variable manufacturing costs (18,000 units × $115 per unit)	2,070,000	
Cost of goods available for sale	2,070,000	
Deduct: Ending inventory (500 units × $115 per unit)	(57,500)	
Variable cost of goods sold	2,012,500	
Variable marketing costs (17,500 units × $45 per unit)	787,500	
Total variable costs		2,800,000
Contribution margin		4,637,500
Fixed costs		
Fixed manufacturing costs	1,080,000	
Fixed administrative costs	965,450	
Fixed marketing	1,366,400	
Total fixed costs		3,411,850
Operating income		$1,225,650

2. Fixed manufacturing overhead rate = $1,080,000 / 18,000 units = $60 per unit

2013 Absorption-Costing Based Income Statement		
Revenues (17,500 units × $425 per unit)		$7,437,500
Cost of goods sold		
Beginning inventory	$ 0	
Variable manufacturing costs (18,000 units × $115 per unit)	2,070,000	
Allocated fixed manufacturing costs (18,000 units × $60 per unit)	1,080,000	
Cost of goods available for sale	3,150,000	
Deduct ending inventory (500 units × ($115 + $60) per unit)	(87,500)	
Cost of goods sold		3,062,500
Gross margin		4,375,000
Operating costs		
Variable marketing costs (17,500 units × $45 per unit)	787,500	
Fixed administrative costs	965,450	
Fixed marketing	1,366,400	
Total operating costs		3,119,350
Operating income		$1,255,650

3. 2013 operating income under absorption costing is greater than the operating income under variable costing because in 2013 inventories increased by 500 units. As a result, under absorption costing, a portion of the fixed overhead remained in the ending inventory, and led to a lower cost of goods sold (relative to variable costing). As shown below, the difference in the two operating incomes is exactly the same as the difference in the fixed manufacturing costs included in ending vs. beginning inventory (under absorption costing).

Operating income under absorption costing	$1,255,650
Operating income under variable costing	1,225,650
Difference in operating income under absorption vs. variable costing	$ 30,000
Under absorption costing:	
Fixed mfg. costs in ending inventory (500 units × $60 per unit)	$ 30,000
Fixed mfg. costs in beginning inventory (0 units × $60 per unit)	0
Change in fixed mfg. costs between ending and beginning inventory	$ 30,000

4. Relative to the alternative of using contribution margin (from variable costing), the absorption-costing based gross margin has some pros and cons as a performance measure for Griswold's supervisors. It takes into account both variable costs and fixed costs—costs that the supervisors should be able to control in the long-run—and therefore is a more complete measure than contribution margin which ignores fixed costs (and may cause the supervisors to pay less attention to fixed costs). The downside of using absorption-costing-based gross margin is the supervisor's temptation to use inventory levels to control the gross margin—in particular, to shore up a sagging gross margin by building up inventories. This can be offset by specifying, or limiting, the inventory build-up that can occur, charging the supervisor a carrying cost for holding inventory, and using nonfinancial performance measures such as the ratio of ending to beginning inventory.

2-36 (20–30 min.) **Comparison of costing methods.**

All units and costs are in thousands.

1. Variable-costing income statements:

	2012		2013	
	Sales	1,000 units	Sales	1,200 units
	Production	1,400 units	Production	1,000 units
Revenues ($3 per unit)		$3,000		$3,600
Variable costs:				
Beginning inventory	$ 0		$ 200	
Variable cost of goods manufactured	700		500	
Cost of goods available for sale	700		700	
Deduct ending inventory[a]	(200)		(100)	
Variable cost of goods sold	500		600	
Variable operating costs	1,000		1,200	
Variable costs		1,500		1,800
Contribution margin		1,500		1,800
Fixed costs				
Fixed manufacturing costs	700		700	
Fixed operating costs	400		400	
Total fixed costs		1,100		1,100
Operating income		$ 400		$ 700

[a] Unit inventoriable costs:
Year 1: $700 ÷ 1,400 = $0.50 per unit; $0.50 × (1,400 – 1,000)
Year 2: $500 ÷ 1,000 = $0.50 per unit; $0.50 × (400 + 1,000 – 1,200)

