CHAPTER 9
INVENTORY COSTING AND CAPACITY ANALYSIS

9-1 No. Differences in operating income between variable costing and absorption costing are due to accounting for fixed *manufacturing* costs. Under variable costing only variable manufacturing costs are included as inventoriable costs. Under absorption costing both variable and fixed manufacturing costs are included as inventoriable costs. Fixed marketing and distribution costs are not accounted for differently under variable costing and absorption costing.

9-2 The term direct costing is a misnomer for variable costing for two reasons:

a. Variable costing does not include all direct costs as inventoriable costs. Only variable direct manufacturing costs are included. Any fixed direct manufacturing costs, and any direct nonmanufacturing costs (either variable or fixed), are excluded from inventoriable costs.
b. Variable costing includes as inventoriable costs not only direct manufacturing costs but also some indirect costs (variable indirect manufacturing costs).

9-3 No. The difference between absorption costing and variable costs is due to accounting for fixed manufacturing costs. As service or merchandising companies have no fixed manufacturing costs, these companies do not make choices between absorption costing and variable costing.

9-4 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).

9-5 No. A company that makes a variable-cost/fixed-cost distinction is not forced to use any specific costing method. The Stassen Company example in the text of Chapter 9 makes a variable-cost/fixed-cost distinction. As illustrated, it can use variable costing, absorption costing, or throughput costing.

A company that does not make a variable-cost/fixed-cost distinction cannot use variable costing or throughput costing. However, it is not forced to adopt absorption costing. For internal reporting, it could, for example, classify all costs as costs of the period in which they are incurred.

9-6 Variable costing does not view fixed costs as unimportant or irrelevant, but it maintains that the distinction between behaviors of different costs is crucial for certain decisions. The planning and management of fixed costs is critical, irrespective of what inventory costing method is used.

9-7 Under absorption costing, heavy reductions of inventory during the accounting period might combine with low production and a large production volume variance. This combination could result in lower operating income even if the unit sales level rises.

9-8 (a) The factors that affect the breakeven point under variable costing are:

1. Fixed (manufacturing and operating) costs.
2. Contribution margin per unit.

(b) The factors that affect the breakeven point under absorption costing are:

1. Fixed (manufacturing and operating) costs.
2. Contribution margin per unit.
3. Production level in units in excess of breakeven sales in units.
4. Denominator level chosen to set the fixed manufacturing cost rate.

9-9 Examples of dysfunctional decisions managers may make to increase reported operating income are:

a. Plant managers may switch production to those orders that absorb the highest amount of fixed manufacturing overhead, irrespective of the demand by customers.
b. Plant managers may accept a particular order to increase production even though another plant in the same company is better suited to handle that order.
c. Plant managers may defer maintenance beyond the current period to free up more time for production.

9-10 Approaches used to reduce the negative aspects associated with using absorption costing include:

a. Change the accounting system:
   - Adopt either variable or throughput costing, both of which reduce the incentives of managers to produce for inventory.
   - Adopt an inventory holding charge for managers who tie up funds in inventory.
b. Extend the time period used to evaluate performance. By evaluating performance over a longer time period (say, 3 to 5 years), the incentive to take short-run actions that reduce long-term income is lessened.
c. Include nonfinancial as well as financial variables in the measures used to evaluate performance.

9-11 The *theoretical capacity* and *practical capacity* denominator-level concepts emphasize what a plant can supply. The *normal capacity utilization* and *master-budget capacity utilization* concepts emphasize what customers demand for products produced by a plant.

9-12 The *downward demand spiral* is the continuing reduction in demand for a company's product that occurs when the prices of competitors' products are not met and (as demand drops further), higher and higher unit costs result in more and more reluctance to meet competitors' prices. Pricing decisions need to consider competitors and customers as well as costs.

9-13 No. It depends on how a company handles the production-volume variance in the end-of-period financial statements. For example, if the adjusted allocation-rate approach is used, each denominator-level capacity concept will give the same financial statement numbers at year-end.

9-14 For tax reporting in the U.S., the IRS requires only that indirect production costs are "fairly" apportioned among all items produced. Overhead rates based on normal or master-budget capacity utilization, as well as the practical capacity concept are permitted. At year-end, proration of any variances between inventories and cost of goods sold is required (unless the variance is immaterial in amount).

9-15 No. The costs of having too much capacity/too little capacity involve revenue opportunities potentially forgone as well as costs of money tied up in plant assets.

9-16 (30 min.) **Variable and absorption costing, explaining operating-income differences.**

1. Key inputs for income statement computations are

	April	May
Beginning inventory	0	150
Production	500	400
Goods available for sale	500	550
Units sold	350	520
Ending inventory	150	30

The budgeted fixed cost per unit and budgeted total manufacturing cost per unit under absorption costing are

		April	May
(a)	Budgeted fixed manufacturing costs	$2,000,000	$2,000,000
(b)	Budgeted production	500	500
(c)=(a)÷(b)	Budgeted fixed manufacturing cost per unit	$4,000	$4,000
(d)	Budgeted variable manufacturing cost per unit	$10,000	$10,000
(e)=(c)+(d)	Budgeted total manufacturing cost per unit	$14,000	$14,000

(a) Variable costing

	April 2011		May 2011	
Revenues[a]		$8,400,000		$12,480,000
Variable costs				
Beginning inventory	$ 0		$1,500,000	
Variable manufacturing costs[b]	5,000,000		4,000,000	
Cost of goods available for sale	5,000,000		5,500,000	
Deduct ending inventory[c]	(1,500,000)		(300,000)	
Variable cost of goods sold	3,500,000		5,200,000	
Variable operating costs[d]	1,050,000		1,560,000	
Total variable costs		4,550,000		6,760,000
Contribution margin		3,850,000		5,720,000
Fixed costs				
Fixed manufacturing costs	2,000,000		2,000,000	
Fixed operating costs	600,000		600,000	
Total fixed costs		2,600,000		2,600,000
Operating income		$1,250,000		$3,120,000

[a] $24,000 × 350; $24,000 × 520
[b] $10,000 × 500; $10,000 × 400
[c] $10,000 × 150; $10,000 × 30
[d] $3,000 × 350; $3,000 × 520

(b) Absorption costing

	April 2011		May 2011	
Revenues[a]		$8,400,000		$12,480,000
Cost of goods sold				
Beginning inventory	$ 0		$2,100,000	
Variable manufacturing costs[b]	5,000,000		4,000,000	
Allocated fixed manufacturing costs[c]	2,000,000		1,600,000	
Cost of goods available for sale	7,000,000		7,700,000	
Deduct ending inventory[d]	(2,100,000)		(420,000)	
Adjustment for prod.-vol. variance[e]	0		400,000 U	
Cost of goods sold		4,900,000		7,680,000
Gross margin		3,500,000		4,800,000
Operating costs				
Variable operating costs[f]	1,050,000		1,560,000	
Fixed operating costs	600,000		600,000	
Total operating costs		1,650,000		2,160,000
Operating income		$1,850,000		$ 2,640,000

[a] $24,000 × 350; $24,000 × 520
[b] $10,000 × 500; $10,000 × 400
[c] $4,000 × 500; $4,000 × 400
[d] $14,000 × 150; $14,000 × 30
[e] $2,000,000 – $2,000,000; $2,000,000 – $1,600,000
[f] $3,000 × 350; $3,000 × 520

2. Absorption-costing operating income – Variable-costing operating income = Fixed manufacturing costs in ending inventory – Fixed manufacturing costs in beginning inventory

April:

$1,850,000 – $1,250,000 = ($4,000 × 150) – ($0)
$600,000 = $600,000

May:

$2,640,000 – $3,120,000 = ($4,000 × 30) – ($4,000 × 150)
– $480,000 = $120,000 – $600,000
– $480,000 = – $480,000

The difference between absorption and variable costing is due solely to moving fixed manufacturing costs into inventories as inventories increase (as in April) and out of inventories as they decrease (as in May).

9-17 (20 min.) **Throughput costing (continuation of Exercise 9-16).**

1.	April 2011		May 2011	
Revenues[a]		$8,400,000		$12,480,000
Direct material cost of goods sold				
Beginning inventory				
Direct materials in goods	$ 0		$1,005,000	
manufactured[b]	3,350,000		2,680,000	
Cost of goods available for sale	3,350,000		3,685,000	
Deduct ending inventory[c]	(1,005,000)		(201,000)	
Total direct material cost of goods sold		2,345,000		3,484,000
Throughput margin		6,055,000		8,996,000
Other costs				
Manufacturing costs	3,650,000[d]		3,320,000[e]	
Other operating costs	1,650,000[f]		2,160,000[g]	
Total other costs		5,300,000		5,480,000
Operating income		$ 755,000		$ 3,516,000

[a] $24,000 × 350; $24,000 × 520
[b] $6,700 × 500; $6,700 × 400
[c] $6,700 × 150; $6,700 × 30
[d] ($3,300 × 500) + $2,000,000
[e] ($3,300 × 400) + $2,000,000
[f] ($3,000 × 350) + $600,000
[g] ($3,000 × 520) + $600,000

2. Operating income under:

	April	May
Variable costing	$1,250,000	$3,120,000
Absorption costing	1,850,000	2,640,000
Throughput costing	755,000	3,516,000

In April, throughput costing has the lowest operating income, whereas in May throughput costing has the highest operating income. Throughput costing puts greater emphasis on sales as the source of operating income than does either absorption or variable costing.

3. Throughput costing puts a penalty on production without a corresponding sale in the same period. Costs other than direct materials that are variable with respect to production are expensed in the period of incurrence, whereas under variable costing they would be capitalized. As a result, throughput costing provides less incentive to produce for inventory than either variable costing or absorption costing.

