

# Chapter 7

## Variable Costing: A Tool for Management

### Solutions to Questions

**7-1** The basic difference between absorption and variable costing is due to the handling of fixed manufacturing overhead. Under absorption costing, fixed manufacturing overhead is treated as a product cost and hence is an asset until products are sold. Under variable costing, fixed manufacturing overhead is treated as a period cost and is charged in full against the current period's income.

**7-2** Selling and administrative expenses are treated as period costs under both variable costing and absorption costing.

**7-3** Under absorption costing, fixed manufacturing overhead costs are included in product costs, along with direct materials, direct labor, and variable manufacturing overhead. If some of the units are not sold by the end of the period, then they are carried into the next period as inventory. The fixed manufacturing overhead cost attached to the units in ending inventory follow the units into the next period as part of their inventory cost. When the units carried over as inventory are finally sold, the fixed manufacturing overhead cost that has been carried over with the units is included as part of that period's cost of goods sold.

**7-4** Absorption costing advocates believe that absorption costing does a better job of matching costs with revenues than variable costing. They argue that all manufacturing costs must be assigned to products to properly match the costs of producing units of product with the revenues from the units when they are sold. They believe that no distinction should be made between variable and fixed manufacturing costs for the purposes of matching costs and revenues.

**7-5** Advocates of variable costing argue that fixed manufacturing costs are not really the cost of any particular unit of product. If a unit is made or not, the total fixed manufacturing costs will be exactly the same. Therefore, how can one say that these costs are part of the costs of the products? These costs are incurred to have the capacity to make products during a particular period and should be charged against that period as period costs according to the matching principle.

**7-6** If production and sales are equal, net operating income should be the same under absorption and variable costing. When production equals sales, inventories do not increase or decrease and therefore under absorption costing fixed manufacturing overhead cost cannot be deferred in inventory or released from inventory.

**7-7** If production exceeds sales, absorption costing will usually show higher net operating income than variable costing. When production exceeds sales, inventories increase and therefore under absorption costing part of the fixed manufacturing overhead cost of the current period will be deferred in inventory to the next period. In contrast, all of the fixed manufacturing overhead cost of the current period will be charged immediately against income as a period cost under variable costing.

**7-8** If fixed manufacturing overhead cost is released from inventory, then inventory levels must have decreased and therefore production must have been less than sales.

**7-9** Inventory decreased. The decrease resulted in fixed manufacturing overhead cost being released from inventory and charged against income as part of cost of goods sold. This added fixed manufacturing overhead cost resulted in a

loss even though the company operated at its breakeven.

**7-10** Under absorption costing it is possible to increase net operating income simply by increasing the level of production without any increase in sales. If production exceeds sales, units of product are added to inventory. These units carry a portion of the current period's fixed manufacturing overhead costs into the inventory account, thereby reducing the current period's reported expenses and causing net operating income to increase.

**7-11** Generally speaking, variable costing cannot be used externally for financial reporting purposes nor can it be used for tax purposes. It can, however, be used in internal reports.

**7-12** Differences in reported net operating income between absorption and variable costing arise because of changing levels of inventory. Under JIT, goods are produced strictly to customers' orders. With production geared to sales, inventories are largely (or entirely) eliminated. If inventories are completely eliminated, they cannot change from one period to another and absorption costing and variable costing will report the same net operating income.

**Exercise 7-1 (15 minutes)**

(Note: All currency values are in thousands of rupiah.)

1. Under absorption costing, all manufacturing costs (variable and fixed) are included in product costs.

Direct materials .....	Rp100
Direct labor .....	320
Variable manufacturing overhead .....	40
Fixed manufacturing overhead (Rp60,000 ÷ 250 units) ....	<u>240</u>
Unit product cost .....	<u>Rp700</u>

2. Under variable costing, only the variable manufacturing costs are included in product costs.

Direct materials .....	Rp100
Direct labor .....	320
Variable manufacturing overhead .....	<u>40</u>
Unit product cost .....	<u>Rp460</u>

Note that selling and administrative expenses are not treated as product costs under either absorption or variable costing; that is, they are not included in the costs that are inventoried. These expenses are always treated as period costs and are charged against the current period's revenue.

**Exercise 7-2 (30 minutes)**

(Note: All currency values are in thousands of rupiah.)

- 25 units × Rp240 per unit fixed manufacturing overhead per unit = Rp6,000
- The variable costing income statement appears below:

Sales.....		Rp191,250
Less variable expenses:		
Variable cost of goods sold:		
Beginning inventory .....	Rp	0
Add variable manufacturing costs (250 units × Rp460 per unit).....		<u>115,000</u>
Goods available for sale.....		115,000
Less ending inventory (25 units × Rp460 per unit) .....		<u>11,500</u>
Variable cost of goods sold* .....		103,500
Variable selling and administrative expenses (225 units × Rp20 per unit) .....		<u>4,500</u>
Contribution margin .....		<u>83,250</u>
Less fixed expenses:		
Fixed manufacturing overhead.....	60,000	
Fixed selling and administrative expenses.....	<u>20,000</u>	<u>80,000</u>
Net operating income .....		<u><u>Rp 3,250</u></u>

\* The variable cost of goods sold could be computed more simply as:  
225 units sold × Rp460 per unit = Rp103,500.

The difference in net operating income between variable and absorption costing can be explained by the deferral of fixed manufacturing overhead cost in inventory that has taken place under the absorption costing approach. Note from part (1) that Rp6,000 of fixed manufacturing overhead cost has been deferred in inventory to the next period. Thus, net operating income under the absorption costing approach is Rp6,000 higher than it is under variable costing.

**Exercise 7-3 (20 minutes)**

1.	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>
Beginning inventories (units) .....	200	170	180
Ending inventories (units) .....	<u>170</u>	<u>180</u>	<u>220</u>
Change in inventories (units) .....	<u>(30)</u>	<u>10</u>	<u>40</u>
Variable costing net operating income .....	\$1,080,400	\$1,032,400	\$996,400
Add: Fixed manufacturing overhead cost deferred in inventory under absorption costing (10 units × \$560 per unit; 40 units × \$560 per unit) .....		5,600	22,400
Deduct: Fixed manufacturing overhead cost released from inventory under absorption costing (30 units × \$560 per unit) .....	<u>(16,800)</u>		
Absorption costing net operating income .....	<u>\$1,063,600</u>	<u>\$1,038,000</u>	<u>\$1,018,800</u>

2. Since absorption costing net operating income was greater than variable costing net operating income in Year 4, inventories must have increased during the year and hence fixed manufacturing overhead was deferred in inventories. The amount of the deferral is just the difference between the two net operating incomes or \$28,000 = \$1,012,400 – \$984,400.

**Exercise 7-4 (30 minutes)**

1. a. By assumption, the unit selling price, unit variable costs, and total fixed costs are constant from year to year. Consequently, variable costing net operating income will vary with sales. If sales increase, variable costing net operating income will increase. If sales decrease, variable costing net operating income will decrease. If sales are constant, variable costing net operating income will be constant. Since variable costing net operating income was \$510,600 each year, unit sales must have been the same in each year.

The same is not true of absorption costing net operating income. Sales and absorption costing net operating income do not necessarily move in the same direction since changes in inventories also affect absorption costing net operating income.

- b. When variable costing net operating income exceeds absorption costing net operating income, sales exceed production. Inventories shrink and fixed manufacturing overhead costs are released from inventories. In contrast, when variable costing net operating income is less than absorption costing net operating income, production exceeds sales. Inventories grow and fixed manufacturing overhead costs are deferred in inventories. The year-by-year effects are shown below.

<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>	<i>Year 4</i>
Variable costing NOI < Absorption costing NOI	Variable costing NOI < Absorption costing NOI	Variable costing NOI > Absorption costing NOI	Variable costing NOI > Absorption costing NOI
Production > Sales	Production > Sales	Production < Sales	Production < Sales
Inventories grow	Inventories grow	Inventories shrink	Inventories shrink

**Exercise 7-4 (continued)**

2. a. As discussed in part (1 a) above, unit sales and variable costing net operating income move in the same direction when unit selling prices and the cost structure are constant. Since variable costing net operating income varied from year to year, unit sales must have also varied from year to year. This is true even though the absorption costing net operating income was the same for all four years. How can that be? By manipulating production (and inventories) it may be possible for some time to keep absorption costing net operating income rock steady or on an upward path even though unit sales fluctuate from year to year. However, if this is done in the face of falling sales, eventually inventories will grow to be so large that they cannot be ignored.
- b. As stated in part (1 b) above, when variable costing net operating income exceeds absorption costing net operating income, sales exceed production. Inventories shrink and fixed manufacturing overhead costs are released from inventories. In contrast, when variable costing net operating income is less than absorption costing net operating income, production exceeds sales. Inventories grow and fixed manufacturing overhead costs are deferred in inventories. The year-by-year effects are shown below.