2. Absorption-costing income statements:

	2012		2013	
	Sales	1,000 units	Sales	1,200 units
	Production	1,400 units	Production	1,000 units
Revenues ($3 per unit)		$3,000		$3,600
Cost of goods sold:				
Beginning inventory	$ 0		$ 400	
Variable manufacturing costs	700		500	
Fixed manufacturing costs[a]	700		700	
Cost of goods available for sale	1,400		1,600	
Deduct ending inventory[b]	(400)		(200)	
Cost of goods sold		1,000		1,400
Gross margin		2,000		2,200
Operating costs:				
Variable operating costs	1,000		1,200	
Fixed operating costs	400		400	
Total operating costs		1,400		1,600
Operating income		$ 600		$ 600

[a] Fixed manufacturing cost rate:
Year 1: $700 ÷ 1,400 = $0.50 per unit
Year 2: $700 ÷ 1,400 = $0.50 per unit

[b] Unit inventoriable costs:
Year 1: $0.50 per unit (variable mfg) + $0.50 per unit (fixed mfg) = $1 per unit; $1.00 × (1400 – 1000)
Year 2: $0.50 per unit (variable mfg) + $0.50 per unit (fixed mfg) = $1 per unit; $1.00 × (400 + 1,000 – 1,200)

3.

	2012	2013
Variable Costing:		
Operating income	$400	$700
Ending inventory	200	100
Absorption Costing:		
Operating income	$600	$600
Ending inventory	400	200
Fixed manuf. overhead		
• in beginning inventory	0	200
• in ending inventory	200	100

$$\begin{pmatrix}\text{Absorption costing}\\ \text{operating income}\end{pmatrix} - \begin{pmatrix}\text{Variable costing}\\ \text{operating income}\end{pmatrix} = \begin{pmatrix}\text{Fixed manuf. costs}\\ \text{in ending inventory}\end{pmatrix} - \begin{pmatrix}\text{Fixed manuf. costs}\\ \text{in beginning inventory}\end{pmatrix}$$

Year 1:	$600 – $400	=	$0.50 × 400 – $0
	$200	=	$200
Year 2:	$600 – $700	=	($0.50 × 200) – ($0.50 × 400)
	–$100	=	–$100

The difference in reported operating income is due to the amount of fixed manufacturing overhead in the beginning and ending inventories. In Year 1, absorption costing has a higher operating income of $200 due to ending inventory having $200 in fixed manufacturing overhead, while beginning inventory does not exist. In Year 2, variable costing has a higher operating income of $100 due to ending inventory under absorption costing having $100 less in fixed manufacturing overhead than does beginning inventory.

4. (a.) Absorption costing is more likely to lead to inventory build-ups than variable costing. Under absorption costing, operating income in a given accounting period is increased by inventory buildup, because some fixed manufacturing costs are accounted for as an asset (inventory) instead of as a cost of the period of production.

(b.) Although variable costing will counteract undesirable inventory build-ups, other measures can be used without abandoning absorption costing. Examples include:

1. careful budgeting and inventory planning;
2. incorporating a carrying charge for inventory;
3. changing the period used to evaluate performance to be long-term;
4. including nonfinancial variables that measure inventory levels in performance evaluations.

2-37 (20-25 min.) **Cost Classification: ethics.**

1. Warehousing costs per unit $= \dfrac{\text{Warehousing costs}}{\text{Units produced}}$

$= \dfrac{\$3,630,000}{220,000 \text{ units}} = \$16.50$ per unit.

If the $3,630,000 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 $16.50 per unit and expensed as each unit of the product is sold. Therefore, if only 190,000 of the 220,000 units are sold, only $3,135,000 ($16.50 per unit × 190,000 units) of the $3,630,000 would be expensed in the current period. The remaining $3,630,000 – $3,135,000 = $495,000 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 $495,000 ($16.50 per unit × 30,000 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 Higgins would improve his personal bonus and take-home pay by
11.5% × $495,000 = $56,925

4. The controller should not reclassify costs as product costs just so the plant can reap short-term benefits, including the increase in Higgins'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 State'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 Higgins. Higgins stands to personally benefit from the reclassification of costs. The controller should insist that she must adhere to generally accepted accounting principles so as not to submit fraudulent financial statements to corporate headquarters. If Higgins insists on the reclassification, the controller should raise the issue with the chief financial officer after informing Higgins that she 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.

Harvard Business School

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Justin Anson Distillery, Inc.

