

Chapter 7

Variable Costing: A Tool for Management

Solutions to Questions

7-1 Absorption and variable costing differ in how they handle 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 expensed on the current period's income statement.

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. When the units 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 argue 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 under absorption costing part of the fixed manufacturing overhead cost of the current period is deferred in inventory to the next period. In contrast, all of the fixed manufacturing overhead cost of the current period is immediately expensed 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 Under absorption costing net operating income can be increased by simply 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, reducing the current period's reported expenses and causing net operating income to increase.

7-10 Differences in reported net operating income between absorption and variable costing

arise because of changing levels of inventory. In lean production, 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)

1. Under absorption costing, all manufacturing costs (variable and fixed) are included in product costs. (All currency values are in thousands of rupiah, denoted by Rp.)

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

2. Under variable costing, only the variable manufacturing costs are included in product costs. (All currency values are in thousands of rupiah, denoted by Rp.)

| | |
|-----------------------------------------|--------------|
| Direct materials..... | Rp100 |
| Direct labor..... | 320 |
| Variable manufacturing overhead..... | <u>40</u> |
| Variable costing unit product cost..... | <u>Rp460</u> |

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

Exercise 7-2 (20 minutes)

(Note: All currency values are in thousands of rupiah, denoted by Rp.)

1. 25 units in ending inventory \times Rp240 per unit fixed manufacturing overhead per unit = Rp6,000
2. The variable costing income statement appears below:

| | | |
|-----------------------------------------------|---------------|-----------------|
| Sales..... | | Rp191,250 |
| Variable expenses: | | |
| Variable cost of goods sold | Rp103,50 | |
| (225 units sold \times Rp460 per unit)..... | 0 | |
| Variable selling and administrative expenses | | |
| (225 units \times Rp20 per unit)..... | <u>4,500</u> | <u>108,000</u> |
| Contribution margin..... | | 83,250 |
| Fixed expenses: | | |
| Fixed manufacturing overhead..... | 60,000 | |
| Fixed selling and administrative expenses.... | <u>20,000</u> | <u>80,000</u> |
| Net operating income..... | | <u>Rp 3,250</u> |

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. | Year 1 | Year 2 | Year 3 |
|--------------------------------------------------------------------------------------------------------------------|--------------------|--------------------|--------------------|
| Beginning inventories..... | 200 | 170 | 180 |
| Ending inventories..... | <u>170</u> | <u>180</u> | <u>220</u> |
| Change in inventories..... | <u>(30)</u> | <u>10</u> | <u>40</u> |
| Fixed manufacturing overhead in beginning inventories (@\$560 per unit)..... | \$112,000 | \$ 95,200 | \$100,800 |
| Fixed manufacturing overhead in ending inventories (@\$560 per unit)..... | <u>95,200</u> | <u>100,800</u> | <u>123,200</u> |
| Fixed manufacturing overhead deferred in (released from) inventories (@\$560 per unit)..... | <u>(\$ 16,800)</u> | <u>\$ 5,600</u> | <u>\$ 22,400</u> |
| Variable costing net operating income..... | \$1,080,400 | \$1,032,400 | \$ 996,400 |
| Add (deduct) fixed manufacturing overhead cost deferred in (released from) inventory under absorption costing..... | <u>(16,800)</u> | <u>5,600</u> | <u>22,400</u> |
| Absorption costing net operating income..... | <u>\$1,063,600</u> | <u>\$1,038,000</u> | <u>\$1,018,800</u> |

2. Because 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 the difference between the two net operating incomes, or \$28,000 = \$1,012,400 – \$984,400.

Exercise 7-4 (45 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. Because variable costing net operating income was \$41,694 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 because changes in inventories also affect absorption costing net operating income.

- b. When variable costing net operating income exceeds absorption costing net operating income, sales exceeds 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> |
|-----------------------------------------------------|-----------------------------------------------------|-----------------------------------------------------|
| Variable costing NOI = Absorption costing NOI | Variable costing NOI < Absorption costing NOI | Variable costing NOI > Absorption costing NOI |
| Production = Sales | Production > Sales | Production < Sales |
| Inventories remain the same | Inventories grow | 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. Because variable costing net operating income declined, unit sales must have also declined. This is true even though the absorption costing net operating income increased. How can that be? By manipulating production (and inventories) it may be possible to maintain or increase the level of absorption costing net operating income even though unit sales decline. However, 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 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> |
|-----------------------------------------------------|-----------------------------------------------------|-----------------------------------------------------|
| Variable costing NOI = Absorption costing NOI | Variable costing NOI < Absorption costing NOI | Variable costing NOI < Absorption costing NOI |
| Production = Sales | Production > Sales | Production > Sales |
| Inventories remain the same | 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 unit selling prices, unit variable costs, and total fixed costs remain the same. In the second case, absorption costing net operating income increases from year to year even though unit sales decline. 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..... | \$306,306 |
| Contribution margin per unit..... | \$71,000 |
| Annual fixed selling and administrative expenses. | \$362,000 |