<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>	<i>Year 4</i>
Variable costing NOI > Absorption costing NOI	Variable costing NOI > Absorption costing NOI	Variable costing NOI < Absorption costing NOI	Variable costing NOI < Absorption costing NOI
Production < Sales	Production < Sales	Production > Sales	Production > Sales
Inventories shrink	Inventories shrink	Inventories grow	Inventories grow

### Exercise 7-4 (continued)

3. Variable costing appears to provide a much better picture of economic reality than absorption costing in the examples above. In the first case, absorption costing net operating income fluctuates wildly even though unit sales are the same each year and there are no changes in unit selling prices, unit variable costs, or total fixed costs. In the second case, absorption costing net operating income is rock steady from year to year even though unit sales fluctuate significantly. Absorption costing is much more subject to manipulation than variable costing. Simply by changing production levels (and thereby deferring or releasing costs from inventory) absorption costing net operating income can be manipulated upward or downward.

Note: This exercise is based on the following data:

Common data:

Annual fixed manufacturing costs .....	\$1,436,400
Contribution margin per unit .....	\$130
Annual fixed SGA costs .....	\$653,000

Part 1:

	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>	<i>Year 4</i>
Beginning inventory...	500	1,500	3,500	2,500
Production .....	21,000	22,000	19,000	18,000
Sales .....	20,000	20,000	20,000	20,000
Ending .....	1,500	3,500	2,500	500
Variable costing net operating income ..	\$510,600	\$510,600	\$510,600	\$510,600
Fixed manufacturing overhead in beginning inventory* .....	\$35,910	\$102,600	\$228,518	\$189,000
Fixed manufacturing overhead in ending inventory .....	\$102,600	\$228,518	\$189,000	\$39,900
Absorption costing net operating income ..	\$577,290	\$636,518	\$471,082	\$361,500



**Exercise 7-4 (continued)**

Part 2:

	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>	<i>Year 4</i>
Beginning inventory...	6,000	2,000	1,775	5,463
Production .....	18,000	20,775	22,688	20,936
Sales .....	22,000	21,000	19,000	20,000
Ending .....	2,000	1,775	5,463	6,399
Variable costing net operating income ..	\$770,600	\$640,600	\$380,600	\$510,600
Fixed manufacturing overhead in begin- ning inventory* .....	\$326,455	\$159,600	\$122,745	\$345,890
Fixed manufacturing overhead in ending inventory .....	\$159,600	\$122,745	\$345,890	\$439,035
Absorption costing net operating income ..	\$603,745	\$603,745	\$603,745	\$603,745

\* Fixed manufacturing overhead in beginning inventory is assumed in both parts 1 and 2 for Year 1. A FIFO inventory flow assumption is used.

**Exercise 7-5 (30 minutes)**

1. a. The unit product cost under absorption costing would be:

Direct materials .....	\$ 6
Direct labor .....	9
Variable manufacturing overhead .....	<u>3</u>
Total variable costs .....	18
Fixed manufacturing overhead (\$300,000 ÷ 25,000 units) .	<u>12</u>
Unit product cost .....	<u>\$30</u>

b. The absorption costing income statement:

Sales (20,000 units × \$50 per unit) .....		\$1,000,000
Less cost of goods sold:		
Beginning inventory .....	\$ 0	
Add cost of goods manufactured		
(25,000 units × \$30 per unit) .....	<u>750,000</u>	
Goods available for sale .....	750,000	
Less ending inventory		
(5,000 units × \$30 per unit) .....	<u>150,000</u>	<u>600,000</u>
Gross margin .....		400,000
Less selling and administrative expenses		
[(20,000 units × \$4 per unit) + \$190,000] ..		<u>270,000</u>
Net operating income .....		<u>\$ 130,000</u>

**Exercise 7-5 (continued)**

2. a. The unit product cost under variable costing would be:

Direct materials .....	\$ 6
Direct labor .....	9
Variable manufacturing overhead ..	<u>3</u>
Unit product cost .....	<u><u>\$18</u></u>

b. The variable costing income statement:

Sales (20,000 units × \$50 per unit).....		\$1,000,000
Less variable expenses:		
Variable cost of goods sold:		
Beginning inventory .....	\$ 0	
Add variable manufacturing costs		
(25,000 units × \$18 per unit).....	<u>450,000</u>	
Goods available for sale.....	450,000	
Less ending inventory		
(5,000 units × \$18 per unit) .....	<u>90,000</u>	
Variable cost of goods sold.....	360,000 *	
Variable selling expense		
(20,000 units × \$4 per unit) .....	<u>80,000</u>	<u>440,000</u>
Contribution margin .....		560,000
Less fixed expenses:		
Fixed manufacturing overhead .....	300,000	
Fixed selling and administrative expense ...	<u>190,000</u>	<u>490,000</u>
Net operating income.....		<u><u>\$ 70,000</u></u>

\*The variable cost of goods sold could be computed more simply as:  
 20,000 units × \$18 per unit = \$360,000.

**Exercise 7-6 (20 minutes)**

1. Sales (35,000 units × \$25 per unit) .....		\$875,000
Less variable expenses:		
Variable cost of goods sold		
(35,000 units × \$12 per unit*).....	\$420,000	
Variable selling and administrative expenses		
(35,000 units × \$2 per unit) .....	<u>70,000</u>	<u>490,000</u>
Contribution margin .....		385,000
Less fixed expenses:		
Fixed manufacturing overhead.....	160,000	
Fixed selling and administrative expenses.....	<u>210,000</u>	<u>370,000</u>
Net operating income .....		<u>\$ 15,000</u>
* Direct materials .....	\$ 5	
Direct labor .....	6	
Variable manufacturing overhead.....	<u>1</u>	
Total variable manufacturing cost.....	<u>\$12</u>	

2. The difference in net operating income can be explained by the \$20,000 in fixed manufacturing overhead deferred in inventory under the absorption costing method:

Variable costing net operating income.....	\$15,000
Add: Fixed manufacturing overhead cost deferred in	
inventory under absorption costing: 5,000 units ×	
\$4 per unit in fixed manufacturing cost .....	<u>20,000</u>
Absorption costing net operating income.....	<u>\$35,000</u>

**Exercise 7-7 (20 minutes)**

1. The company is using variable costing. The computations are:

	<i>Variable Costing</i>	<i>Absorption Costing</i>
Direct materials .....	\$ 9	\$ 9
Direct labor .....	10	10
Variable manufacturing overhead ....	5	5
Fixed manufacturing overhead (\$150,000 ÷ 25,000 units) .....	<u>—</u>	<u>6</u>
Unit product cost .....	<u>\$24</u>	<u>\$30</u>
Total cost, 3,000 units .....	<u>\$72,000</u>	<u>\$90,000</u>

2. a. No, \$72,000 is not the correct figure to use, since variable costing is not generally accepted for external reporting purposes or for tax purposes.

b. The Finished Goods inventory account should be stated at \$90,000, which represents the absorption cost of the 3,000 unsold units. Thus, the account should be increased by \$18,000 for external reporting purposes. This \$18,000 consists of the amount of fixed manufacturing overhead cost that is allocated to the 3,000 unsold units under absorption costing:

$$3,000 \text{ units} \times \$6 \text{ per unit fixed manufacturing overhead cost} = \$18,000$$

**Exercise 7-8 (30 minutes)**

1. Under variable costing, only the variable manufacturing costs are included in product costs.

Direct materials .....	\$ 50
Direct labor .....	80
Variable manufacturing overhead ...	<u>20</u>
Unit product cost .....	<u>\$150</u>

Note that selling and administrative expenses are not treated as product costs; that is, they are not included in the costs that are inventoried. These expenses are always treated as period costs and are charged against the current period's revenue.