Teaching Note

Substantive Issues Raised

The managers of Anson Distillery have increased production by fifty percent in 2012, only to see reported earnings fall dramatically. Since sales revenue has remained level, management is debating how and why income should fall when business seems so good.

The issues raised by the case involve both what production costs should be charged to inventory accounts, and therefore be carried to future periods as product costs, and which should be charged to the current accounting period. An unusual production process involving the aging of whisky in barrels, a four-year operating cycle, the one-product nature of the business, and the sudden increase in production, combine to present the inventory cost issue in a dramatic way.

Pedagogical Objectives

The primary objective of the case is to illustrate that a production cost that is added to inventory does not reduce income until the inventory is sold. The converse—a cost charged to the expenses of the current period reduces income in that period—is already obvious to most students.

Whether a cost of production can be carried forward to a future period as inventory cost depends on both accounting convention and management judgment. The choice also depends on accounting philosophy, and it is the heart of arguments for and against variable costing. This case can be used to present those arguments, but the case can also be taught as an inventory valuation/reported income case without reference to whether costs are variable—to be charged to product; or fixed—to be charged to the current accounting period.

Opportunities for Student Analysis

Study questions assigned should focus students' attention on the issue of which costs should be assigned to inventory. As the cost increases in 2012 have been largely caused by the decision to increase production levels, the importance of this issue is highlighted.

As to what costs should be included in inventory, the strongest case can be made for the wooden barrels.

This is adapted from a teaching note prepared by Professor William J. Bruns as an aid to instructors in the classroom use of the case "Justin Anson Distillery, Inc.," No. 189-065.

Because these barrels are not effectively consumed in the production process (which includes aging, since non-aged bourbon is not really saleable bourbon), the barrels are in essence raw materials. **Exhibit TN-1** shows the effects of treating the barrel costs as product costs; this change shows profit in 2012 to be $491,000 instead of the $895,000 loss when the cost of the barrels was treated as an expense.

As an extension of this reasoning, an argument can be made to include all aging costs as product costs (**Exhibit TN-3**), giving a profit of $1,067,000. To counter the student who defends this position, I ask if he would put these costs (e.g., factory occupancy) into inventory where Anson making more than one product. This question points out that, in a literal sense, *all* costs in a one-product organization such as Anson are "direct costs" of that product. Yet certainly some of those same costs would be treated as period costs in a multiproduct operation.

In many ways, the figures in **Exhibits TN-1 and TN-2** represent an extreme position. In teaching this case, very few instructors can remember encountering students who argue that the barrels are not a part of the product. (Occasionally, a student will argue that barrels are really like machines—to be capitalized and depreciated over the four-year production cycle. This is another interesting perspective to discuss if time allows, which it rarely does.)

The other extreme is illustrated in **Exhibit TN-3**, which shows the effects of treating all costs as product costs, as suggested by Mr. Anson in the case. The inventory values developed there are obviously too high, because they include bottling costs for 2009-11, as were other costs that should probably be treated as product costs.

Students can get so bogged down on these details of adjustment that they lose perspective on the case. Thus, while I entertain limited discussion on the "incorrectness" of the figures in **Exhibit TN-3**, I also point out that including *only* barrels boosts Anson's profit in 2012 by $1,386,000, whereas the total of *all* other possible aging costs raises this figure only another $576,000. Similarly, including only barrels in inventory increases retained earnings by a factor greater than 3 (from $6,268,000 to $19,574,000, ignoring cased goods).

Many other questions may be introduced by the students. Should Anson charge variable aging costs to inventory, and treat fixed costs as period costs? (Can we separate the fixed and variable, and even so, would the effort result in better management control?) Should interest on the loans necessary to finance capacity expansion be included in inventory? Should the barrels be capitalized and depreciated over four years? Should whiskey leakage be shown as a separate item on the income statement? Should standard costs be established for a barrel of whiskey? Each of these could probably be supported under a given set of assumptions.

In any case, the student should clearly understand that the product versus period cost question arose solely because of the increase in production. Had Anson continued producing and selling the equivalent of 43,000 barrels per year, the issue would not have been important, since profits would have been the same under any alternative.