Scenario A:

| | <i>Year 1</i> | <i>Year 2</i> | <i>Year 3</i> |
|--------------------------------------------------------------|---------------|---------------|---------------|
| Beginning inventory..... | 1 | 1 | 2 |
| Production..... | 10 | 11 | 9 |
| Sales..... | 10 | 10 | 10 |
| Ending..... | 1 | 2 | 1 |
| Variable costing net operating income. | \$41,694 | \$41,694 | \$41,694 |
| Fixed manufacturing overhead in beginning inventory*..... | \$30,631 | \$30,631 | \$55,692 |
| Fixed manufacturing overhead in ending inventory..... | \$30,631 | \$55,692 | \$34,034 |
| Absorption costing net operating income..... | \$41,694 | \$66,755 | \$20,036 |

* 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 7-4 (continued)

Scenario B:

| | <i>Year 1</i> | <i>Year 2</i> | <i>Year 3</i> |
|--------------------------------------------------------------|---------------|---------------|---------------|
| Beginning inventory..... | 1 | 1 | 4 |
| Production..... | 10 | 12 | 20 |
| Sales..... | 10 | 9 | 8 |
| Ending..... | 1 | 4 | 16 |
| Variable costing net operating income (loss)..... | \$41,694 | (\$29,306) | (\$100,306) |
| Fixed manufacturing overhead in beginning inventory*..... | \$30,631 | \$30,631 | \$102,102 |
| Fixed manufacturing overhead in ending inventory..... | \$30,631 | \$102,102 | \$245,045 |
| Absorption costing net operating income..... | \$41,694 | \$42,165 | \$42,637 |

* 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> |
| Absorption costing unit product cost..... | <u>\$30</u> |

- b. The absorption costing income statement:

| | |
|-----------------------------------------------------------------------------------------|-------------------|
| Sales (20,000 units × \$50 per unit)..... | \$1,000,000 |
| Cost of goods sold (20,000 units × \$30 per unit)..... | <u>600,000</u> |
| Gross margin..... | 400,000 |
| Selling and administrative expenses [(20,000 units × \$4 per unit) + \$190,000]..... | <u>270,000</u> |
| Net operating income..... | <u>\$ 130,000</u> |

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

| | |
|---------------------------------------|-------------|
| Direct materials..... | \$ 6 |
| Direct labor..... | 9 |
| Variable manufacturing overhead. . | <u>3</u> |
| Variable costing unit product cost. . | <u>\$18</u> |

- b. The variable costing income statement:

| | | |
|--------------------------------------------------------------------|----------------|------------------|
| Sales (20,000 units × \$50 per unit)..... | | \$1,000,000 |
| Variable expenses: | | |
| Variable cost of goods sold (20,000 units × \$18 per unit)..... | \$360,000 | |
| Variable selling expense (20,000 units × \$4 per unit)..... | <u>80,000</u> | <u>440,000</u> |
| Contribution margin..... | | 560,000 |
| Fixed expenses: | | |
| Fixed manufacturing overhead..... | 300,000 | |
| Fixed selling and administrative expense..... | <u>190,000</u> | <u>490,000</u> |
| Net operating income..... | | <u>\$ 70,000</u> |

Exercise 7-6 (30 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 because 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 units × \$6 per unit fixed manufacturing overhead cost = \$18,000).

Exercise 7-7 (20 minutes)

| | | |
|----------------------------------------------|----------------|------------------|
| 1. Sales (35,000 units × \$25 per unit)..... | | \$875,000 |
| 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 |
| 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 7-8 (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> |
| Variable costing 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.

2. The variable costing income statement appears below:

| | | |
|----------------------------------------------------------------------------------|----------------|--------------------|
| Sales..... | | \$3,990,000 |
| Variable expenses: | | |
| Variable cost of goods sold (19,000 units × \$150 per unit)..... | \$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 |
| 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> |

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> |

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

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> |
| Absorption costing 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 (19,000 units × \$185 per unit)..... | <u>3,515,000</u> |
| Gross margin..... | 475,000 |
| Selling and administrative expenses (\$285,000 + 19,000 units × \$10 per unit)..... | <u>475,000</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.

Exercise 7-10 (10 minutes)

Sales were above the company's break-even sales and yet the company sustained a loss. The apparent contradiction is explained by the fact that the CVP analysis is based on variable costing, whereas the income reported to shareholders is prepared using absorption costing. Because sales were above the breakeven, the variable costing net operating income would have been positive. However, the absorption costing net operating income was negative. Ordinarily, this would only happen if inventories decreased and fixed manufacturing overhead deferred in inventories was released to the income statement on the absorption costing income statement. This added fixed manufacturing overhead cost resulted in a loss on an absorption costing basis even though the company operated at its breakeven on a variable costing basis.