2. The variable costing income statement appears below:

Sales.....		\$3,990,000
Less variable expenses:		
Variable cost of goods sold:		
Beginning inventory .....	\$ 0	
Add variable manufacturing costs		
(20,000 units × \$150 per unit) .....	<u>3,000,000</u>	
Goods available for sale.....	3,000,000	
Less ending inventory		
(1,000 units × \$150 per unit).....	<u>150,000</u>	
Variable cost of goods sold* .....	2,850,000	
Variable selling and administrative expenses		
(19,000 units × \$10 per unit) .....	<u>190,000</u>	<u>3,040,000</u>
Contribution margin .....		950,000
Less fixed expenses:		
Fixed manufacturing overhead.....	700,000	
Fixed selling and administrative expenses.....	<u>285,000</u>	<u>985,000</u>
Net operating loss.....		<u>\$ (35,000)</u>

\* The variable cost of goods sold could be computed more simply as:  
 19,000 units sold × \$150 per unit = \$2,850,000.

**Exercise 7-8 (continued)**

3. The break-even point in units sold can be computed using the contribution margin per unit as follows:

Selling price per unit.....	\$210
Variable cost per unit.....	<u>160</u>
Contribution margin per unit ....	<u>\$ 50</u>

$$\begin{aligned}\text{Break-even unit sales} &= \frac{\text{Fixed expenses}}{\text{Unit contribution margin}} \\ &= \frac{\$985,000}{\$50 \text{ per unit}} = 19,700 \text{ units}\end{aligned}$$

**Exercise 7-9 (20 minutes)**

1. Under absorption costing, all manufacturing costs (variable and fixed) are included in product costs.

Direct materials .....	\$ 50
Direct labor .....	80
Variable manufacturing overhead .....	20
Fixed manufacturing overhead (\$700,000 ÷ 20,000 units) ..	<u>35</u>
Unit product cost .....	<u>\$185</u>

2. The absorption costing income statement appears below:

Sales (19,000 units × \$210 per unit) .....		\$3,990,000
Cost of goods sold:		
Beginning inventory .....	\$	0
Add cost of goods manufactured (20,000 units × \$185 per unit) .....		<u>3,700,000</u>
Goods available for sale .....		3,700,000
Less ending inventory (1,000 units × \$185 per unit) .....		<u>185,000</u>
Gross margin .....		3,515,000
Less selling and administrative expenses:		475,000
Variable selling and administrative expenses (19,000 units × \$10 per unit) .....		190,000
Fixed selling and administrative expenses .....		<u>285,000</u>
Net operating income .....		<u>\$ 0</u>

Note: The company apparently has exactly zero net operating income even though its sales are below the break-even point computed in Exercise 7-8. This occurs because \$35,000 of fixed manufacturing overhead has been deferred in inventory and does not appear on the income statement prepared using absorption costing.



**Problem 7-10 (45 minutes)**

1. a. The unit product cost under absorption costing is:

Direct materials .....	\$20
Direct labor .....	8
Variable manufacturing overhead .....	2
Fixed manufacturing overhead ( $\$100,000 \div 10,000$ units) ....	<u>10</u>
Unit product cost .....	<u>\$40</u>

b. The absorption costing income statement is:

Sales (8,000 units $\times$ \$75 per unit).....		\$600,000
Less cost of goods sold:		
Beginning inventory .....	\$	0
Add cost of goods manufactured		
(10,000 units $\times$ \$40 per unit) .....	<u>400,000</u>	
Goods available for sale .....		400,000
Less ending inventory		
(2,000 units $\times$ \$40 per unit) .....	<u>80,000</u>	<u>320,000</u>
Gross margin .....		280,000
Less selling and administrative expenses		
[(8,000 units $\times$ \$6 per unit) + \$200,000] .....		<u>248,000</u>
Net operating income .....		<u>\$ 32,000</u>

2. a. The unit product cost under absorption costing is:

Direct materials .....	\$20
Direct labor .....	8
Variable manufacturing overhead ....	<u>2</u>
Unit product cost .....	<u>\$30</u>

**Problem 7-10 (continued)**

b. The variable costing income statement is:

Sales (8,000 units × \$75 per unit) .....		\$600,000
Less variable expenses:		
Variable cost of goods sold:		
Beginning inventory .....	\$	0
Add variable manufacturing costs		
(10,000 units × \$30 per unit).....		<u>300,000</u>
Goods available for sale .....		300,000
Less ending inventory		
(2,000 units × \$30 per unit) .....		<u>60,000</u>
Variable cost of goods sold.....		240,000
Variable selling expenses		
(8,000 units × \$6 per unit).....		<u>48,000</u>
Contribution margin .....		<u>312,000</u>
Less fixed expenses:		
Fixed manufacturing overhead .....	100,000	
Fixed selling and administrative expenses .....	<u>200,000</u>	<u>300,000</u>
Net operating income.....		<u>\$ 12,000</u>

3. The difference in the ending inventory relates to a difference in the handling of fixed manufacturing overhead costs. Under variable costing, these costs have been expensed in full as period costs. Under absorption costing, these costs have been added to units of product at the rate of \$10 per unit ( $\$100,000 \div 10,000$  units produced = \$10 per unit). Thus, under absorption costing a portion of the \$100,000 fixed manufacturing overhead cost for the month has been added to the inventory account rather than expensed on the income statement:

Added to the ending inventory		
(2,000 units × \$10 per unit).....	\$	20,000
Expensed as part of cost of goods sold		
(8,000 units × \$10 per unit).....		<u>80,000</u>
Total fixed manufacturing overhead cost for the month...		<u>\$100,000</u>

**Problem 7-10** (continued)

Since \$20,000 of fixed manufacturing overhead cost has been deferred in inventory under absorption costing, the net operating income reported under that costing method is \$20,000 higher than the net operating income under variable costing, as shown in parts (1) and (2) above.

**Problem 7-11 (30 minutes)**

1. The unit product cost under the variable costing method is computed as follows:

Direct materials .....	\$ 4
Direct labor .....	7
Variable manufacturing overhead ...	<u>1</u>
Unit product cost .....	<u>\$12</u>

With this figure, the variable costing income statements can be prepared:

	<i>Year 1</i>	<i>Year 2</i>
Sales.....	<u>\$1,000,000</u>	<u>\$1,250,000</u>
Less variable expenses:		
Variable cost of goods sold (@ \$12 per unit).....	480,000	600,000
Variable selling and administrative ex- penses (@ \$2 per unit).....	<u>80,000</u>	<u>100,000</u>
Total variable expenses.....	<u>560,000</u>	<u>700,000</u>
Contribution margin .....	<u>440,000</u>	<u>550,000</u>
Less fixed expenses:		
Fixed manufacturing overhead.....	270,000	270,000
Fixed selling and administrative expenses ....	<u>130,000</u>	<u>130,000</u>
Total fixed expenses.....	<u>400,000</u>	<u>400,000</u>
Net operating income .....	<u>\$ 40,000</u>	<u>\$ 150,000</u>

2. The reconciliation of absorption and variable costing follows:

	<i>Year 1</i>	<i>Year 2</i>
Variable costing net operating income.....	\$40,000	\$150,000
Add: Fixed manufacturing overhead de- ferred in inventory under absorption cost- ing (5,000 units × \$6 per unit) .....	30,000	
Deduct: Fixed manufacturing overhead re- leased from inventory under absorption costing (5,000 units × \$6 per unit) .....		<u>(30,000)</u>
Absorption costing net operating income.....	<u>\$70,000</u>	<u>\$120,000</u>

**Problem 7-12 (60 minutes)**

1. a.	Direct materials .....	\$ 3.50	
	Direct labor .....	12.00	
	Variable manufacturing overhead .....	1.00	
	Fixed manufacturing overhead ( $\$300,000 \div 30,000$ units) .....	<u>10.00</u>	
	Unit product cost .....	<u>\$26.50</u>	
b.	Sales (28,000 units) .....		\$1,120,000
	Less cost of goods sold:		
	Beginning inventory .....	\$ 0	
	Add cost of goods manufactured (30,000 units $\times$ \$26.50 per unit) .....	<u>795,000</u>	
	Goods available for sale .....	795,000	
	Less ending inventory (2,000 units $\times$ \$26.50 per unit) .....	<u>53,000</u>	<u>742,000</u>
	Gross margin .....		378,000
	Less selling and administrative expenses* ....		<u>368,000</u>
	Net operating income .....		<u>\$ 10,000</u>
	*\$168,000 variable + \$200,000 fixed = \$368,000.		
c.	Variable costing net loss .....		\$(10,000)
	Add: Fixed manufacturing overhead cost deferred in inventory under absorption costing (2,000 units $\times$ \$10 per unit) .....	<u>20,000</u>	
	Absorption costing net operating income .....		<u>\$ 10,000</u>

## Problem 7-12 (continued)

2. Under absorption costing, the company did earn a profit for the quarter. However, before the question can really be answered, one must first define what is meant by a "profit." The central issue here relates to *timing* of release of fixed manufacturing overhead costs to expense. Advocates of variable costing would argue that all such costs should be expensed immediately, and that no profit is earned unless the revenues of a period are sufficient to cover the fixed manufacturing overhead costs in full. From this point of view, then, no profit was earned during the quarter, since the fixed costs were not fully covered.