9-18 (40 min.) **Variable and absorption costing, explaining operating-income differences.**

1. Key inputs for income statement computations are:

	January	February	March
Beginning inventory	0	300	300
Production	1,000	800	1,250
Goods available for sale	1,000	1,100	1,550
Units sold	700	800	1,500
Ending inventory	300	300	50

The budgeted fixed manufacturing cost per unit and budgeted total manufacturing cost per unit under absorption costing are:

		January	February	March
(a)	Budgeted fixed manufacturing costs	$400,000	$400,000	$400,000
(b)	Budgeted production	1,000	1,000	1,000
(c)=(a)÷(b)	Budgeted fixed manufacturing cost per unit	$ 400	$ 400	$ 400
(d)	Budgeted variable manufacturing cost per unit	$ 900	$ 900	$ 900
(e)=(c)+(d)	Budgeted total manufacturing cost per unit	$ 1,300	$ 1,300	$ 1,300

(a) Variable Costing

	January 2012		February 2012		March 2012	
Revenues[a]		$1,750,000		$2,000,000		$3,750,000
Variable costs						
Beginning inventory[b]	$ 0		$270,000		$ 270,000	
Variable manufacturing costs[c]	900,000		720,000		1,125,000	
Cost of goods available for sale	900,000		990,000		1,395,000	
Deduct ending inventory[d]	(270,000)		(270,000)		(45,000)	
Variable cost of goods sold	630,000		720,000		1,350,000	
Variable operating costs[e]	420,000		480,000		900,000	
Total variable costs		1,050,000		1,200,000		2,250,000
Contribution margin		700,000		800,000		1,500,000
Fixed costs						
Fixed manufacturing costs	400,000		400,000		400,000	
Fixed operating costs	140,000		140,000		140,000	
Total fixed costs		540,000		540,000		540,000
Operating income		$ 160,000		$ 260,000		$ 960,000

[a] $2,500 × 700; $2,500 × 800; $2,500 × 1,500

[b] $? × 0; $900 × 300; $900 × 300

[c] $900 × 1,000; $900 × 800; $900 × 1,250

[d] $900 × 300; $900 × 300; $900 × 50

[e] $600 × 700; $600 × 800; $600 × 1,500

(b) Absorption Costing

	January 2012		February 2012		March 2012	
Revenues[a]		$1,750,000		$2,000,000		$3,750,000
Cost of goods sold						
Beginning inventory[b]	$ 0		$ 390,000		$ 390,000	
Variable manufacturing costs[c]	900,000		720,000		1,125,000	
Allocated fixed manufacturing costs[d]	400,000		320,000		500,000	
Cost of goods available for sale	1,300,000		1,430,000		2,015,000	
Deduct ending inventory[e]	(390,000)		(390,000)		(65,000)	
Adjustment for prod. vol. var.[f]	0		80,000 U		(100,000) F	
Cost of goods sold		910,000		1,120,000		1,850,000
Gross margin		840,000		880,000		1,900,000
Operating costs						
Variable operating costs[g]	420,000		480,000		900,000	
Fixed operating costs	140,000		140,000		140,000	
Total operating costs		560,000		620,000		1,040,000
Operating income		$ 280,000		$ 260,000		$ 860,000

[a] $2,500 × 700; $2,500 × 800; $2,500 × 1,500
[b] $?× 0; $1,300 × 300; $1,300 × 300
[c] $900 × 1,000; $900 × 800; $900 × 1,250
[d] $400 × 1,000; $400 × 800; $400 × 1,250
[e] $1,300 × 300; $1,300 × 300; $1,300 × 50
[f] $400,000 – $400,000; $400,000 – $320,000; $400,000 – $500,000
[g] $600 × 700; $600 × 800; $600 × 1,500

2. $\left(\begin{array}{c}\text{Absorption-costing}\\ \text{operating}\\ \text{income}\end{array}\right) - \left(\begin{array}{c}\text{Variable costing}\\ \text{operating}\\ \text{income}\end{array}\right) = \left(\begin{array}{c}\text{Fixed manufacturing}\\ \text{costs in}\\ \text{ending inventory}\end{array}\right) - \left(\begin{array}{c}\text{Fixed manufacturing}\\ \text{costs in}\\ \text{beginning inventory}\end{array}\right)$

January:	$280,000 – $160,000	=	($400 × 300) – $0
	$120,000	=	$120,000
February:	$260,000 – $260,000	=	($400 × 300) – ($400 × 300)
	$0	=	$0
March:	$860,000 – $960,000	=	($400 × 50) – ($400 × 300)
	– $100,000	=	– $100,000

The difference between absorption and variable costing is due solely to moving fixed manufacturing costs into inventories as inventories increase (as in January) and out of inventories as they decrease (as in March).

9-19 (20–30 min.) **Throughput costing (continuation of Exercise 9-18).**

1.

	January		February		March	
Revenues[a]		$1,750,000		$2,000,000		$3,750,000
Direct material cost of goods sold						
Beginning inventory[b]	$ 0		$150,000		$ 150,000	
Direct materials in goods manufactured[c]	500,000		400,000		625,000	
Cost of goods available for sale	500,000		550,000		775,000	
Deduct ending inventory[d]	(150,000)		(150,000)		(25,000)	
Total direct material cost of goods sold		350,000		400,000		750,000
Throughput margin		1,400,000		1,600,000		3,000,000
Other costs						
Manufacturing[e]	800,000		720,000		900,000	
Operating[f]	560,000		620,000		1,040,000	
Total other costs		1,360,000		1,340,000		1,940,000
Operating income		$ 40,000		$ 260,000		$1,060,000

[a] $2,500 × 700; $2,500 × 800; $2,500 × 1,500
[b] $? × 0; $500 × 300; $500 × 300
[c] $500 × 1,000; $500 × 800; $500 × 1,250
[d] $500 × 300; $500 × 300; $500 ×50
[e] ($400 × 1,000) + $400,000; ($400 × 800) + $400,000; ($400 × 1,250) + $400,000
[f] ($600 × 700) + $140,000; ($600 × 800) + $140,000; ($600 × 1,500) + $140,000

2. Operating income under:

	January	February	March
Variable costing	$160,000	$260,000	$ 960,000
Absorption costing	280,000	260,000	860,000
Throughput costing	40,000	260,000	1,060,000

Throughput costing puts greater emphasis on sales as the source of operating income than does absorption or variable costing. Accordingly, income under throughput costing is highest in periods where the number of units sold is relatively large (as in March) and lower in periods of weaker sales (as in January).

3. Throughput costing puts a penalty on producing without a corresponding sale in the same period. Costs other than direct materials that are variable with respect to production are expensed when incurred, whereas under variable costing they would be capitalized as an inventoriable cost.

9-20 (40 min) **Variable versus absorption costing.**

1.

Beginning Inventory + 2012 Production = 2012 Sales + Ending Inventory

85,000 units + 2012 Production = 345,400 units + 34,500 units

2012 Production = 294,900 units

Income Statement for the Zwatch Company, Variable Costing
for the Year Ended December 31, 2012

Revenues: $22 × 345,400		$7,598,800
Variable costs		
Beginning inventory: $5.10 × 85,000	$ 433,500	
Variable manufacturing costs: $5.10 × 294,900	1,503,990	
Cost of goods available for sale	1,937,490	
Deduct ending inventory: $5.10 × 34,500	(175,950)	
Variable cost of goods sold	1,761,540	
Variable operating costs: $1.10 × 345,400	379,940	
Adjustment for variances	0	
Total variable costs		2,141,480
Contribution margin		5,457,320
Fixed costs		
Fixed manufacturing overhead costs	1,440,000	
Fixed operating costs	1,080,000	
Total fixed costs		2,520,000
Operating income		$2,937,320

Absorption Costing Data

Fixed manufacturing overhead allocation rate =
Fixed manufacturing overhead/Denominator level machine-hours = $1,440,000 ÷ 6,000
= $240 per machine-hour

Fixed manufacturing overhead allocation rate per unit =
Fixed manufacturing overhead allocation rate/standard production rate = $240 ÷ 50
= $4.80 per unit

Income Statement for the Zwatch Company, Absorption Costing
for the Year Ended December 31, 2012

Revenues: $22 × 345,400		$7,598,800
Cost of goods sold		
Beginning inventory ($5.10 + $4.80) × 85,000	$ 841,500	
Variable manuf. costs: $5.10 × 294,900	1,503,990	
Allocated fixed manuf. costs: $4.80 × 294,900	1,415,520	
Cost of goods available for sale	$3,761,010	
Deduct ending inventory: ($5.10 + $4.80) × 34,500	(341,550)	
Adjust for manuf. variances ($4.80 × 5,100)[a]	24,480 U	
Cost of goods sold		3,443,940
Gross margin		4,154,860
Operating costs		
Variable operating costs: $1.10 × 345,400	$ 379,940	
Fixed operating costs	1,080,000	
Total operating costs		1,459,940
Operating income		$2,694,920

[a] Production volume variance = [(6,000 hours × 50) – 294,900] × $4.80
= (300,000 – 294,900) × $4.80
= $24,480

2. Zwatch's operating margins as a percentage of revenues are

Under variable costing:	
Revenues	$7,598,800
Operating income	2,937,320
Operating income as percentage of revenues	38.7%
Under absorption costing:	
Revenues	$7,598,800
Operating income	2,694,920
Operating income as percentage of revenues	35.5%

3. Operating income using variable costing is about 9% higher than operating income calculated using absorption costing.

Variable costing operating income – Absorption costing operating income =
$2,937,320 – $2,694,920 = $242,400

Fixed manufacturing costs in beginning inventory under absorption costing –
Fixed manufacturing costs in ending inventory under absorption costing
= ($4.80 × 85,000) – ($4.80 × 34,500) = $242,400

4. The factors the CFO should consider include
   (a) Effect on managerial behavior.
   (b) Effect on external users of financial statements.

I would recommend absorption costing because it considers all the manufacturing resources (whether variable or fixed) used to produce units of output. Absorption costing has many critics. However, the dysfunctional aspects associated with absorption costing can be reduced by

- Careful budgeting and inventory planning.
- Adding a capital charge to reduce the incentives to build up inventory.
- Monitoring nonfinancial performance measures.

9-21 (10 min.) **Absorption and variable costing.**

The answers are 1(a) and 2(c). Computations:

1. **Absorption Costing**:

Revenues[a]		$4,800,000
Cost of goods sold:		
Variable manufacturing costs[b]	$2,400,000	
Allocated fixed manufacturing costs[c]	360,000	2,760,000
Gross margin		2,040,000
Operating costs:		
Variable operating[d]	1,200,000	
Fixed operating	400,000	1,600,000
Operating income		$ 440,000

[a] $40 × 120,000
[b] $20 × 120,000
[c] Fixed manufacturing rate = $600,000 ÷ 200,000 = $3 per output unit
Fixed manufacturing costs = $3 × 120,000
[d] $10 × 120,000

2. **Variable Costing**:

Revenues[a]		$4,800,000
Variable costs:		
Variable manufacturing cost of goods sold[b]	$2,400,000	
Variable operating costs[c]	1,200,000	3,600,000
Contribution margin		1,200,000
Fixed costs:		
Fixed manufacturing costs	600,000	
Fixed operating costs	400,000	1,000,000
Operating income		$ 200,000

[a] $40 × 120,000
[b] $20 × 120,000
[c] $10 × 120,000

9-22 (40 min) **Absorption versus variable costing.**

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

2011 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	1,100,000	
Fixed administrative costs	965,450	
Fixed marketing	1,366,400	
Total fixed costs		3,431,850
Operating income		$1,205,650

2. Fixed manufacturing overhead rate = $1,100,000 / 20,000 units = $55 per unit

2011 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 × $55 per unit)	990,000	
Cost of goods available for sale	3,060,000	
Deduct ending inventory (500 units × ($115 + $55) per unit)	(85,000)	
Add unfavorable production volume variance	110,000[a] U	
Cost of goods sold		3,085,000
Gross margin		4,352,500
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		$1,233,150

[a] PVV = $1,100,000 budgeted fixed mfg. costs – $990,000 allocated fixed mfg. costs = $110,000 U

3. 2011 operating income under absorption costing is greater than the operating income under variable costing because in 2011 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	$1,233,150
Operating income under variable costing	1,205,650
Difference in operating income under absorption vs. variable costing	$ 27,500
Under absorption costing:	
Fixed mfg. costs in ending inventory (500 units × $55 per unit)	$ 27,500
Fixed mfg. costs in beginning inventory (0 units × $55 per unit)	0
Change in fixed mfg. costs between ending and beginning inventory	$ 27,500

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 Grunewald'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.