An interesting approach to illustrating how a manager could examine the impact of where to draw the product was developed by David Wilson while a visiting professor at Harvard. Wilson developed the cost of production analysis shown in **Exhibit TN-5**. The cumulative cost of production can be used to determine the cost of goods sold and inventory values at any point from $57.63 per barrel (case exhibits) to $151.83 (**Exhibit TN-3**). A Statement of Cost of Goods Sold and an Income Statement built on costs through warehousing is given in **Exhibits TN-6**, **TN-7**, **and TN-**8. These exhibits illustrate a format that allows a student (or manager) to "plug in" any cost he or she wishes and trace the impact through the income statement.

Finally, the question of the appropriate method of accounting for Anson Distillery to use in preparing annual statements to be submitted to Valley National Bank should be addressed. The original financial statements are clearly misleading, as they make 2012 look like a bad year even though management is looking optimistically into the future. Unless the banking officers are expert accountants, they could easily be confused by this ultra-conservative expensing of all costs, including the barrels. But if too many costs are capitalized in inventory, they will depress future earnings when the inventory is sold. Management has to understand the accounting here so that they can plan the business

strategy for earnings, just as they have tried to understand their competitive situation and take actions to exploit what they feel is a growing demand for their product.

Suggestions for Classroom Use

The assignment questions in the case provide a useful classroom discussion sequence for the case. In most cases, a wide diversity of views generates useful class discussions. As students present their arguments and numerical analysis, it is not unusual for considerable diversity to develop. As the exhibits to this note reveal, there are many twists, turns, and pitfalls into which the student will wander and fall.

Depending on the background of the class, instructors will have to judge the relative importance of concepts and fully articulating financial statements. It is usually impossible in a single class to cover both, unless students are at an advanced level. With beginning students, I usually open with a general question about the costs that belong in inventory, move quickly to a fairly complete analysis of the "include only the barrels" assumption (on which most students can agree, so it illustrates how inventory value articulates with cost of goods sold, eventually), and leave less time for the "include all costs" question. It is sometimes fun, especially if the class has time to discuss the issue of what to show the bank, to vote on alternative student resolutions of this issue. Rarely does a class reach real agreement.

Exhibit TN-1 Effect of Treating Barrel Costs as a Product Cost

Account	Change	2012 Amount		New Amount
Income Statement				
Total cost of goods sold	+$2,980	(43,000 bbls. sold)		
	-4,366	(63,000 bbls. produced)		
Net change	-$1,386	+$43,683	=	$42,297
Profit (loss)	+1,386	+(895)	=	491
Balance Sheet				
Bulk whiskey inventory:	+$8,940	(43,000 bbls./year 2009, 2010, 2011)		
	+4,366	(63,000 bbls., 2012)		
	+$13,306	+$11,067	=	$24,373
Cased goods inventory: [a]	+346.5	+4,331	=	4,677.5
Total assets	+$13,652.5	+$24,785		$38,437.5
Retained earnings	+$13,652.5	+$6,268		$19,920.5
Ignoring cased goods:				
Total assets	+$13,306.0	+$24,785		$38,091.0
Retained earnings	+$13,306.0	+$6,268		$19,574.0

[a] A sophisticated adjustment few students will attempt. Can best be ignored if not raised in discussion.

$$\frac{175{,}000 \text{ gallons}}{35 \text{ gallons}/\text{bbl}} = 5{,}000 \text{ bbl. X } \$69.30/\text{bbl} = \$346{,}500$$

Exhibit TN-2 Statement of Income for year Ended June 30, 2012
(revised; $ thousands)

Sales		$46,200
Cost of goods sold:		
Federal excise taxes		34,766
7/1/11 inventory (172 k bbl.)	$21,834	
Add: Production (63 k bbl.)	7,997	
	$29,831	
7/1/12 Inventory (192 k bbl.)	24,373	
		5,458
		$40,224
Other costs (6,439-4,366)		2,073
Total cost of goods sold		$42,297
Gross Profit		$ 3,903
Less: Sales and administrative expenses		3,412
Profit		$ 491

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Exhibit TN-3 Effect of Treating All Warehousing, Aging, and Barrel Costs as Product Costs