Advocates of absorption costing would argue, however, that fixed manufacturing overhead costs attach to units of product as they are produced, and that such costs do not become an expense until the units are sold. Therefore, if the selling price of a unit is greater than the unit product cost (including a proportionate amount of fixed manufacturing overhead), then a profit is earned even if some units produced are unsold and carry some fixed manufacturing overhead with them to the following period. A difficulty with this argument is that "profits" will vary under absorption costing depending on how many units are added to or taken out of inventory. That is, profits will depend not only on sales, but on what happens to inventories. In particular, profits can be consciously manipulated by increasing or decreasing a company's inventories.

**Problem 7-12 (continued)**

3. a. Sales (32,000 units × \$40 per unit) .....		\$1,280,000
Less variable expenses:		
Variable cost of goods sold		
(32,000 units × \$16.50 per unit).....	\$528,000	
Variable selling and administrative ex-		
penses (32,000 units × \$6 per unit) .....	<u>192,000</u>	<u>720,000</u>
Contribution margin .....		560,000
Less fixed expenses:		
Fixed manufacturing overhead.....	300,000	
Fixed selling and administrative expense ...	<u>200,000</u>	<u>500,000</u>
Net operating income .....		<u>\$ 60,000</u>

b. The absorption costing unit product cost will remain at \$26.50, the same as in part (1).

Sales (32,000 units × \$40 per unit) .....		\$1,280,000
Less cost of goods sold:		
Beginning inventory		
(2,000 units × \$26.50 per unit).....	\$ 53,000	
Add cost of goods manufactured		
(30,000 units × \$26.50 per unit).....	<u>795,000</u>	
Goods available for sale .....	848,000	
Less ending inventory .....	<u>0</u>	<u>848,000</u>
Gross margin .....		432,000
Less selling and administrative expenses* ....		<u>392,000</u>
Net operating income .....		<u>\$ 40,000</u>

\*\$192,000 variable + \$200,000 fixed = \$392,000.

c. Variable costing net operating income .....	\$ 60,000
Deduct: fixed manufacturing overhead cost	
released from inventory under absorption	
costing (2,000 units × \$10 per unit) .....	<u>(20,000)</u>
Absorption costing net operating income .....	<u>\$ 40,000</u>

**Problem 7-13 (45 minutes)**

1. a. and b.

	<i>Absorption Costing</i>	<i>Variable Costing</i>
Direct materials .....	\$48	\$48
Variable manufacturing overhead .....	2	2
Fixed manufacturing overhead (\$360,000 ÷ 12,000 units) .....	<u>30</u>	<u>—</u>
Unit product cost .....	<u>\$80</u>	<u>\$50</u>

2. Absorption costing income statement:

Sales (10,000 units × \$150 per unit) .....		\$1,500,000
Less cost of goods sold:		
Beginning inventory .....	\$ 0	
Add cost of goods manufactured (12,000 units × \$80 per unit) .....	<u>960,000</u>	
Good available for sale .....	960,000	
Less ending inventory (2,000 units × \$80 per unit) .....	<u>160,000</u>	<u>800,000</u>
Gross margin .....		700,000
Less selling and administrative expenses [(12% × \$1,500,000) + \$470,000] .....		<u>650,000</u>
Net operating income .....		<u>\$ 50,000</u>



**Problem 7-13 (continued)**

3. Variable costing income statement:

Sales (10,000 units × \$150 per unit).....		\$1,500,000
Less variable expenses:		
Variable cost of goods sold:		
Beginning inventory .....	\$	0
Add variable manufacturing costs		
(12,000 units × \$50 per unit) .....		<u>600,000</u>
Goods available for sale .....		600,000
Less ending inventory		
(2,000 units × \$50 per unit) .....		<u>100,000</u>
Variable cost of goods sold* .....		500,000
Variable selling and administrative ex-		
penses .....		<u>180,000</u>
Contribution margin.....		<u>820,000</u>
Less fixed expenses:		
Fixed manufacturing overhead .....		360,000
Fixed selling and administrative expenses ...		<u>470,000</u>
Net operating loss .....		<u>\$ (10,000)</u>

\* This could be computed more simply as 10,000 units × \$50 per unit = \$500,000

4. A manager may prefer to take the statement prepared under the absorption approach in part (2), since it shows a profit for the month. As long as inventory levels are rising, absorption costing will report higher profits than variable costing. Notice in the situation above that the company is operating below its theoretical break-even point, but yet reports a profit under the absorption approach. The ethics of this approach are debatable.

5. Variable costing net operating loss .....	\$ (10,000)
Add: Fixed manufacturing overhead cost deferred	
in inventory under absorption costing	
(2,000 units × \$30 per unit).....	<u>60,000</u>
Absorption costing net operating income.....	<u>\$ 50,000</u>

**Problem 7-14 (45 minutes)**

1. a. and b.

	<i>Absorption Costing</i>	<i>Variable Costing</i>
Direct materials .....	\$ 7	\$ 7
Direct labor .....	10	10
Variable manufacturing overhead .....	5	5
Fixed manufacturing overhead (\$315,000 ÷ 17,500 units) .....	<u>18</u>	<u>—</u>
Unit product cost .....	<u>\$40</u>	<u>\$22</u>

2.

	<i>July</i>	<i>August</i>
Sales.....	<u>\$900,000</u>	<u>\$1,200,000</u>
Less variable expenses:		
Variable cost of goods sold @ \$22 per unit..	330,000	440,000
Variable selling and administrative expenses @ \$3 per unit.....	<u>45,000</u>	<u>60,000</u>
Total variable expenses .....	<u>375,000</u>	<u>500,000</u>
Contribution margin .....	<u>525,000</u>	<u>700,000</u>
Less fixed expenses:		
Fixed manufacturing overhead.....	315,000	315,000
Fixed selling and administrative expenses....	<u>245,000</u>	<u>245,000</u>
Total fixed expenses.....	<u>560,000</u>	<u>560,000</u>
Net operating income (loss).....	<u>\$ (35,000)</u>	<u>\$ 140,000</u>

3.

	<i>July</i>	<i>August</i>
Variable costing net operating income (loss).....	\$ (35,000)	\$ 140,000
Add: Fixed manufacturing overhead cost deferred in inventory under absorption costing (2,500 units × \$18 per unit) .....	45,000	
Deduct: Fixed manufacturing overhead cost released from inventory under absorption costing (2,500 units × \$18 per unit) .....	<u>          </u>	<u>(45,000)</u>
Absorption costing net operating income.....	<u>\$ 10,000</u>	<u>\$ 95,000</u>

### Problem 7-14 (continued)

4. As shown in the reconciliation in part (3) above, \$45,000 of fixed manufacturing overhead cost was deferred in inventory under absorption costing at the end of July, since \$18 of fixed manufacturing overhead cost "attached" to each of the 2,500 unsold units that went into inventory at the end of that month. This \$45,000 was part of the \$560,000 total fixed cost that has to be covered each month in order for the company to break even. Since the \$45,000 was added to the inventory account, and thus did not appear on the income statement for July as an expense, the company was able to report a small profit for the month even though it sold less than the break-even volume of sales. In short, only \$515,000 of fixed cost ( $\$560,000 - \$45,000$ ) was expensed for July, rather than the full \$560,000 as contemplated in the break-even analysis. As stated in the text, this is a major problem with the use of absorption costing internally for management purposes. The method does not harmonize well with the principles of cost-volume-profit analysis, and can result in data that are unclear or confusing to management.