9-23 (20–30 min.) **Comparison of actual-costing methods.**

The numbers are simplified to ease computations. This problem avoids standard costing and its complications.

1. Variable-costing income statements:

	2011		2012	
	Sales 1,000 units Production 1,400 units		Sales 1,200 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:

	2011		2012	
	Sales 1,000 units Production 1,400 units		Sales 1,200 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)		(240)	
Cost of goods sold		1,000		1,360
Gross margin		2,000		2,240
Operating costs:				
Variable operating costs	1,000		1,200	
Fixed operating costs	400		400	
Total operating costs		1,400		1,600
Operating income		$ 600		$ 640

[a] Fixed manufacturing cost rate:
Year 1: $700 ÷ 1,400 = $0.50 per unit
Year 2: $700 ÷ 1,000 = $0.70 per unit

[b] Unit inventoriable costs:
Year 1: $1,400 ÷ 1,400 = $1.00 per unit; $1.00 × (1400 – 1000)
Year 2: $1,200 ÷ 1,000 = $1.20 per unit; $1.20 × (400 + 1,000 – 1,200)

3.

	2011	2012
Variable Costing:		
Operating income	$400	$700
Ending inventory	200	100
Absorption Costing:		
Operating income	$600	$640
Ending inventory	400	240
Fixed manuf. overhead		
• in beginning inventory	0	200
• in ending inventory	200	140

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

$$\begin{aligned}
\text{Year 1: } \$600 - \$400 &= \$0.50 \times 400 - \$0\\
\$200 &= \$200\\
\text{Year 2: } \$640 - \$700 &= (\$0.70 \times 200) - (\$0.50 \times 400)\\
-\$60 &= -\$60
\end{aligned}$$

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 $60 due to ending inventory under absorption costing having $60 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.

9-24 (40 min.) **Variable and absorption costing, sales, and operating-income changes.**

1. Helmetsmart's annual fixed manufacturing costs are $1,078,000. It allocates $22 of fixed manufacturing costs to each unit produced. Therefore, it must be using $1,078,000 ÷ $22 = 49,000 units (annually) as the denominator level to allocate fixed manufacturing costs to the units produced.

We can see from Helmetsmart's income statements that it disposes of any production volume variance against cost of goods sold. In 2012, 58,800 units were produced instead of the budgeted 49,000 units. This resulted in a favorable production volume variance of $215,600 F ((58,800 – 49,000) units × $22 per unit), which, when written off against cost of goods sold, increased gross margin by that amount.

2. The breakeven calculation, same for each year, is shown below:

Calculation of breakeven volume	**2011**	**2012**	**2013**
Selling price ($1,960,000 ÷ 49,000; $1,960,000 ÷ 49,000; $2,352,000 ÷ 58,800)	$ 40	$ 40	$ 40
Variable cost per unit (all manufacturing)	14	14	14
Contribution margin per unit	$ 26	$ 26	$ 26
Total fixed costs (fixed mfg. costs + fixed selling & admin. costs)	$1,274,000	$1,274,000	$1,274,000
Breakeven quantity = Total fixed costs ÷ contribution margin per unit	49,000	49,000	49,000

3.

Variable Costing

	2011	**2012**	**2013**
Sales (units)	49,000	49,000	58,800
Revenues	$1,960,000	$1,960,000	$2,352,000
Variable cost of goods sold			
Beginning inventory $14 × 0; 0; 9,800	0	0	137,200
Variable manuf. costs $14 × 49,000; 58,800; 49,000	686,000	823,200	686,000
Deduct ending inventory $14 × 0; 9,800; 0	0	(137,200)	0
Variable cost of goods sold	686,000	686,000	823,200
Contribution margin	$1,274,000	$1,274,000	$1,528,800
Fixed manufacturing costs	$1,078,000	$1,078,000	$1,078,000
Fixed selling and administrative expenses	196,000	196,000	196,000
Operating income	$ 0	$ 0	$ 254,800
Explaining variable costing operating income			
Contribution margin ($26 contribution margin per unit × sales units)	$1,274,000	$1,274,000	$1,528,800
Total fixed costs	1,274,000	1,274,000	1,274,000
Operating income	$ 0	$ 0	$ 254,800

4.

Reconciliation of absorption/variable costing operating incomes	**2011**	**2012**	**2013**
(1) Absorption costing operating income	$0	$215,600	$ 39,200
(2) Variable costing operating income	0	0	254,800
(3) Difference in operating incomes = (1) – (2)	$0	$215,600	$(215,600)
(4) Fixed mfg. costs in ending inventory under absorption costing (ending inventory in units × $22 per unit)	$0	$215,600	$ 0
(5) Fixed mfg. costs in beginning inventory under absorption costing (beginning inventory in units × $22 per unit)	0	0	215,600
(6) Difference = (4) – (5)	$0	$215,600	$(215,600)

In the table above, row (3) shows the difference between the operating income under absorption costing and the operating income under variable costing, for each of the three years. In 2011, the difference is $0; in 2012, absorption costing income is greater by $215,600; and in 2013, it is less by $215,600. Row (6) above shows the difference between the fixed costs in ending inventory and the fixed costs in beginning inventory under absorption costing; this figure is $0 in 2011, $215,600 in 2012 and –$215,600 in 2013. Row (3) and row (6) explain and reconcile the operating income differences between absorption costing and variable costing.

Stuart Weil is surprised at the non-zero, positive net income (reported under absorption costing) in 2012, when sales were at the 'breakeven volume' of 49,000; further, he is concerned about the drop in operating income in 2013, when, in fact, sales increased to 58,800 units. In 2012, starting with zero inventories, 58,800 units were produced and 49,000 were sold, i.e., at the end of the year, 9,800 units remained in inventory. These 9,800 units had each absorbed $22 of fixed costs (total of $215,600), which would remain as assets on Helmetsmart's balance sheet until they were sold. Cost of goods sold, representing only the costs of the 49,000 units sold in 2012, was accordingly reduced by $215,600, the production volume variance, resulting in a positive operating income even though sales were at breakeven levels. The following year, in 2013, production was 49,000 units, sales were 58,800 units i.e., all of the fixed costs that were included in 2012 ending inventory, flowed through COGS in 2013. Contribution margin in 2013 was $1,528,800 (58,800 units × $26), but, in absorption costing, COGS also contains the allocated fixed manufacturing costs of the units sold, which were $1,293,600 (58,800 units × $22), resulting in an operating income of $39,200 = 1,528,800 – $1,293,600 – $196,000 (fixed sales and admin.) Hence the drop in operating income under absorption costing, even though sales were greater than the computed breakeven volume: inventory levels decreased sufficiently in 2013 to cause 2013's operating income to be lower than 2012 operating income.

Note that beginning and ending with zero inventories during the 2011-2013 period, under both costing methods, Helmetsmart's total operating income was $254,800.

9-25 (10 min.) **Capacity management, denominator-level capacity concepts.**

1. a, b
2. a
3. d
4. c, d
5. c
6. d
7. a
8. b (or a)
9. b
10. c, d
11. a, b

9-26 (20 min.) **Denominator-level problem.**

1. Budgeted fixed manufacturing overhead costs rates:

Denominator Level Capacity Concept	Budgeted Fixed Manufacturing Overhead per Period	Budgeted Capacity Level	Budgeted Fixed Manufacturing Overhead Cost Rate
Theoretical	$ 6,480,000	5,400	$ 1,200.00
Practical	6,480,000	3,840	1687.50
Normal	6,480,000	3,240	2,000.00
Master-budget	6,480,000	3,600	1,800.00

The rates are different because of varying denominator-level concepts. Theoretical and practical capacity levels are driven by supply-side concepts, i.e., "how much can I produce?" Normal and master-budget capacity levels are driven by demand-side concepts, i.e., "how much can I sell?" (or "how much should I produce?")

2. The variances that arise from use of the theoretical or practical level concepts will signal that there is a divergence between the supply of capacity and the demand for capacity. This is useful input to managers. As a general rule, however, it is important not to place undue reliance on the production volume variance as a measure of the economic costs of unused capacity.

3. Under a cost-based pricing system, the choice of a master-budget level denominator will lead to high prices when demand is low (more fixed costs allocated to the individual product level), further eroding demand; conversely, it will lead to low prices when demand is high, forgoing profits. This has been referred to as the downward demand spiral—the continuing reduction in demand that occurs when the prices of competitors are not met and demand drops, resulting in even higher unit costs and even more reluctance to meet the prices of competitors. The positive aspects of the master-budget denominator level are that it is based on demand for the product and indicates the price at which all costs per unit would be recovered to enable the company to make a profit. Master-budget denominator level is also a good benchmark against which to evaluate performance.

9-27 (60 min.) **Variable and absorption costing and breakeven points**

1.

2011 Variable-Costing Based Operating Income Statement

Revenues (995 boards × $750 per board)		$746,250
Variable costs		
Beginning inventory (240 boards × $335 per board)	$ 80,400	
Variable manufacturing costs (900 boards × $335 per board)	301,500	
Cost of goods available for sale	381,900	
Deduct: Ending inventory (145 boards × $335 per board)	(48,575)	
Variable cost of goods sold	333,325	
Variable shipping costs (995 boards × $15 per board)	14,925	
Total variable costs		348,250
Contribution margin		398,000
Fixed costs		
Fixed manufacturing costs	280,000	
Fixed selling and administrative	112,000	
Total fixed costs		392,000
Operating income		$ 6,000

2.