Account	Change	2012 Amount		New Amount
Income Statement				
Cost of barrels	-$1,386	+$3,969	=	$2,709
Occupancy costs:				
Factory building	-36	+327	=	291
Rented building	-330	+629	=	299
Warehouse labor	-160	+367	=	207
Chemical laboratory	-33	+183	=	150
Depreciation:				
Warehouse equipment	-9	+22	=	13
Government supervision	-8	+15	=	7
Total cost of goods sold	-$1,962	+$43,683	=	$41,721
Profit (loss)	+1,962	+(895)	=	1,067
Balance Sheet				
Bulk whiskey inventory:	+$13,431	($4,477 x 3 years)		
	6,439	(2012 prod.)		
	$19,870	+$11,067	=	$28,125
Cased goods inventory: [a]	+$521	+4,331	=	$4,852
Total assets	$20,391	+$24,785	=	$43,322
Retained earnings	20,391	+6,268	=	24,805
Ignoring cased goods:				
Total assets	$19,870	+$24,785	=	$44,655
Retained earnings	19,870	+6,268	=	26,138

[a] A sophisticated adjustment few students will attempt. Can best be ignored if not raised in discussion.

$$\frac{175{,}000 \text{ gallons}}{35 \text{ gallons}/\text{bbl}} \times \$4, \frac{477}{43000 \text{ bbl.}} = 5{,}000 \text{ bbl.} \times 104.12/\text{bbl} = \$520{,}581$$

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Exhibit TN-4 Per Barrel Inventory Costs

	Cost		Barrels		Aging		Total
Present accounting	$57.63					=	$57.63
Adding barrels only	57.63	+	69.30			=	126.93
"Full" costs	57.63	+	69.30	+	24.90	=	151.83
2012 Income ($ thousands)							
Present accounting	$(895)						
Including barrels	491						
"Full" costs	1,067						

Exhibit TN-5 Costs of Production

	2011 (43,000 barrels)			2012 (63,000 barrels)		
	$000	**Per Barrel**	**CUM**	**$000**	**Per Barrel**	**CUM**
Average production cost (per **Exhibit 2**)	$2,478	$57.63	$57.63	$3,631	$57.63	$57.63
Cost of barrels	2,980	69.30	126.93	4,366	69.30	126.93
Occupancy — factory	291	6.77	133.70	327	5.19	132.12
— rent	299	6.95	140.65	629	9.98	142.10
Warehousing	207	4.81	145.47	367	5.83	147.93
Chemical laboratory	150	3.49	148.95	183	2.90	150.83
Depreciation — factory	26	0.60	149.56	26	0.41	151.24
— warehouse equipment	13	0.30	149.86	22	0.35	151.59
Government supervision	7	0.16	150.02	15	0.24	151.83
	$6,451	$150.01		$9,566	$151.83	
Production quantity		43,000 bbls.			63,000 bbls.	
Ending inventory		172,000 bbls.			192,000 bbls.	

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Exhibit TN-6 Statement of Cost of Goods Sold for the Years ended June 30, 2011 and 2012 ($000)

	2011	2012
Costs of product charged to sales:		
Beginning inventory		
172,000 bbls. @ 145.47	$25,021	$25,021
Production for year		
43,000 bbls. @ 145.47	6,255	
63,000 bbls. @ 147.93		9,320
	$31,276	$34,341
Ending inventory		
172,000 bbls. @ 145.47	25,021	
192,000 bbls. @ 146.13[a]		28,057
	$ 6,255	$ 6,284
Bottling costs	504	504
Cased goods-in process:		
Beginning: $4,554		
Ending: $4,554	0	0
Cost of Goods Sold	$ 6,759	$ 6,788

[a] Average inventory cost = 34,341/235,000 = 146.13

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Exhibit TN-7 Income Statements for the Years ended June 30, 2011 and 2012 ($000)

	2011	2012
Net sales	$46,200	$46,200
Federal excise taxes	34,766	34,766
	$11,434	$11,434
Cost of goods sold	6,759	6,788
Gross margin	$ 4,675	$ 4,646
Less:		
Chemical lab expense	150	183
Depreciation	39	48
Government supervising	7	15
Selling and advertising	1,725	2,061
Administrative and general	1,100	1,351
Total expenses	$ 3,021	$ 3,658
Net profit	$ 1,654	$ 988

Exhibit TN-8 Reconciliation of Incomes ($000)

Net profit (Exhibit TN-7)		$ 988
Reported net loss		895
Difference		$1,883
Change in inventory:	**2011**	**2012**
Adjusted	$25,021	$28,057
Anson basis	9,914	11,067
Overhead costs in inventory	$15,107	$16,990
Net increase in overhead in inventory		$ 1,883