**Problem 7-15 (45 minutes)**

1. a. and b.

	<u>Absorption Costing</u>		<u>Variable Costing</u>	
	<i>Year 1</i>	<i>Year 2</i>	<i>Year 1</i>	<i>Year 2</i>
Variable production costs.....	\$ 8	\$ 8	\$8	\$8
Fixed manufacturing overhead costs:				
\$300,000 ÷ 20,000 units.....	15			
\$300,000 ÷ 25,000 units.....		<u>12</u>		
Unit product cost .....	<u>\$23</u>	<u>\$20</u>	<u>\$8</u>	<u>\$8</u>

2.

	<u>Year 1</u>		<u>Year 2</u>	
Sales.....		\$700,000		\$700,000
Less variable expenses:				
Variable cost of goods sold:				
Beginning inventory .....	\$ 0		\$ 0	
Add variable manufacturing costs.....	<u>160,000</u>		<u>200,000</u>	
Goods available for sale.....	160,000		200,000	
Less ending inventory .....	<u>0</u>		<u>40,000</u>	
Variable cost of goods sold* .....	160,000		160,000	
Variable selling expense and administrative expenses (20,000 units × \$1 per unit).....	<u>20,000</u>	<u>180,000</u>	<u>20,000</u>	<u>180,000</u>
Contribution margin .....		520,000		520,000
Less fixed expenses:				
Fixed manufacturing overhead.....	300,000		300,000	
Fixed selling and administrative expenses.....	<u>180,000</u>	<u>480,000</u>	<u>180,000</u>	<u>480,000</u>
Net operating income .....		<u>\$ 40,000</u>		<u>\$ 40,000</u>

\*This could be computed more simply as 20,000 units × \$8 per unit = \$160,000.

**Problem 7-15 (continued)**

	<i>Year 1</i>	<i>Year 2</i>
3. Variable costing net operating income.....	\$ 40,000	\$ 40,000
Add: Fixed manufacturing overhead cost deferred in inventory under absorption costing (5,000 units × \$12 per unit).....		<u>60,000</u>
Absorption costing net operating income.....	<u>\$ 40,000</u>	<u>\$100,000</u>

4. The increase in production in Year 2, in the face of level sales, caused a buildup of inventory and a deferral of a portion of Year 2's fixed manufacturing overhead costs to the next year. This deferral of cost relieved Year 2 of \$60,000 (5,000 units × \$12 per unit) of fixed manufacturing overhead cost that it otherwise would have borne. Thus, net operating income was \$60,000 higher in Year 2 than in Year 1, even though the same number of units was sold each year. In sum, by increasing production and building up inventory, profits increased without any increase in sales or reduction in costs. This is a major criticism of the absorption costing approach.
5. a. Under JIT, production would have been geared to sales. Hence inventories would not have been built up in Year 2.
- b. Under JIT, the net operating income for Year 2 using absorption costing would have been \$40,000—the same as in Year 1. With production geared to sales, there would have been no inventory buildup at the end of Year 2 and therefore there would have been no fixed manufacturing overhead costs deferred in inventory. The entire \$300,000 in fixed manufacturing overhead costs would have been charged against Year 2 operations, rather than having \$60,000 of it deferred to future periods through the inventory account. Thus, net operating income would have been about the same in each year under *both* variable and absorption costing.

**Problem 7-16 (30 minutes)**

1. Because of soft demand for the Brazilian Division's product, the inventory should be drawn down to the minimum level of 50 units. Drawing inventory down to the minimum level would require production as follows during the last quarter:

Desired inventory, December 31 .....	50 units
Expected sales, last quarter .....	<u>600 units</u>
Total needs .....	650 units
Less inventory, September 30.....	<u>400 units</u>
Required production .....	<u>250 units</u>

Drawing inventory down to the minimum level would save inventory carrying costs such as storage (rent, insurance), interest, and obsolescence.

The number of units scheduled for production will not affect the reported net operating income or loss for the year if variable costing is in use. All fixed manufacturing overhead cost will be treated as an expense of the period regardless of the number of units produced. Thus, no fixed manufacturing overhead cost will be shifted between periods through the inventory account and income will be a function of the number of units sold, rather than a function of the number of units produced.

2. To maximize the Brazilian Division's operating income, Mr. Cavalas could produce as many units as storage facilities will allow. By building inventory to the maximum level, Mr. Cavalas will be able to defer a portion of the year's fixed manufacturing overhead costs to future years through the inventory account, rather than having all of these costs appear as charges on the current year's income statement. Building inventory to the maximum level of 1,000 units would require production as follows during the last quarter:

Desired inventory, December 31 .....	1,000 units
Expected sales, last quarter .....	<u>600 units</u>
Total needs .....	1,600 units
Less inventory, September 30.....	<u>400 units</u>
Required production .....	<u>1,200 units</u>

### Problem 7-16 (continued)

Thus, by producing enough units to build inventory to the maximum level that storage facilities will allow, Mr. Cavalas could relieve the current year of fixed manufacturing overhead cost and thereby maximize the current year's operating income.

3. By setting a production schedule that will maximize his division's net operating income—and maximize his own bonus—Mr. Cavalas will be acting against the best interests of the company as a whole. The extra units aren't needed and will be expensive to carry in inventory. Moreover, there is no indication that demand will be any better next year than it has been in the current year, so the company may be required to carry the extra units in inventory a long time before they are ultimately sold.

The company's bonus plan undoubtedly is intended to increase the company's profits by increasing sales and controlling expenses. If Mr. Cavalas sets a production schedule as shown in part (2) above, he will obtain his bonus as a result of *producing* rather than as a result of selling. Moreover, he will obtain it by creating *greater* expenses—rather than fewer expenses—for the company as a whole.

In sum, producing as much as possible so as to maximize the division's net operating income and the manager's bonus would be unethical because it subverts the goals of the overall organization.

**Problem 7-17 (75 minutes)**

1.	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>
Sales.....	<u>\$800,000</u>	<u>\$ 640,000</u>	<u>\$800,000</u>
Less variable expenses:			
Variable cost of goods sold			
@ \$2 per unit .....	100,000	80,000	100,000
Variable selling and administra-			
tive expenses @ \$1 per unit .....	<u>50,000</u>	<u>40,000</u>	<u>50,000</u>
Total variable expenses .....	<u>150,000</u>	<u>120,000</u>	<u>150,000</u>
Contribution margin .....	<u>650,000</u>	<u>520,000</u>	<u>650,000</u>
Less fixed expenses:			
Fixed manufacturing overhead.....	480,000	480,000	480,000
Fixed selling and administrative			
expenses.....	<u>140,000</u>	<u>140,000</u>	<u>140,000</u>
Total fixed expenses.....	<u>620,000</u>	<u>620,000</u>	<u>620,000</u>
Net operating income (loss) .....	<u>\$ 30,000</u>	<u>\$(100,000)</u>	<u>\$ 30,000</u>



**Problem 7-17 (continued)**

2. a.	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>
Variable manufacturing cost.....	\$ 2.00	\$ 2.00	\$ 2.00
Fixed manufacturing cost:			
\$480,000 ÷ 50,000 units.....	9.60		
\$480,000 ÷ 60,000 units.....		8.00	
\$480,000 ÷ 40,000 units.....			<u>12.00</u>
Unit product cost .....	<u>\$11.60</u>	<u>\$10.00</u>	<u>\$14.00</u>
b. Variable costing net operating income (loss).....	\$30,000	\$(100,000)	\$ 30,000
Add (Deduct): Fixed manufacturing overhead cost deferred in inventory from Year 2 to Year 3 under absorption costing (20,000 units × \$8.00 per unit) ...		160,000	(160,000)
Add: Fixed manufacturing overhead cost deferred in inventory from Year 3 to the future under absorption costing (10,000 units × \$12.00 per unit).....			<u>120,000</u>
Absorption costing net operating income (loss) .....	<u>\$30,000</u>	<u>\$ 60,000</u>	<u>\$ (10,000)</u>

3. Production went up sharply in Year 2 thereby reducing the unit product cost, as shown in (2a) above. This reduction in cost per unit, combined with the large amount of fixed manufacturing overhead cost deferred in inventory for the year, more than offset the loss of revenue. The net result is that the company's net operating income increased.