2011 Absorption-Costing Based Operating Income Statement

Revenues (995 boards × $750 per board)		$746,250
Cost of goods sold		
Beginning inventory (240 boards × $615[a] per board)	$147,600	
Variable manufacturing costs (900 boards × $335 per board)	301,500	
Allocated fixed manufacturing costs (900 boards × $280 per board)	252,000	
Cost of goods available for sale	701,100	
Deduct ending inventory (145 boards × $615 per board)	(89,175)	
Cost of goods sold at standard cost	611,925	
Production-volume variance [$280 × (1,000 – 900)]	28,000 U	639,925
Gross margin		106,325
Operating costs		
Variable shipping costs (995 boards × $15 per board)	14,925	
Fixed selling and administrative	112,000	
Total operating costs		126,925
Operating income		$ (20,600)

[a]Fixed manufacturing cost per unit = Fixed manufacturing cost/denominator level of production
= $280,000/1,000 snowboards
= $280 per snowboard

$280 fixed manufacturing cost + $335 variable manufacturing cost = $615 per board

3. Breakeven point in units:

a. Variable Costing:

$$Q = \frac{\text{Total Fixed Costs + Target Operating Income}}{\text{Contribution Margin Per Unit}}$$

$$Q = \frac{(\$280{,}000 + \$112{,}000) + \$0}{\$750 - (\$335 + \$15)}$$

$$Q = \frac{\$392{,}000}{\$400}$$

$$Q = 980 \text{ snowboards}$$

b. Absorption costing:

Fixed manufacturing cost rate = \$280,000 ÷ 1,000 = \$280 per snowboard

$$Q = \frac{\begin{matrix}\text{Total} \\ \text{fixed} \\ \text{costs}\end{matrix} + \begin{matrix}\text{Target} \\ \text{operating} \\ \text{income}\end{matrix} + \left[\begin{matrix}\text{Fixed} \\ \text{manufacturing} \\ \text{cost rate}\end{matrix} \times \left(\begin{matrix}\text{Breakeven} \\ \text{sales} \\ \text{in units}\end{matrix} - \begin{matrix}\text{Units} \\ \text{produced}\end{matrix}\right)\right]}{\text{Contribution margin per unit}}$$

$$Q = \frac{(\$280{,}000 + \$112{,}000) + \$0 + [\$280\,(Q - 900)]}{\$400}$$

$\$400Q = \$392{,}000 + \$280Q - \$252{,}000$

$\$400Q - \$280Q = \$392{,}000 - \$252{,}000$

$\$120Q = \$140{,}000$

$Q = 1{,}167$ snowboards

4. Proof of breakeven point:

a. Variable Costing:

Revenues, $750 × 980 units	$735,000
Variable costs, $350 × 980	343,000
Contribution margin, $400 × 980	392,000
Fixed costs	392,000
Operating income	$ 0

b. Absorption costing:

Revenues, $750 × 1,167 units		$875,250
Cost of goods sold:		
Cost of goods at standard cost, $615 × 1,167 units	$717,705	
Production-volume variance, $280 × (1,000 – 900)	28,000 U	745,705
Gross margin		129,545
Variable shipping costs, $15 × 1,167 units	17,505	
Fixed selling and administrative costs	112,000	129,505
Operating income		$ 40*

*This is not zero due to rounding to 1,167 whole units sold.

5. If $20,000 of fixed administrative costs were reclassified as production costs, there would be no change in breakeven sales using variable costing. This is because all fixed costs, regardless of whether they are for production or administrative activities, are treated the same way in a variable costing system. However, this is not true for absorption costing. The change in classification would impact the fixed manufacturing overhead rate that is applied to units of production. If sales and production are unequal, the additional fixed overhead would either increase or decrease breakeven sales.

6. The additional $25 per unit variable production cost will cause unit contribution margin to decrease from $400 to $375. This decrease will cause the breakeven point to increase.

In the case of variable costing:
Q = $392,000 ÷ $375
Q = 1,045 units (rounded)

In the case of absorption costing:
$375Q = $392,000 + $280Q – $252,000
$375Q – $280Q = $392,000 – $252,000
$95Q = $140,000
Q = 1,474 units (rounded)

9-28 (40 min.) **Variable costing versus absorption costing.**

1. Absorption Costing:

Mavis Company Income Statement
For the Year Ended December 31, 2012

Revenues (540,000 × $5.00)		$2,700,000
Cost of goods sold:		
Beginning inventory (30,000 × $3.70[a])	$ 111,000	
Variable manufacturing costs (550,000 × $3.00)	1,650,000	
Allocated fixed manufacturing costs (550,000 × $0.70)	385,000	
Cost of goods available for sale	2,146,000	
Deduct ending inventory (40,000 × $3.70)	(148,000)	
Add adjustment for prod.-vol. variance (50,000[b] × $0.70)	35,000 U	
Cost of goods sold		2,033,000
Gross margin		667,000
Operating costs:		
Variable operating costs (540,000 × $1)		540,000
Fixed operating costs		120,000
Total operating costs		660,000
Operating income		$ 7,000

[a] $3.00 + ($7.00 ÷ 10) = $3.00 + $0.70 = $3.70

[b] [(10 units per mach. hr. × 60,000 mach. hrs.) – 550,000 units)] = 50,000 units unfavorable

2. Variable Costing:

Mavis Company Income Statement
For the Year Ended December 31, 2012

Revenues		$2,700,000
Variable cost of goods sold:		
Beginning inventory (30,000 × $3.00)	$ 90,000	
Variable manufacturing costs (550,000 × $3.00)	1,650,000	
Cost of goods available for sale	1,740,000	
Deduct ending inventory (40,000 × $3.00)	(120,000)	
Variable cost of goods sold		1,620,000
Variable operating costs		540,000
Contribution margin		540,000
Fixed costs:		
Fixed manufacturing overhead costs	420,000	
Fixed operating costs	120,000	
Total fixed costs		540,000
Operating income		$ 0

3. The difference in operating income between the two costing methods is:

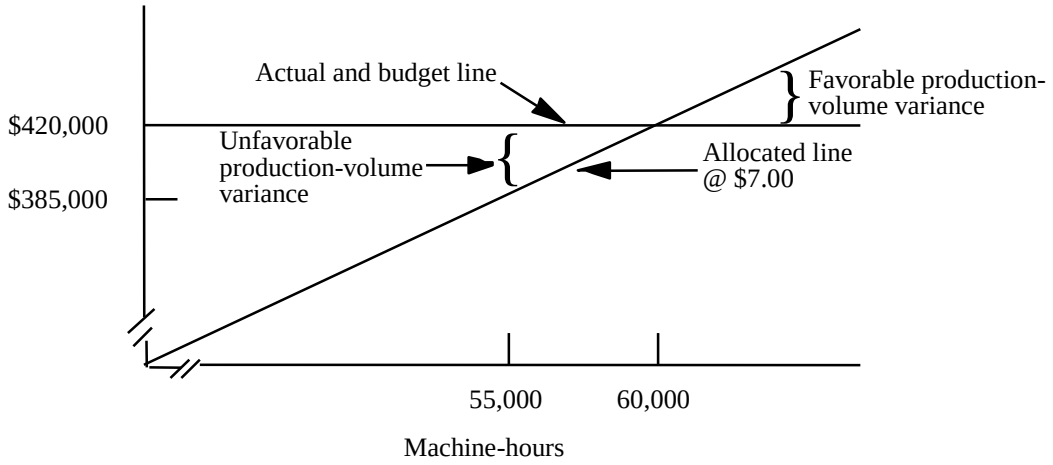
$$\begin{pmatrix}\text{Absorption costing}\\ \text{operating income}\end{pmatrix} - \begin{pmatrix}\text{Variable costing}\\ \text{operating income}\end{pmatrix} = \begin{pmatrix}\text{Fixed manuf. costs}\\ \text{in ending inventory}\end{pmatrix} - \begin{pmatrix}\text{Fixed manuf. costs}\\ \text{in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

$$\begin{aligned} \$7{,}000 - \$0 &= [(40{,}000 \times \$0.70) - (30{,}000 \times \$0.70)] \\ \$7{,}000 &= \$28{,}000 - \$21{,}000 \\ \$7{,}000 &= \$7{,}000 \end{aligned}$$

The absorption-costing operating income exceeds the variable costing figure by $7,000 because of the increase of $7,000 during 2012 of the amount of fixed manufacturing costs in ending inventory vis-à-vis beginning inventory.

4.

Total fixed manufacturing costs



5. Absorption costing is more likely to lead to buildups of inventory than does variable costing. Absorption costing enables managers to increase reported operating income by building up inventory which reduces the amount of fixed manufacturing overhead included in the current period's cost of goods sold.

Ways to reduce this incentive include

(a) Careful budgeting and inventory planning.
(b) Change the accounting system to variable costing or throughput costing.
(c) Incorporate a carrying charge for carrying inventory.
(d) Use a longer time period to evaluate performance than a quarter or a year.
(e) Include nonfinancial as well as financial measures when evaluating management performance.

9-29 (40 min.) **Variable costing and absorption costing, the All-Fixed Company.**

This problem always generates active classroom discussion.

1. The treatment of fixed manufacturing overhead in absorption costing is affected primarily by what denominator level is selected as a base for allocating fixed manufacturing costs to units produced. In this case, is 20,000 tons per year, 40,000 tons, or some other denominator level the most appropriate base?

We usually place the following possibilities on the board or overhead projector and then ask the students to indicate by vote how many used one denominator level versus another. Incidentally, discussion tends to move more clearly if variable-costing income statements are discussed first, because there is little disagreement as to computations under variable costing.

a. Variable-Costing Income Statement:

		2010	2011	Together
Revenues (and contribution margin)		$400,000	$400,000	$800,000
Fixed costs:				
Manufacturing costs	$320,000			
Operating costs	60,000	380,000	380,000	760,000
Operating income		$ 20,000	$ 20,000	$ 40,000

b. Absorption-Costing Income Statement:

The ambiguity about the 20,000- or 40,000-unit denominator level is intentional. IF YOU WISH, THE AMBIGUITY MAY BE AVOIDED BY GIVING THE STUDENTS A SPECIFIC DENOMINATOR LEVEL IN ADVANCE.

Alternative 1. Use 40,000 units as a denominator; fixed manufacturing overhead per unit is $320,000 ÷ 40,000 = $8.

	2010	2011	Together
Revenues	$400,000	$ 400,000	$800,000
Cost of goods sold			
Beginning inventory	0	160,000*	0
Allocated fixed manufacturing costs at $8	320,000	—	320,000
Deduct ending inventory	(160,000)	—	—
Adjustment for production-volume variance	0	320,000 U	320,000 U
Cost of goods sold	160,000	480,000	640,000
Gross margin	240,000	(80,000)	160,000
Operating costs	60,000	60,000	120,000
Operating income	$180,000	$(140,000)	$ 40,000

* Inventory carried forward from 2010 and sold in 2011.