4. The fixed manufacturing overhead cost deferred in inventory from Year 2 was charged against Year 3 operations, as shown in the reconciliation in (2b). This added charge against Year 3 operations was offset somewhat by the fact that part of Year 3's fixed manufacturing overhead costs were deferred in inventory to future years [again see (2b)]. Overall, the added costs charged against Year 3 were greater than the costs deferred to future years, so the company reported less income for the year even though the same number of units was sold as in Year 1.

**Problem 7-17 (continued)**

5. a. With JIT, production would have been geared to sales in each year so that little or no inventory of finished goods would have been built up in either Year 2 or Year 3.
- b. If JIT had been in use, the net operating income under absorption costing would have been the same as under variable costing in all three years. With production geared to sales, there would have been no ending inventory, and therefore there would have been no fixed manufacturing overhead costs deferred in inventory to other years. Assuming that the company *expected* to sell 50,000 units in each year and that unit product costs were set on the basis of that level of expected activity, the income statements under absorption costing would have appeared as follows:

	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>
Sales.....	<u>\$ 800,000</u>	<u>\$ 640,000</u>	<u>\$ 800,000</u>
Less cost of goods sold:			
Cost of goods manufac-			
tured @ \$11.60 per unit ....	580,000	464,000 *	580,000
Add underapplied overhead..	<u>          </u>	<u>96,000 **</u>	<u>          </u>
Cost of goods sold .....	<u>580,000</u>	<u>560,000</u>	<u>580,000</u>
Gross margin .....	220,000	80,000	220,000
Less selling and administra-			
tive expenses .....	<u>190,000</u>	<u>180,000</u>	<u>190,000</u>
Net operating income (loss)....	<u>\$ 30,000</u>	<u>\$(100,000)</u>	<u>\$ 30,000</u>

\* 40,000 units × \$11.60 per unit = \$464,000.

\*\* 10,000 units *not* produced × \$9.60 per unit fixed manufacturing overhead cost per unit = \$96,000 fixed manufacturing overhead cost not applied to products.

**Case 7-18 (90 minutes)**

1.	<i>July</i>	<i>August</i>	<i>September</i>
Sales.....	<u>\$1,750,000</u>	<u>\$1,875,000</u>	<u>\$2,000,000</u>
Less variable expenses:			
Variable manufacturing costs @ \$9 per unit .....	630,000	675,000	720,000
Variable selling and administrative expenses @ \$6 per unit.....	<u>420,000</u>	<u>450,000</u>	<u>480,000</u>
Total variable expenses	<u>1,050,000</u>	<u>1,125,000</u>	<u>1,200,000</u>
Contribution margin .....	<u>700,000</u>	<u>750,000</u>	<u>800,000</u>
Less fixed expenses:			
Fixed manufacturing overhead <sup>1</sup> .....	560,000	560,000	560,000
Fixed selling and administrative expenses <sup>2</sup> .....	<u>200,000</u>	<u>200,000</u>	<u>200,000</u>
Total fixed expenses.....	<u>760,000</u>	<u>760,000</u>	<u>760,000</u>
Net operating income (loss) .....	<u>\$ (60,000)</u>	<u>\$ (10,000)</u>	<u>\$ 40,000</u>

<sup>1</sup> \$1,680,000 ÷ 3 = \$560,000 per month.

<sup>2</sup> Fixed selling and administrative expenses (from July's figures):  
\$620,000 – (70,000 units × \$6 per unit = \$420,000) = \$200,000.

Note how clear and easy to follow the variable costing statements are as compared to the absorption costing statements.

The \$560,000 monthly fixed manufacturing overhead cost can also be obtained by the following computation:

	<i>July</i>	<i>August</i>	<i>September</i>
Fixed manufacturing overhead cost applied .....	\$595,000	\$560,000	\$420,000
Underapplied or (overapplied) overhead .....	<u>(35,000)</u>	<u>          </u>	<u>140,000</u>
Fixed manufacturing overhead cost ..	<u>\$560,000</u>	<u>\$560,000</u>	<u>\$560,000</u>

### Case 7-18 (continued)

2. The break-even point under variable costing would be:

$$\begin{aligned}\text{Break-even point} &= \frac{\text{Fixed costs}}{\text{Unit contribution margin}} \\ &= \frac{\$760,000}{\$25 - (\$9 + \$6)} = \frac{\$760,000}{\$10 \text{ per unit}} = 76,000 \text{ units}\end{aligned}$$

On the surface this answer appears to be incorrect, since the company sold *less* than 76,000 units in both July and August and yet showed a profit in both months on the absorption costing statements. In fact, when a student gives an answer of 76,000 units as the break-even point, you should ask, "How can 76,000 units be the break-even point when the company sold only 70,000 units in July and 75,000 units in August and reported a profit in both months?"

The answer to this apparent inconsistency is that production exceeded sales in both July and August. This resulted in deferring a portion of the fixed manufacturing overhead costs of these months to the future rather than showing the cost as an expense on the income statement. In each month, this deferral of fixed manufacturing overhead cost was large enough to permit the company to report a profit, even though less than the break-even volume of units was sold.

3. Under absorption costing, profits are affected by both sales and production. If production exceeds sales, then a portion of the fixed manufacturing overhead cost of the period will be deferred to the future. In periods where these deferrals of fixed manufacturing overhead cost take place, profits will be inflated, as in July for Warner Company. If production is less than sales, then fixed manufacturing overhead costs that were deferred in inventory and carried over from prior periods will be released from inventory and charged as an expense on the income statement. In addition, if production in these months is less than planned, then underapplied overhead will result, which, when added to the costs being released from inventory through inventory reduction, will depress earnings. We can see this happening in September in Warner Company, where planned production was 80,000 units, but only 60,000 units were produced.

**Case 7-18 (continued)**

In sum, with profits dependent on both sales and production under absorption costing, profits can move erratically, depending on the relation between sales and production in a given period.

4. It is helpful to prepare a schedule showing inventories, production, and sales as a guide in preparing a reconciliation:

	<i>Beginning Inventory</i>	<i>Units Produced</i>	<i>Units Sold</i>	<i>Ending Inventory</i>
July.....	5,000	85,000	70,000	20,000
August .....	20,000	80,000	75,000	25,000
September.....	25,000	60,000	80,000	5,000

Before preparing a reconciliation, we must also determine the fixed manufacturing overhead rate per unit of product. This rate would be:

$$\begin{aligned}
 \text{Fixed manufacturing overhead rate} &= \frac{\text{Monthly fixed manufacturing overhead cost}}{\text{Planned monthly production}} \\
 &= \frac{\$560,000}{80,000 \text{ units}} = \$7 \text{ per unit}
 \end{aligned}$$

**Case 7-18 (continued)**

Given these data, the reconciliation would be:

	<i>July</i>	<i>August</i>	<i>September</i>
Variable costing net operating income (loss) .....	\$ (60,000)	\$ (10,000)	\$ 40,000
Deduct: Fixed manufacturing overhead cost released from inventory in July (5,000 units × \$7 per unit).....	(35,000)		
Add: Fixed manufacturing overhead cost deferred in inventory in July (20,000 units × \$7 per unit) .....	140,000		
Deduct: Fixed manufacturing overhead cost released from inventory in August (20,000 units × \$7 per unit) .....		(140,000)	
Add: Fixed manufacturing overhead cost deferred in inventory in August (25,000 units × \$7 per unit) .....		175,000	
Deduct: Fixed manufacturing overhead cost released from inventory in September (25,000 units × \$7 per unit) .....			(175,000)
Add: Fixed manufacturing overhead cost deferred in inventory in September (5,000 units × \$7 per unit) .....	_____	_____	<u>35,000</u>
Absorption costing net operating income (loss) .....	<u>\$ 45,000</u>	<u>\$ 25,000</u>	<u>\$ (100,000)</u>

**Case 7-18 (continued)**

An alternate approach to the reconciliation would be as follows:

	<i>July</i>	<i>August</i>	<i>September</i>
Variable costing net operating income (loss) .....	\$(60,000)	\$(10,000)	\$ 40,000
Add: Fixed manufacturing overhead cost deferred in inventory at the end of July (15,000 unit increase × \$7 per unit) .....	105,000		
Add: Fixed manufacturing overhead cost deferred in inventory at the end of August (5,000 unit increase × \$7 per unit) .....		35,000	
Deduct: Fixed manufacturing overhead cost released from inventory during September (20,000 unit decrease × \$7 per unit) .....	_____	_____	<u>(140,000)</u>
Absorption costing net operating income (loss) .....	<u>\$ 45,000</u>	<u>\$ 25,000</u>	<u>\$(100,000)</u>

5. a. Under JIT, production is geared strictly to sales. Therefore, the company would have produced only enough units during September to meet sales needs. The computation is as follows:

Units sold during September .....	80,000
Less units in inventory at the beginning of the month...	<u>25,000</u>
Units produced during September under JIT .....	<u>55,000</u>

Although not asked for in the question, a move to JIT during September would have resulted in an even deeper loss for the month. The reason is that producing only 55,000 units (rather than 60,000 units, as in the problem) would have resulted in \$35,000 more in underapplied overhead (see the computation below), or a loss of \$135,000 instead of a loss of \$100,000 for the month.

**Case 7-18 (continued)**

Units produced during September.....	60,000
Units that would have been produced under JIT .....	<u>55,000</u>
Decrease in production .....	5,000
Fixed manufacturing overhead rate per unit.....	<u>× \$7</u>
Increased loss for the month.....	<u>\$35,000</u>

- b. Starting with the next quarter, there will be little or no difference between the income reported under variable costing and the income reported under absorption costing. With no inventories on hand, fixed manufacturing overhead cost is not shifted between periods under absorption costing.
  
- c. With no inventories available for deferral of fixed manufacturing overhead costs to other periods, it would not be possible to show a profit under absorption costing if sales were less than the break-even level. As stated in part (5b) above, profits (and losses) will be the same under both costing methods.



**Case 7-19** (120 minutes)

- The CVP analysis developed in the previous chapter works with variable costing but generally not with absorption costing. However, when production equals sales, absorption costing net operating income equals variable costing net operating income and we can use CVP analysis without any modification.

Selling price.....	\$120.00
Less variable cost per unit .....	<u>87.20</u>
Unit contribution margin .....	<u>\$ 32.80</u>

$$\begin{aligned}
 \text{Unit sales to achieve} &= \frac{\text{Fixed expenses} + \text{Target net profit}}{\text{Unit contribution margin}} \\
 \text{target profit} &= \frac{\$11,448,000 + \$2,000,000}{\$32.80 \text{ per unit}} \\
 &= 410,000 \text{ units}
 \end{aligned}$$

- The unit product cost at a production level of 410,000 units would be calculated as follows:

Direct materials .....	\$57.20
Direct labor .....	15.00
Variable manufacturing overhead .....	5.00
Fixed manufacturing overhead (\$6,888,000 ÷ 410,000 units).....	<u>16.80</u>
Unit product cost .....	<u>\$94.00</u>

**Case 7-19 (continued)**

Sales (410,000 units × \$120 per unit) .....		\$49,200,000
Cost of goods sold:		
Beginning inventory .....	\$	0
Add cost of goods manufactured (410,000 units × \$94 per unit).....		<u>38,540,000</u>
Goods available for sale .....		38,540,000
Less ending inventory .....		<u>0</u>
Gross margin .....		<u>38,540,000</u>
Less selling and administrative expenses:		10,660,000
Variable selling and administrative (410,000 units × \$10 per unit).....		4,100,000
Fixed selling and administrative .....		<u>4,560,000</u>
Net operating income .....		<u>8,660,000</u>
		<u>\$ 2,000,000</u>

3. By increasing production so that it exceeds sales, inventories will be built up. This will have the effect of deferring fixed manufacturing overhead in the ending inventory. How much fixed manufacturing overhead must be deferred in this manner? The managers are suggesting an artificial boost to earnings of \$328,000 since at the current rate of sales, profit will only be \$1,672,000 and they want to hit the target profit of \$2,000,000.

The amount of production,  $Q$ , required to defer \$328,000 can be determined as follows:

Units in beginning inventory ..	0
Plus units produced .....	<u>Q</u>
Units available for sale .....	Q
Less units sold .....	<u>400,000</u>
Units in ending inventory .....	<u>Q - 400,000</u>

$$\text{Fixed manufacturing overhead per unit} = \frac{\$6,888,000}{Q}$$

**Case 7-19 (continued)**

$$\text{Fixed manufacturing overhead deferred in inventory} = \text{Fixed manufacturing overhead rate per unit} \times \text{Number of units added to inventory}$$

$$\$328,000 = \frac{\$6,888,000}{Q} \times (Q - 400,000)$$

$$\$328,000 \times Q = \$6,888,000 \times (Q - 400,000)$$

$$\$328,000 \times Q = \$6,888,000 \times Q - \$6,888,000 \times 400,000$$

$$\$6,560,000 \times Q = \$6,888,000 \times 400,000$$

$$Q = 420,000 \text{ units}$$

4. The unit product cost at a production level of 420,000 units would be calculated as follows:

Direct materials .....	\$57.20
Direct labor .....	15.00
Variable manufacturing overhead .....	5.00
Fixed manufacturing overhead (\$6,888,000 ÷ 420,000 units) ..	<u>16.40</u>
Unit product cost .....	<u>\$93.60</u>

The absorption costing income statement would be:

Sales (400,000 units × \$120 per unit) .....		\$48,000,000
Cost of goods sold:		
Beginning inventory .....	\$	0
Add cost of goods manufactured		
(420,000 units × \$93.60 per unit) .....	<u>39,312,000</u>	
Goods available for sale .....	39,312,000	
Less ending inventory		
(20,000 units × \$93.60 per unit) .....	<u>1,872,000</u>	<u>37,440,000</u>
Gross margin .....		10,560,000
Less selling and administrative expenses:		
Variable selling and administrative		
(400,000 units × \$10 per unit) .....	4,000,000	
Fixed selling and administrative .....	<u>4,560,000</u>	<u>8,560,000</u>
Net operating income .....		<u>\$ 2,000,000</u>

## Case 7-19 (continued)

5. As a practical matter, the scheme of building inventories in order to increase profits would work. However, the \$328,000 in fixed manufacturing overhead is only *deferred* in inventory. It is an ax hanging over the head of the managers. If the inventories are allowed to fall back to normal levels in the next year, all of that deferred cost will be released to the income statement. In order to keep using inventory buildups as a way of meeting profit goals, inventories must keep *growing* year after year. Eventually, someone on the Board of Directors is likely to question the wisdom of such large inventories. Inventories tie up capital, take space, result in operating problems, and expose the company to the risk of obsolescence. When inventories are eventually cut due to these problems, all of the deferred costs will flow through to the income statement—with a potentially devastating effect on net operating income.

Apart from this practical consideration, behavioral and ethical issues should be addressed. Taking the ethical issue first, it is unlikely that building up inventories is the kind of action the Board of Directors had in mind when they set the profit goal. Chances are that the Board of Directors would object to this kind of manipulation if they were informed of the reason for the buildup of inventories. The company must incur costs in order to build inventories at the end of the year. Does this make any sense when there is no indication that the excess inventories will be needed to meet sales demand? Wouldn't it be better to wait and meet demand out of normal production as needed? Essentially, the managers who approached Guochang are asking him to waste the owners' money so as to artificially inflate the reported net operating income so that they can get a bonus.

Behaviorally, this is troubling because it suggests that the former CEO left behind an unfortunate legacy in the form of managers who encourage questionable business practices. Guochang needs to set a new moral climate in the company or there will likely be even bigger problems down the road. Guochang should firmly turn down the managers' request and let them know why.

## Case 7-19 (continued)

Having said all of that, it would not be easy for Guochang to turn down a bonus that could be potentially as large as \$25,000—which is precisely what Guochang would be doing if he were to pass up the opportunity to inflate the company's earnings. And, his refusal to cooperate with the other managers may create a great deal of resentment and bitterness. This is a very difficult position for any manager to be in and many would probably succumb to the temptation.