Alternative 2. Use 20,000 units as a denominator; fixed manufacturing overhead per unit is $320,000 ÷20,000 = $16.

	2010	2011	Together
Revenues	$400,000	$400,000	$800,000
Cost of goods sold			
Beginning inventory	0	320,000*	0
Allocated fixed manufacturing costs at $16	640,000	—	640,000
Deduct ending inventory	(320,000)	—	—
Adjustment for production-volume variance	(320,000) F	320,000 U	0
Cost of goods sold	0	640,000	640,000
Gross margin	400,000	(240,000)	160,000
Operating costs	60,000	60,000	120,000
Operating income	$340,000	$(300,000)	$ 40,000

*Inventory carried forward from 2010 and sold in 2011.

Note that operating income under variable costing follows sales and is not affected by inventory changes.

Note also that students will understand the variable-costing presentation much more easily than the alternatives presented under absorption costing.

2. $$\text{Breakeven point under variable costing} = \frac{\text{Fixed costs}}{\text{Contribution margin per ton}} = \frac{\$380,000}{\$20}$$

$$= 19,000 \text{ tons per year or } 38,000 \text{ for two years.}$$

Most students will say that the breakeven point is 19,000 tons per year under both absorption costing and variable costing. The logical question to ask a student who answers 19,000 tons for variable costing is: "What operating income do you show for 2011 under absorption costing?" If a student answers $(140,000) (alternative 1 above), or $(300,000) (alternative 2 above), ask: "But you say your breakeven point is 19,000 tons. How can you show an operating loss on 20,000 tons sold during 2011?"

The answer to the above dilemma lies in the fact that operating income is affected by both sales and production under absorption costing.

Given that sales would be 20,000 tons in 2010, solve for the production level that will provide a breakeven level of zero operating income. Using the formula in the chapter, sales of 20,000 units, and a fixed manufacturing overhead rate of $8 (based on $320,000 ÷ 40,000 units denominator level = $8):

Let P = Production level

$$\text{Breakeven sales in units} = \frac{\left(\begin{matrix}\text{Total}\\ \text{fixed}\\ \text{costs}\end{matrix}\right) + \left(\begin{matrix}\text{Target}\\ \text{operating}\\ \text{income}\end{matrix}\right) + \left[\left(\begin{matrix}\text{Fixed manuf.}\\ \text{overhead}\\ \text{rate}\end{matrix}\right) \times \left(\begin{matrix}\text{Breakeven}\\ \text{sales in units}\end{matrix} - \begin{matrix}\text{Units}\\ \text{produced}\end{matrix}\right)\right]}{\text{Unit contributin margin}}$$

$$20{,}000 \text{ tons} = \frac{\$380{,}000 + \$0 + \$8(20{,}000 - P)}{\$20}$$

$\$400{,}000 = \$380{,}000 + \$160{,}000 - \$8P$

$\$8P = \$140{,}000$

$P = 17{,}500$ units

Proof:

Gross margin, 20,000 × ($20 – $8)		$240,000
Production-volume variance,		
(40,000 – 17,500) × $8	$180,000	
Marketing and administrative costs	60,000	240,000
Operating income		$ 0

Given that production would be 40,000 tons in 2010, solve for the breakeven unit sales level. Using the formula in the chapter and a fixed manufacturing overhead rate of $8 (based on a denominator level of 40,000 units):

Let N = Breakeven sales in units

$$N = \frac{\left(\begin{matrix}\text{Total}\\ \text{fixed}\\ \text{costs}\end{matrix}\right) + \left(\begin{matrix}\text{Target}\\ \text{operating}\\ \text{income}\end{matrix}\right) + \left[\left(\begin{matrix}\text{Fixed manuf.}\\ \text{overhead}\\ \text{rate}\end{matrix}\right) \times \left(\text{N} - \text{Units produced}\right)\right]}{\text{Unit contributin margin}}$$

$$N = \frac{\$380{,}000 + \$0 + \$8(N - 40{,}000)}{\$20}$$

$\$20N = \$380{,}000 + \$8N - \$320{,}000$

$\$12N = \$60{,}000$

$N = 5{,}000$

Proof:

Gross margin, 5,000 × ($20 – $8)		$60,000
Production-volume variance	$ 0	
Marketing and administrative costs	60,000	60,000
Operating income		$ 0

We find it helpful to put the following comparisons on the board:

Variable costing breakeven = f(sales)
= 19,000 tons

Absorption costing breakeven	=	f(sales and production)
	=	f(20,000 and 17,500)
	=	f(5,000 and 40,000)

3. Absorption costing inventory cost: Either $160,000 (using 40,000 denominator level) or $320,000 (using 20,000 denominator level) at the end of 2010 and zero at the end of 2011.

Variable costing: Zero at all times. This is a major criticism of variable costing and focuses on the issue of the definition of an asset.

4. Operating income is affected by both production and sales under absorption costing. Hence, most managers would prefer absorption costing because their performance in any given reporting period, at least in the short run, is influenced by how much production is scheduled near the end of a period.

9-30 (30–35 min.) **Comparison of variable costing and absorption costing.**

1. Since production volume variance is unfavorable, the budgeted fixed manufacturing overhead must be larger than the fixed manufacturing overhead allocated.

$$\begin{pmatrix}\text{Production-volume}\\ \text{variance}\end{pmatrix} = \begin{pmatrix}\text{Budgeted fixed}\\ \text{manufacturing overhead}\end{pmatrix} - \begin{pmatrix}\text{Fixed manufacturing}\\ \text{overhead allocated}\end{pmatrix}$$

$$\$400{,}000 = \$1{,}200{,}000 - \text{Allocated}$$

$$\text{Allocated} = \$800{,}000, \text{ which is 67\% of } \$1{,}200{,}000$$

If 67% of the budgeted fixed costs were allocated, the plant must have been operating at 67% of denominator level in 2012.

2. The problem provides the beginning and ending inventory balances under both, variable and absorption costing. Under variable costing, all fixed costs are written off as period costs, i.e., they are not inventoried. Under absorption costing, inventories include variable and fixed costs. Therefore the difference between inventory under absorption costing and inventory under variable costing is the amount of fixed costs included in the inventory.

	Absorption Costing	**Variable Costing**	**Fixed Manuf. Overhead in Inventory**
Inventories:			
December 31, 2011	$1,720,000	$1,200,000	$520,000
December 31, 2012	206,000	66,000	140,000

3. Note that the answer to (3) is independent of (1). The difference in operating income of $380,000 ($1,520,000 – $1,140,000) is explained by the release of $380,000 of fixed manufacturing costs when the inventories were decreased during 2012:

	Absorption Costing	**Variable Costing**	**Fixed Manuf. Overhead in Inventory**
Inventories:			
December 31, 2011	$1,720,000	$1,200,000	$520,000
December 31, 2012	206,000	66,000	140,000
Release of fixed manuf. costs			$380,000

The above schedule in this requirement is a formal presentation of the equation:

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

$$(\$1{,}140{,}000 - \$1{,}520{,}000) = (\$140{,}000 - \$520{,}000)$$
$$-\$380{,}000 = -\$380{,}000$$

Alternatively, the presence of fixed manufacturing overhead costs in each income statement can be analyzed:

Absorption costing,	
Fixed manuf. costs in cost of goods sold ($5,860,000 − $4,680,000)	$1,180,000
Production-volume variance	400,000
	1,580,000
Variable costing, fixed manuf. costs charged to expense	(1,200,000)
Difference in operating income explained	$ 380,000

4. Under absorption costing, operating income is a function of both sales and production (i.e., change in inventory levels). During 2012, Hinkle experienced a severe decline in inventory levels: sales were probably higher than anticipated, production was probably lower than planned (at 67% of denominator level), resulting in much of the 2012 beginning inventory passing through cost of goods sold in 2012. This means that under absorption costing, large amounts of inventoried fixed costs have flowed through 2012 cost of goods sold, resulting in a smaller operating income than in 2011, despite an increase in sales volume.

9-31 (30 min.) **Effects of differing production levels on absorption costing income: Metrics to minimize inventory buildups.**

1.

	20,000 books	**24,000 books**	**30,000 Books**
Revenues	$1,600,000	$1,600,000	$1,600,000
Cost of goods sold	1,400,000[a]	1,400,000	1,400,000
Production volume --- *variance	0[b]	(80,000)[c]	(200,000)[d]
Net cost of goods sold	1,400,000	1,320,000	1,200,000
Gross Margin	$ 200,000	$ 280,000	$ 400,000

[a] cost per unit = ($50 + $400,000/20,000 books sold) = $70 per book
CGS = $70 × 20,000 = $1,400,000

[b] volume variance = Budgeted fixed cost – fixed overhead rate × production
$400,000 – ($20 × 20,000 books) = $0

[c] volume variance = Budgeted fixed cost – fixed overhead rate × production
$400,000 – ($20 × 24,000 books) = $80,000

[d] volume variance = Budgeted fixed cost – fixed overhead rate × production
$400,000 – ($20 × 30,000 books) = $200,000

2.

	20,000 Books	24,000 books	30,000 books
Beginning inventory	0	0	0
+ Production	20,000 books	24,000 books	30,000 books
	20,000	24,000	30,000
- Books sold	20,000	20,000	20,000
Ending inventory	0 books	4,000 books	10,000 books
× Cost per book	× $70	× $70	× $70
Cost of Ending Inventory	$0	$280,000	$700,000

3a.

	20,000 books	24,000 books	30,000 books
Gross margin	$200,000	$280,000	$400,000
Less 10% × Ending inventory	0	(28,000)	(70,000)
Adjusted gross margin	$200,000	$252,000	$330,000

While adjusting for ending inventory does to some degree mitigate the increase in inventory associated with excess production, it may be difficult to mechanically compensate for all of the increased income. In addition, it does nothing to hold the manager responsible for the poor decisions from the organization's standpoint.

3b.

	20,000 books	24,000 Books	30,000 books
1) Inventory change:			
End inventory ─ begin inventory	0	4,000 books	10,000 books
2) Excess production (%)			
Production ÷ sales	20,000 ÷ 20,000	24,000 ÷ 20,000	30,000 ÷20,000
	1.0	1.2	1.5

- A ratio of ending inventory to beginning inventory, as suggested in the book, is not possible since beginning inventory was 0, so we substituted change in inventory level.

For these non-financial measures to be useful they must be incorporated into the reward function of the manager.

9-32 (25–30 min.) **Alternative denominator-level capacity concepts, effect on operating income.**

1.