6. The Board of Directors, with their bonus plan, has unintentionally created a situation that is very difficult for the new CEO. Whenever such a bonus plan is based on absorption costing net operating income, the temptation exists to manipulate net operating income by changing the amount that is produced. This temptation is magnified when an all-or-nothing bonus is awarded based on meeting target profits. When actual profits appear to be within spitting distance of the target profits, the temptation to manipulate net operating income to get the all-or-nothing bonus becomes almost overpowering. Ideally, managers should resist such temptations, but this particular temptation can be easily avoided. Bonuses should be based on variable costing net operating income, which is less subject to manipulation. And, all-or-nothing bonuses should be replaced with bonuses that start out small and slowly grow with net operating income.

**Case 7-20 (90 minutes)**

1. Under absorption costing, the net operating income of a particular period is dependent on both production and sales. For this reason, the controller's explanation was accurate. He should have pointed out, however, that the reduction in production resulted in a large amount of underapplied overhead, which was added to cost of goods sold in the second quarter. By producing fewer units than planned, the company was not able to absorb all the fixed manufacturing overhead incurred during the quarter into units of product. The result was that this unabsorbed overhead ended up on the income statement as a charge against the period, thereby sharply slashing income.

2.

	<i>First Quarter</i>	<i>Second Quarter</i>
Sales.....	<u>\$480,000</u>	<u>\$600,000</u>
Less variable expenses:		
Variable manufacturing @ \$8 per unit .....	96,000	120,000
Variable selling and administrative expenses @\$5 per unit .....	<u>60,000</u>	<u>75,000</u>
Total variable expenses .....	<u>156,000</u>	<u>195,000</u>
Contribution margin .....	<u>324,000</u>	<u>405,000</u>
Less fixed expenses:		
Fixed manufacturing overhead.....	180,000	180,000
Fixed selling and administrative expenses* .....	<u>140,000</u>	<u>140,000</u>
Total fixed expenses.....	<u>320,000</u>	<u>320,000</u>
Net operating income .....	<u>\$ 4,000</u>	<u>\$ 85,000</u>

*Selling and administrative expenses, first quarter .....	\$200,000
Less variable portion (12,000 units × \$5 per unit) .....	<u>60,000</u>
Fixed selling and administrative expenses.....	<u>\$140,000</u>

**Case 7-20 (continued)**

3. To answer this part, it is helpful to prepare a schedule of inventories, production, and sales in units:

	<i>Beginning Inventory</i>	<i>Units Produced</i>	<i>Units Sold</i>	<i>Ending Inventory</i>
First quarter .....	4,000	15,000	12,000	7,000
Second quarter .....	7,000	9,000	15,000	1,000

Using these inventory data, the reconciliation would be as follows:

	<i>First Quarter</i>	<i>Second Quarter</i>
Variable costing net operating income.....	\$ 4,000	\$ 85,000
Deduct: Fixed manufacturing overhead cost released from inventory during the First Quarter (4,000 units × \$12 per unit).....	(48,000)	
Add (deduct): Fixed manufacturing overhead cost deferred in inventory from the First Quarter to the Second Quarter (7,000 units × \$12 per unit) .....	84,000	(84,000)
Add: Fixed manufacturing overhead cost de- ferred in inventory from the Second Quarter to the future (1,000 units × \$12 per unit).....		<u>12,000</u>
Absorption costing net operating income.....	<u>\$ 40,000</u>	<u>\$ 13,000</u>

Alternative solution:

Variable costing net operating income.....	\$ 4,000	\$85,000
Add: Fixed manufacturing overhead cost de- ferred in inventory to the Second Quarter (3,000 unit increase × \$12 per unit) .....	36,000	
Deduct: Fixed manufacturing overhead cost released from inventory due to a decrease in inventory during the Second Quarter (6,000 unit decrease × \$12 per unit) .....		<u>(72,000)</u>
Absorption costing net operating income.....	<u>\$40,000</u>	<u>\$13,000</u>

**Case 7-20 (continued)**

4. The advantages of using the variable costing method for internal reporting purposes include the following:

- Variable costing aids in forecasting and reporting income for decision-making purposes.
- Fixed costs are reported in total amount, thereby increasing the opportunity for more effective control of these costs.
- Profits vary directly with sales volume and are not affected by changes in inventory levels.
- Analysis of cost-volume-profit relationships is facilitated and management is able to determine the break-even point and total profit for a given volume of production and sales.

The disadvantages of using the variable costing method for internal reporting purposes include the following:

- Variable costing lacks acceptability for external financial reporting and cannot be used for income taxes in the United States. As a result, additional record keeping costs may be required.
- It may be difficult to determine what costs are fixed and what costs are variable.

5. a. Under JIT, production is geared strictly to sales. Therefore, the company would have produced only enough units during the quarter to meet sales needs. The computations are:

Units sold .....	15,000
Less units in inventory at the beginning of the quarter ..	<u>7,000</u>
Units produced during the quarter under JIT .....	<u>8,000</u>



**Case 7-20 (continued)**

Although not asked for in the problem, a move to JIT during the Second Quarter would have reduced the company's reported net operating income even further. The net operating income for the quarter would have been:

Sales.....		\$600,000
Less cost of goods sold:		
Beginning inventory .....	\$140,000	
Add cost of goods manufactured (8,000 units × \$20 per unit) .....	<u>160,000</u>	
Goods available for sale .....	300,000	
Ending inventory .....	<u>0</u>	
Cost of goods sold .....	300,000	
Add underapplied overhead* .....	<u>84,000</u>	<u>384,000</u>
Gross margin .....		216,000
Less selling and administrative expenses....		<u>215,000</u>
Net operating income .....		<u>\$ 1,000</u>

\* Overhead rates are based on 15,000 units produced each quarter. If only 8,000 units are produced, then the underapplied fixed manufacturing overhead will be 7,000 units × \$12 per unit = \$84,000.

- b. Starting with the Third Quarter, there will be little or no difference between the incomes reported under variable costing and under absorption costing. The reason is that there will be little or no inventories on hand and therefore no way to shift fixed manufacturing overhead cost between periods under absorption costing.

## Group Exercise 7-21

1. Absorption costing, which includes both fixed and variable manufacturing costs in the product cost, is widely considered to be required on external financial reports in the United States.
2. A company with sales below the break-even point may be able to report a profit if its inventories increase. Break-even points are computed assuming that fixed costs are expensed in the year in which they are incurred. However, if production exceeds sales and the company uses absorption costing, then a portion of the fixed manufacturing costs will be included as part of ending inventories on the balance sheet rather than being expensed on the income statement.
3. Under absorption costing, whenever inventories increase, profits will increase. Inventories could increase because management intentionally manipulates profits, but they could also increase for other reasons. For example, inventories may increase if the company is expecting an increase in demand for the company's products early in the next accounting period.
4. Under absorption costing, accounting profits are reduced when inventories decrease. Fixed manufacturing overhead costs that are deferred in inventories are released to the income statement whenever inventories are reduced. Inventories may be reduced for a number of good reasons including a switch to JIT operations or an anticipated fall in demand early in the next accounting period.

## Group Exercise 7-22

1. A higher proportion of fixed costs will increase the disparity between absorption unit product costs and the costs reported under variable costing. This will also have the effect of magnifying fluctuations in net operating income that occur under absorption costing as a consequence of changes in inventories. (See the discussion in part 2 below.)

Proponents of absorption costing will make the same arguments as before, as will the proponents of variable costing. However, the higher proportion of fixed costs will increase the differences between reports based on variable costing and those based on absorption costing. Consequently, this issue becomes more important as the proportion of fixed costs in the cost structure increases.

2. As long as absorption costing is used for external reporting purposes, inventory buildups will result in higher reported profits, while inventory reductions will cause lower reported profits. These effects are magnified as a higher proportion of cost becomes fixed.
3. Some managers may prefer absorption costing and others may prefer variable costing. Managers may prefer absorption costing because absorption costing is used on external financial reports, because they prefer absorption costing on theoretical grounds, or because absorption costing profits are easier to manipulate than variable costing profits—just increase or decrease inventories. Other managers may prefer variable costing because it is easier to understand, because it is easier and more appropriate to use in decisions, because they prefer variable costing on theoretical grounds, or because it isn't subject to fluctuations due to changes in inventories.