Denominator-Level Capacity Concept	Budgeted Fixed Manuf. Overhead per Period (1)	Days of Production per Period (2)	Hours of Production per Day (3)	Barrels per Hour (4)	Budgeted Denominator Level (Barrels) (5) = (2) × (3) × (4)	Budgeted Fixed Manufacturing Overhead Rate per Barrel (6) = (1) ÷ (5)
Theoretical capacity	$28,000,000	360	24	540	4,665,600	$ 6.00
Practical capacity	28,000,000	350	20	500	3,500,000	8.00
Normal capacity utilization	28,000,000	350	20	400	2,800,000	10.00
Master-budget utilization						
(a) January-June 2012	14,000,000	175	20	320	1,120,000	12.50
(b) July-December 2012	14,000,000	175	20	480	1,680,000	8.33

The differences arise for several reasons:

a. The theoretical and practical capacity concepts emphasize supply factors and are consequently higher, while normal capacity utilization and master-budget utilization emphasize demand factors.
b. The two separate six-month rates for the master-budget utilization concept differ because of seasonal differences in budgeted production.

2. Using column (6) from above,

	Per Barrel				
Denominator-Level Capacity Concept	Budgeted Fixed Mfg. Overhead Rate per Barrel (6)	Budgeted Variable Mfg. Cost Rate (7)	Budgeted Total Mfg Cost Rate (8) = (6) + (7)	Fixed Mfg. Overhead Costs Allocated (9) = 2,600,000 × (6)	Fixed Mfg. Overhead Variance (10) = $27,088,000 – (9)
Theoretical capacity	$6.00	$30.20[a]	$36.20	$15,600,000	$11,488,000 U
Practical capacity	8.00	30.20	38.20	20,800,000	6,288,000 U
Normal capacity utilization	10.00	30.20	40.20	26,000,000	1,088,000 U

[a] $78,520,000 ÷ 2,600,000 barrels

Absorption-Costing Income Statement

	Theoretical Capacity	Practical Capacity	Normal Capacity Utilization
Revenues (2,400,000 bbls. × $45 per bbl.)	$108,000,000	$108,000,000	$108,000,000
Cost of goods sold			
Beginning inventory	0	0	0
Variable mfg. costs	78,520,000	78,520,000	78,520,000
Fixed mfg. overhead costs allocated (2,600,000 units ×$6.00; $8.00; $10.00 per unit)	15,600,000	20,800,000	26,000,000
Cost of goods available for sale	94,120,000	99,320,000	104,520,000
Deduct ending inventory (200,000 units × $36.20; $38.20; $40.20 per unit)	(7,240,000)	(7,640,000)	(8,040,000)
Adjustment for variances (add: all unfavorable)	11,488,000U	6,288,000U	1,088,000U
Cost of goods sold	98,368,000	97,968,000	97,568,000
Gross margin	9,632,000	10,032,000	10,432,000
Other costs	0	0	0
Operating income	$ 9,632,000	$ 10,032,000	$ 10,432,000

9-33 (20 min.) **Motivational considerations in denominator-level capacity selection (continuation of 9-32).**

1. If the plant manager gets a bonus based on operating income, he/she will prefer the denominator-level capacity to be based on normal capacity utilization (or master-budget utilization). In times of rising inventories, as in 2012, this denominator level will maximize the fixed overhead trapped in ending inventories and will minimize COGS and maximize operating income. Of course, the plant manager cannot always hope to increase inventories every period, but on the whole, he/she would still prefer to use normal capacity utilization because the smaller the denominator, the higher the amount of overhead costs capitalized for inventory units. Thus, if the plant manager wishes to be able to "adjust" plant operating income by building inventory, normal capacity utilization (or master-budget capacity utilization) would be preferred.

2. Given the data in this question, the theoretical capacity concept reports the lowest operating income and thus (other things being equal) the lowest tax bill for 2012. Lucky Lager benefits by having deductions as early as possible. The theoretical capacity denominator-level concept maximizes the deductions for manufacturing costs.

3. The IRS may restrict the flexibility of a company in several ways:
   a. Restrict the denominator-level concept choice (to say, practical capacity).
   b. Restrict the cost line items that can be expensed rather than inventoried.
   c. Restrict the ability of a company to use shorter write-off periods or more accelerated write-off periods for inventoriable costs.
   d. Require proration or allocation of variances to represent actual costs and actual capacity used.

9-34 (25 min.) **Denominator-level choices, changes in inventory levels, effect on operating income.**

1.

	Theoretical Capacity	Practical Capacity	Normal Capacity Utilization
Denominator level in units	280,000	224,000	200,000
Budgeted fixed manuf. costs	$2,800,000	$2,800,000	$2,800,000
Budgeted fixed manuf. cost allocated per unit	$ 10.00	$ 12.50	$ 14.00
Production in units	220,000	220,000	220,000
Allocated fixed manuf. costs (production in units × budgeted fixed manuf. cost allocated per unit)	$2,200,000	$2,750,000	$3,080,000
Production volume variance (Budgeted fixed manuf. costs – allocated fixed manuf. costs)[a]	$ 600,000 U	$ 50,000 U	$ 280,000 F

[a]PVV is unfavorable if budgeted fixed manuf. costs are greater than allocated fixed costs

2.

	Theoretical Capacity	Practical Capacity	Normal Capacity Utilization
Units sold	230,000	230,000	230,000
Budgeted fixed mfg. cost allocated per unit	$10.00	$12.50	$14.00
Budgeted var. mfg. cost per unit	$ 5.00	$ 5.00	$ 5.00
Budgeted cost per unit of inventory or production	$15.00	$17.50	$19.00
ABSORPTION-COSTING BASED INCOME STATEMENTS			
Revenues ($40 selling price per unit × units sold)	$9,200,000	$9,200,000	$9,200,000
Cost of goods sold			
Beginning inventory (20,000 units × budgeted cost per unit of inventory)	300,000	350,000	380,000
Variable manufacturing costs (220,000 units ×$5 per unit)	1,100,000	1,100,000	1,100,000
Allocated fixed manufacturing overhead (220,000 units × budgeted fixed mfg. cost allocated per unit)	2,200,000	2,750,000	3,080,000
Cost of goods available for sale	3,600,000	4,200,000	4,560,000
Deduct ending inventory (10,000[b] units × budgeted cost per unit of inventory)	(150,000)	(175,000)	(190,000)
Adjustment for production-volume variance	600,000 U	50,000 U	(280,000) F
Total cost of goods sold	4,050,000	4,075,000	4,090,000
Gross margin	5,150,000	5,125,000	5,110,000
Operating costs	900,000	900,000	900,000
Operating income	$4,250,000	$4,225,000	$4,210,000

[b]Ending inventory = Beginning inventory + production – sales = 20,000 + 220,000 – 230,000 = 10,000 units
10,000 × $15.00; 10,000 × $17.50; 10,000 × $19.00

3. Koshu's 2011 beginning inventory was 20,000 units; its ending inventory was 10,000 units. So, during 2011, there was a drop of 10,000 units in inventory levels (matching the 10,000 more units sold than produced). The smaller the denominator level, the larger is the budgeted fixed cost allocated to each unit of production, and, when those units are sold (all the current production is sold, and then some), the larger is the cost of each unit sold, and the smaller is the operating income. Normal capacity utilization is the smallest capacity of the three, hence in this year, when production was less than sales, the absorption-costing based operating income is the smallest when normal capacity utilization is used as the denominator level.

4.

Reconciliation

Theoretical Capacity Operating Income – Practical Capacity Operating Income		$25,000
Decrease in inventory level during 2011	10,000	
Fixed mfg cost allocated per unit under practical capacity – fixed mfg. cost allocated per unit under theoretical capacity ($12.50 – $10)	$2.50	
Additional allocated fixed cost included in COGS under practical capacity = 10,000 units × $2.50 per unit =		$25,000

More fixed manufacturing costs are included in inventory under practical capacity, so, when inventory level decreases (as it did in 2011), more fixed manufacturing costs are included in COGS under practical capacity than under theoretical capacity, resulting in a lower operating income.

9-35 (30-35 min.) **Effects of denominator-level choice.**

1. Normal capacity utilization. Givens denoted*

Actual Costs Incurred (1)	Same Budgeted Lump Sum (as in Static Budget) Regardless of Output Level (2)	Flexible Budget: Same Budgeted Lump Sum (as in Static Budget) Regardless of Output Level (3)	Allocated: Budgeted Input Allowed for Actual Output × Budgeted Rate (4)
$90,600	$96,600*	$96,600*	37,680 hrs.* × $2.50[a] = $94,200
$6,000 F*		$2,400 U*	
Spending variance	Never a variance	Prodn. volume variance	

$$\text{Production volume variance} = \left(\text{Budgeted fixed overhead} - \text{Fixed overhead allocated using budgeted input allowed for actual output achieved}\right)$$

$$\$2{,}400 = (\$96{,}600 - X)$$

$$X = \$94{,}200$$

$$\text{a Budgeted fixed manufacturing overhead rate per unit} = \$94{,}200 \div 37{,}680 \text{ machine-hours}$$

$$= \$2.50 \text{ per machine-hour}$$

$$\text{Denominator level} = \$96{,}600 \div \$2.50 \text{ per machine-hour}$$

$$= 38{,}640 \text{ machine-hours}$$

2. Practical capacity. Givens denoted*

Actual Costs Incurred (1)	Same Lump Sum (as in Static Budget) Regardless of Budgeted Output Level (2)	Flexible Budget: Same Lump Sum (as in Static Budget) Regardless of Budgeted Output Level (3)	Allocated: Budgeted Input Allowed for Actual Output × Budgeted Rate (4)
\$90,600	\$96,600*	\$96,600*	37,680* × \$2.24[a] = \$84,400
	\$6,000 F*		\$12,200 U*
	Spending variance	Never a variance	Prodn. volume variance

$$\text{Production volume variance} = \left(\begin{array}{c}\text{Budgeted fixed overhead}\\ -\ \text{Fixed overhead allocated using budgeted input allowed for actual output achieved}\end{array}\right)$$

$$\$12{,}200 = (\$96{,}600 - X)$$

$$X = \$84{,}400$$

$$\text{[a] Budgeted manufacturing overhead rate per unit} = \$84{,}400 \div 37{,}680 \text{ machine-hours}$$

$$= \$2.24 \text{ per machine-hour}$$

$$\text{Denominator level} = \$96{,}600 \div \$2.24 \text{ per machine-hour}$$

$$= 43{,}125 \text{ machine-hours}$$

3. To maximize operating income, the executive vice president would favor using normal capacity utilization rather than practical capacity. Why? Because normal capacity utilization is a smaller base than practical capacity, resulting in any year-end inventory having a higher unit cost. Thus, less fixed manufacturing overhead would become a 2011 expense as part of the production-volume variance if normal capacity utilization were used as the denominator level.

9-36 (20 min.) **Downward demand spiral.**

1. Fixed manufacturing overhead rate = $700,000/25,000 units = $28 per unit
Manufacturing cost per unit:
$24 direct materials + $36 direct mfg. labor + $12 var. mfg. OH + $28 fixed mfg. OH = $100
Selling price: $100 × 120% = $120.00

2. Fixed manufacturing overhead rate = $700,000/20,000 units = $35 per unit
Manufacturing cost per unit:

$24 direct materials + $36 direct mfg. labor + $12 var. mfg. OH + $35 fixed mfg. OH = $107
Selling price: $107 × 120% = $128.40
By using budgeted units produced, and not practical capacity, as the denominator level, Spirelli is burdening its products with the cost of unused capacity. Apparently, the competitor has not done this, and because of its higher selling price, Spirelli's sales decline. Consequently, 2012 budgeted quantities are even lower, which increases the unit cost and selling price. This phenomenon is known as the downward demand spiral, and it causes Spirelli to continually inflate its selling price, which in turn leads to progressively lower sales.

3. Fixed manufacturing overhead rate = $700,000/50,000 units = $14 per unit
Manufacturing cost per unit:

$24 direct materials + $36 direct mfg. labor + $12 var. mfg. OH + $14 fixed mfg. OH = $86
Selling price: $86 × 120% = $103.20
If Spirelli had used practical capacity as its denominator level of activity, its initial selling price of $103.20 would have been lower than the $105.00 selling price of Spirelli's competitor, and it would likely have resulted in higher sales. Using practical capacity will result in a higher unfavorable production-volume variance, which will most likely be written off to cost of goods sold and reduce operating income. However, as sales and production increase in future years and the company "grows into" its capacity, the amount of unused capacity will be lower, resulting in future cost savings.

9-37 (35 min.) **Absorption costing and production volume variance -- alternative capacity bases**

1. Inventoriable cost per unit = Variable production cost + Fixed manufacturing overhead/Capacity

Capacity Type	Capacity Level	Fixed Mfg. Overhead	Fixed Mfg. Overhead Rate	Variable Production Cost	Inventoriable Cost Per Unit
Theoretical	725,000	$1,015,000	$1.40	$2.70	$4.10
Practical	406,000	$1,015,000	$2.50	$2.70	$5.20
Normal	290,000	$1,015,000	$3.50	$2.70	$6.20
Master Budget	175,000	$1,015,000	$5.80	$2.70	$8.50

2. EBL's actual production level is 250,000 bulbs. We can compute the production-volume variance as:

Production Volume Variance = Budgeted Fixed Mfg. Overhead
– (Fixed Mfg. Overhead Rate × Actual Production Level)

Capacity Type	Capacity Level	Fixed Mfg. Overhead	Fixed Mfg. Overhead Rate	Fixed Mfg. Overhead Rate × Actual Production	Production Volume Variance
Theoretical	725,000	$1,015,000	$1.40	$ 350,000	$665,000 U
Practical	406,000	$1,015,000	$2.50	$ 625,000	$390,000 U
Normal	290,000	$1,015,000	$3.50	$ 875,000	$140,000 U
Master Budget	175,000	$1,015,000	$5.80	$1,450,000	$435,000 F

3. Operating Income for EBL given production of 250,000 bulbs and sales of 175,000 bulbs @ $9.60 apiece:

	Theoretical	Practical	Normal	Master Budget
Revenue [a]	$1,680,000	$1,680,000	$1,680,000	$1,680,000
Less: Cost of goods sold [b]	717,500	910,000	1,085,000	1,487,500
Production-volume variance	665,000 U	390,000 U	140,000 U	(435,000)F
Gross margin	297,500	380,000	455,000	627,500
Variable selling [c]	70,000	70,000	70,000	70,000
Fixed selling	200,000	200,000	200,000	200,000
Operating income	$ 27,500	$ 110,000	$ 185,000	$ 357,500

[a] 175,000 × 9.60
[b] 175,000 × 4.10, × 5.20, × 6.20, × 8.50
[c] 175,000 × 0.40

9-38 (35 min.) **Operating income effects of denominator-level choice and disposal of production-volume variance (continuation of 9-37)**

1. Since no beginning inventories exist, if EBL sells all 250,000 bulbs manufactured, its operating income will be the same under all four capacity options. Calculations are provided below:

	Theoretical	Practical	Normal	Master Budget
Revenue [a]	$2,400,000	$2,400,000	$2,400,000	$2,400,000
Less: Cost of goods sold [b]	1,025,000	1,300,000	1,550,000	2,125,000
Production volume variance	665,000 U	390,000 U	140,000 U	(435,000) F
Gross margin	710,000	710,000	710,000	710,000
Variable selling [c]	100,000	100,000	100,000	100,000
Fixed selling	200,000	200,000	200,000	200,000
Operating income	$ 410,000	$ 410,000	$ 410,000	$ 410,000

[a] 250,000 × 9.60
[b] 250,000 × 4.10, × 5.20, × 6.20, × 8.50
[c] 250,000 × 0.40

2. If the manager of EBL produces and sells 250,000 bulbs, then all capacity levels will result in the same operating income of $410,000 (see requirement 1 above). If the manager of EBL is able to sell only 175,000 of the bulbs produced and if the production-volume variance is closed to cost of goods sold, then the operating income is given as in requirement 3 of 9-37. Both sets of numbers are reproduced below.

	Theoretical	Practical	Normal	Master Budget
Income with sales of 250,000 bulbs	$410,000	$410,000	$410,000	$410,000
Income with sales of 175,000 bulbs	27,500	110,000	185,000	357,500
Decrease in income when there is over-production	$382,500	$ 300,000	$225,000	$ 52,500

Comparing these results, it is clear that for a given level of overproduction relative to sales, the manager's performance will appear better if he/she uses as the denominator a level that is lower. In this example, setting the denominator to equal the master budget (the lowest of the four capacity levels here), minimizes the loss to the manager from being unable to sell the entire production quantity of 250,000 bulbs.

3. In this scenario, the manager of EBL produces 250,000 bulbs and sells 175,000 of them, and the production volume variance is prorated. Given the absence of ending work in process inventory or beginning inventory of any kind, the fraction of the production volume variance that is absorbed into the cost of goods sold is given by 175,000/250,000 or 7/10. The operating income under various denominator levels is then given by the following modification of the solution to requirement 3 of 9-37:

	Theoretical	**Practical**	**Normal**	**Master Budget**
Revenue	$1,680,000	$1,680,000	$1,680,000	$1,680,000
Less: Cost of goods sold	717,500	910,000	1,085,000	1,487,500
Prorated production-volume variance [a]	465,500 U	273,000 U	98,000 U	(304,500) F
Gross margin	497,000	497,000	497,000	497,000
Variable selling [b]	70,000	70,000	70,000	70,000
Fixed selling	200,000	200,000	200,000	200,000
Operating income	$ 227,000	$ 227,000	$ 227,000	$ 227,000

[a] (7/10) × 665,000, × 390,000, × 140,000, × (435,000)
[b] 175,000 × 0.40

Under the proration approach, operating income is $227,000 regardless of the denominator initially used. Thus, in contrast to the case where the production volume variance is written off to cost of goods sold, there is no temptation under the proration approach for the manager to play games with the choice of denominator level.

9-39 (25 min.) **Cost allocation, downward demand spiral.**

SOLUTION EXHIBIT 9-39

	2012 Master Budget (1)	Practical Capacity (2)	2013 Master Budget (3)
Budgeted fixed costs	$1,521,000	$1,521,000	$1,521,000
Denominator level	975,000	1,300,000	780,000
Budgeted fixed cost per meal			
Budgeted fixed costs ÷ Denominator level ($1,521,000 ÷ 975,000; $1,521,000 ÷ 1,300,000; $1,521,000 ÷ 780,000)	$ 1.56	$ 1.17	$ 1.95
Budgeted variable cost per meal	4.90	4.90	4.90
Total budgeted cost per meal	$ 6.46	$ 6.07	$ 6.85

1. The 2012 budgeted fixed costs are $1,521,000. Mealman budgets for 975,000 meals in 2012, and this is used as the denominator level to calculate the fixed cost per meal. $1,521,000 ÷ 975,000 = $1.56 fixed cost per meal. (see column (1) in Solution Exhibit 9-39).

2. In 2013, 3 hospitals have dropped out of the purchasing group and the master budget is 780,000 meals. If this is used as the denominator level, fixed cost per meal = $1,521,000 ÷ 780,000 = $1.95 per meal, and the total budgeted cost per meal would be $6.85 (see column (3) in Solution Exhibit 9-39). If the hospitals have already been complaining about quality and cost and are allowed to purchase from outside, they will not accept this higher price. More hospitals may begin to purchase meals from outside the system, leading to a downward demand spiral, possibly putting Mealman out of business.

3. The basic problem is that Mealman has excess capacity and the associated excess fixed costs. If Smith uses the practical capacity of 1,300,000 meals as the denominator level, the fixed cost per meal will be $1.17 (see column (2) in Solution Exhibit 9-39), and the total budgeted cost per meal would be $6.07, probably a more acceptable price to the customers (it may even draw back the three hospitals that have chosen to buy outside). This denominator level will also isolate the cost of unused capacity and not allocate it to the meals produced. To make the $6.07 price per meal profitable in the long run, Smith will have to find ways to either use the extra capacity or reduce Mealman's practical capacity and the related fixed costs.

9-40 (20 min.) **Cost allocation, responsibility accounting, ethics (continuation of 9-39).**

1. (See Solution Exhibit 9-39). If Mealman uses the rate based on its master budget capacity utilization to allocate fixed costs in 2013, it would allocate 760,500 × $1.95 = $1,482,975. Budgeted fixed costs are $1,521,000. Therefore, the production volume variance = $1,521,000 – $1,482,795 = $38,025 U. An unfavorable production volume variance will reduce operating income by this amount. (Note: in this business, there are no inventories. All variances are written off to cost of goods sold).

2. Hospitals are charged a budgeted variable cost rate and allocated budgeted fixed costs. By overestimating budgeted meal counts, the denominator-level is larger, hence the amount charged to individual hospitals is lower. Consider 2013 where the budgeted fixed cost rate is computed as follows:

$1,521,000/780,000 meals = $1.95 per meal

If in fact, the hospital administrators had better estimated and revealed their true demand (say, 760,500 meals), the allocated fixed cost per meal would have been

$1,521,000/760,500 meals = $2.00 per meal, 2.6% higher than the $1.95 per meal.

Hence, by deliberately overstating budgeted meal count, hospitals are able to reduce the price charged by Mealman for each meal. In this scheme, Mealman bears the downside risk of demand overestimates.

3. Evidence that could be collected include:

(a) Budgeted meal-count estimates and actual meal-count figures each year for each hospital controller. Over an extended time period, there should be a sizable number of both underestimates and overestimates. Controllers could be ranked on both their percentage of overestimation and the frequency of their overestimation.

(b) Look at the underlying demand estimates by patients at individual hospitals. Each hospital controller has other factors (such as hiring of nurses) that give insight into their expectations of future meal-count demands. If these factors are inconsistent with the meal-count demand figures provided to the central food-catering facility, explanations should be sought.

4. (a) Highlight the importance of a corporate culture of honesty and openness. Cayzer could institute a Code of Ethics that highlights the upside of individual hospitals providing honest estimates of demand (and the penalties for those who do not).

(b) Have individual hospitals contract in advance for their budgeted meal count. Unused amounts would be charged to each hospital at the end of the accounting period. This approach puts a penalty on hospital administrators who overestimate demand.

(c) Use an incentive scheme that has an explicit component for meal-count forecasting accuracy. Each meal-count "forecasting error" would reduce the bonus by $0.05. Thus, if a hospital bids for 292,000 meals and actually uses 200,000 meals, its bonus would be reduced by $0.05 × (292,000 – 200,000) = $4,600.

Collaborative Learning Problem

9-41 (60 min.) **Absorption, variable, and throughput costing; performance evaluation**

NOTE: This problem can be broken up, with parts 1, 2, and 3 assigned to 3 or 6 different group members. The group members may reconvene to discuss parts 4 and 5.

(1) a. Absorption Costing with leased truck and salaried driver

	April 2011		May 2011		June 2011	
Revenues[a]		$72,000		$75,000		$78,000
Cost of goods sold						
Beginning inventory[b]	$ 0		$ 540		$15,390	
Variable manufacturing costs[c]	20,740		30,600		15,300	
Allocated fixed manufacturing costs[d]	12,200		18,000		9,000	
Cost of goods available for sale	32,940		49,140		39,690	
Deduct ending inventory[e]	(540)		(15,390)		(4,590)	
Adjustment for prod. vol. var.[f]	7,800 U		2,000 U		11,000 U	
Cost of goods sold		40,200		35,750		46,100
Gross margin		31,800		39,250		31,900
Fixed administrative costs		28,000		28,000		28,000
Operating income		$ 3,800		$11,250		$ 3,900

[a] $6.00 × 12,000, 12,500, 13,000
[b] Fixed overhead rate: $20,000 ÷ 20,000 practical capacity = $1.00/box; Cost per box: $1.20 + 0.35 + 0.15 + 1.00 = $2.70; Beginning inventory: $2.70 × 0; $2.70(0+12,200-12,000); $2.70(200+18,000-12,500)
[c] $1.70 × 12,200, 18,000, 9,000
[d] $1.00 × 12,200, 18,000, 9,000
[e] $2.70 × (12,200 – 12,000); $2.70 × (200 + 18,000 – 12,500); $2.70 × (5,700 + 9,000 – 13,000)
[f] $20,000 – 12,200; $20,000 – 18,000; $20,000 – 9,000

b. Absorption Costing with variable delivery service

	April 2011		May 2011		June 2011	
Revenues[a]		$72,000		$75,000		$78,000
Cost of goods sold						
Beginning inventory[b]	$ 0		$ 570		$ 16,245	
Variable manufacturing costs[c]	25,620		37,800		18,900	
Allocated fixed manufacturing costs[d]	9,150		13,500		6,750	
Cost of goods available for sale	34,770		51,870		41,895	
Deduct ending inventory[e]	(570)		(16,245)		(4,845)	
Adjustment for prod. vol. var.[f]	5,850 U		1,500 U		8,250 U	
Cost of goods sold		40,050		37,125		45,300
Gross margin		31,950		37,875		32,700
Fixed administrative costs		28,000		28,000		28,000
Operating income		$ 3,950		$ 9,875		$ 4,700

[a] $6.00 × 12,000, 12,500, 13,000

[b] Fixed overhead rate: $15,000 ÷ 20,000 practical capacity = $0.75/box; Cost per box: $1.20 + 0.35 + 0.15 + 0.40 + 0.75 = $2.85; Beginning inventory: $2.85 × 0; $2.85 × (0 + 12,200 – 12,000); $2.85 × (200 + 18,000 – 12,500)

[c] $2.10 × 12,200, 18,000, 9,000

[d] $0.75 × 12,200, 18,000, 9,000

[e] $2.85 × (12,200 – 12,000); $2.85 × (200 + 18,000 – 12,500); $2.85 × (5,700 + 9,000 – 13,000)

[f] $15,000 – 9,150; $15,000 – 13,500; $15,000 – 6,750

(2) a. Variable Costing with leased truck and salaried driver

	April 2011		May 2011		June 2011	
Revenues[a]		$72,000		$75,000		$78,000
Variable costs						
Beginning inventory[b]	$ 0		$ 340		$ 9,690	
Variable manufacturing costs[c]	20,740		30,600		15,300	
Cost of goods available for sale	20,740		30,940		24,990	
Deduct ending inventory	(340)		(9,690)		(2,890)	
Variable cost of goods sold		20,400		21,250		22,100
Contribution margin		51,600		53,750		55,900
Fixed costs						
Fixed manufacturing costs[d]	20,000		20,000		20,000	
Fixed administrative costs	28,000		28,000		28,000	
Total fixed costs		48,000		48,000		48,000
Operating income		$ 3,600		$ 5,750		$ 7,900

[a] $6 × 12,000, 12,500, 13,000

[b] $0; $1.70 × (0 + 12,200 – 12,000): $1.70 × (200 + 18,000 – 12,500)

[c] $1.70 × 12,200, 18,000, 9,000

[d] $15,000 + $5,000

b. Variable Costing with variable delivery service[a]

	April 2011		May 2011		June 2011	
Revenues		$72,000		$75,000		$78,000
Variable costs						
Beginning inventory	$ 0		$ 420		$ 11,970	
Variable manufacturing costs	25,620		37,800		18,900	
Cost of goods available for sale	25,620		38,220		30,870	
Deduct ending inventory	(420)		(11,970)		(3,570)	
Variable cost of goods sold		25,200		26,250		27,300
Contribution margin		46,800		48,750		50,700
Fixed costs						
Fixed manufacturing costs[d]	15,000		15,000		15,000	
Fixed administrative costs	28,000		28,000		28,000	
Total fixed costs		43,000		43,000		43,000
Operating income		$ 3,800		$ 5,750		$ 7,700

[a] Variable cost per unit: $1.70 + $0.40 = $2.10

(3) a. Throughput costing with leased truck and salaried driver

	April 2011		May 2011		June 2011	
Revenues		$72,000		$75,000		$78,000
Direct material cost of goods sold						
Beginning inventory[a]	$ 0		$ 240		$ 6,840	
Direct materials in goods manufactured[b]	14,640		21,600		10,800	
Cost of goods available for sale	14,640		21,840		17,640	
Deduct ending inventory[c]	(240)		(6,840)		(2,040)	
Total direct material cost of goods sold		14,400		15,000		15,600
Throughput margin		57,600		60,000		62,400
Other costs						
Manufacturing[d]	26,100		29,000		24,500	
Administrative	28,000		28,000		28,000	
Total other costs		54,100		57,000		52,500
Operating income		$ 3,500		$ 3,000		$ 9,900

[a] $0; $1.20 × (0 + 12,200 – 12,000): $1.20 × (200 + 18,000 – 12,500)
[b] $1.20 × 12,200, 18,000, 9,000
[c] $1.20 × 200; $1.20 × (200 + 18,000 – 12,500); $1.20× (5,700 + 9,000 + 13,000)
[d] ($0.50 × 12,200) + $20,000; ($0.50 × 18,000) + $20,000; ($0.50 × 9,000) + $20,000

b. Throughput costing with variable delivery service

	April 2011		May 2011		June 2011	
Revenues		$72,000		$75,000		$78,000
Direct material cost of goods sold						
Beginning inventory[a]	$ 0		$ 240		$ 6,840	
Direct materials in goods manufactured[b]	14,640		21,600		10,800	
Cost of goods available for sale	14,640		21,840		17,640	
Deduct ending inventory[c]	(240)		(6,840)		(2,040)	
Total direct material cost of goods sold		14,400		15,000		15,600
Throughput margin		57,600		60,000		62,400
Other costs						
Manufacturing[d]	25,980		31,200		23,100	
Administrative	28,000		28,000		28,000	
Total other costs		53,980		59,200		51,100
Operating income		$ 3,620		$ 800		$11,300

[a] $0; $1.20 × (0 + 12,200 – 12,000): $1.20 × (200 + 18,000 – 12,500)
[b] $1.20 × 12,200, 18,000, 9,000
[c] $1.20 × 200; $1.20 × (200 + 18,000 – 12,500); $1.20 × (5,700 + 9,000 + 13,000)
[d] ($0.90 × 12,200) + $15,000; ($0.90 × 18,000) + $15,000; ($0.90 × 9,000) + $15,000

4. Variable costing seems to be the best method to use in this situation, given that the fluctuations in production are due to planning for actual needs and not due to irresponsible buildup of inventories. Actual costs of the inventory produced are not fluctuating, and sales are steadily increasing. Therefore, the method that reflects that steady increase in sales as a steady increase in operating income is the most realistic portrayal of the managers' performance. In the case of absorption costing, operating income is unrealistically high in May and low in June, and the reverse is true with throughput costing.

The benefit of using throughput costing is that net income is reduced if managers produce more units than they can sell. By treating all costs, except direct material costs, as period costs, the income statement expenses not only the cost of goods sold but also the direct labor and variable overhead costs associated with units in ending inventory. So reported income is reduced by the cost of unnecessary production. Throughput costing may be considered superior to variable costing because not only is management not rewarded for producing more than can be sold, they are penalized for excess production. In this example, income is highest when management produced less than demand and therefore reduced inventory that already existed. However, the company does not wish to penalize managers for a necessary temporary buildup of inventory, such as in this case.

5. Because the company is forecasting future growth, the leased truck and salaried driver seem to be the best solution. By June, the total variable cost of the delivery service (based on sales volume in that month) has already exceeded $5,000, the fixed cost of the truck and driver. Had the company not been confident about the potential for the future, however, the delivery service may have been a good choice, at least at the beginning.