Problem 7-11 (30 minutes)

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

| | |
|-----------------------------------------|-------------|
| Direct materials..... | \$ 4 |
| Direct labor..... | 7 |
| Variable manufacturing overhead..... | <u>1</u> |
| Variable costing unit product cost..... | <u>\$12</u> |

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

| | Year 1 | Year 2 |
|---------------------------------------------|--------------------|--------------------|
| Unit sales..... | 40,000 units | 50,000 units |
| Sales..... | <u>\$1,000,000</u> | <u>\$1,250,000</u> |
| Variable expenses: | | |
| Variable cost of goods sold | | |
| (@ \$12 per unit)..... | 480,000 | 600,000 |
| Variable selling and administrative | | |
| expenses (@ \$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> |
| 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:

| | Year 1 | Year 2 |
|------------------------------------------------|-----------------|------------------|
| Variable costing net operating income..... | \$40,000 | \$150,000 |
| Add (deduct) fixed manufacturing overhead | | |
| deferred in (released from) inventory | | |
| under absorption costing (5,000 units × \$6 | | |
| per unit in Year 1; 5,000 units × \$6 per unit | | |
| in Year 2)..... | <u>30,000</u> | <u>(30,000)</u> |
| Absorption costing net operating income..... | <u>\$70,000</u> | <u>\$120,000</u> |

Problem 7-13 (60 minutes)

1. a. Absorption costing unit product cost is:

| | |
|-----------------------------------------------------------------|----------------|
| Direct materials..... | \$ 3.50 |
| Direct labor..... | 12.00 |
| Variable manufacturing overhead..... | 1.00 |
| Fixed manufacturing overhead (\$300,000 ÷ 30,000 units)..... | <u>10.00</u> |
| Absorption costing unit product cost..... | <u>\$26.50</u> |

- b. The absorption costing income statement is:

| | |
|------------------------------------------------------------------------------------------|------------------|
| Sales (28,000 units)..... | \$1,120,000 |
| Cost of goods sold (28,000 units × \$26.50 per unit)..< | <u>742,000</u> |
| Gross margin..... | 378,000 |
| Selling and administrative expenses (\$200,000 + 28,000 units × \$6.00 per unit)..... | <u>368,000</u> |
| Net operating income..... | <u>\$ 10,000</u> |

- c. The reconciliation of variable costing and absorption costing follows:

| | |
|-------------------------------------------------------------------------------------------------------------------------------|------------------|
| Variable costing net loss..... | \$(10,000) |
| Add fixed manufacturing overhead cost deferred in inventory under absorption costing (2,000 units × \$10 per unit)..... | <u>20,000</u> |
| Absorption costing net operating income..... | <u>\$ 10,000</u> |

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 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, no profit was earned during the quarter because the fixed costs were not fully covered.

Problem 7-13 (continued)

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.

3. a. The variable costing income statement is:

| | | |
|--------------------------------------------|----------------|------------------|
| Sales (32,000 units × \$40 per unit)..... | | \$1,280,000 |
| Variable expenses: | | |
| Variable cost of goods sold | | |
| (32,000 units × \$16.50 per unit)..... | \$528,000 | |
| Variable selling and administrative | | |
| expenses (32,000 units × \$6 per unit).... | <u>192,000</u> | <u>720,000</u> |
| Contribution margin..... | | 560,000 |
| 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> |

Problem 7-13 (continued)

- b. The absorption costing income statement would be constructed as follows:

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 |
| Cost of goods sold (32,000 units × \$26.50 per unit).... | <u>848,000</u> |
| Gross margin..... | 432,000 |
| Selling and administrative expenses (\$200,000 + 32,000 units × \$6.00 per unit)..... | <u>392,000</u> |
| Net operating income..... | <u>\$ 40,000</u> |

- c. The reconciliation of variable costing and absorption costing income is:

| | |
|------------------------------------------------------------------------------------------------------------------------------------|------------------|
| 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 7-14 (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> |

| | <i>July</i> | <i>August</i> |
|---------------------------------------------------------------------|--------------------|--------------------|
| 2. Unit sales..... | 15,000 | 20,000 |
| Sales..... | <u>\$900,000</u> | <u>\$1,200,000</u> |
| 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> |
| 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> |

| | <i>July</i> | <i>August</i> |
|------------------------------------------------------------------------------------------------------------------------------------|------------------|------------------|
| 3. 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>(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 because \$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. Because 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.

Problem 7-15 (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 |
| Cost of goods sold (10,000 units × \$80 per unit)..... | <u>800,000</u> |
| Gross margin..... | 700,000 |
| Selling and administrative expenses [\$470,000 + (12% × \$1,500,000)]..... | <u>650,000</u> |
| Net operating income..... | <u>\$ 50,000</u> |

3. Variable costing income statement:

| | | |
|--------------------------------------------------------------------|----------------|--------------------|
| Sales (10,000 units × \$150 per unit)..... | | \$1,500,000 |
| Variable expenses: | | |
| Variable cost of goods sold (10,000 units × \$50 per unit)..... | \$500,000 | |
| Variable selling and administrative expenses..... | <u>180,000</u> | <u>680,000</u> |
| Contribution margin..... | | 820,000 |
| Fixed expenses: | | |
| Fixed manufacturing overhead..... | 360,000 | |
| Fixed selling and administrative expenses. | <u>470,000</u> | <u>830,000</u> |
| Net operating loss..... | | <u>\$ (10,000)</u> |

Problem 7-15 (continued)

4. A manager may prefer to show prospective investors the statement prepared under the absorption approach in part (2) because 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 7-16 (75 minutes)

| 1. | <i>Year 1</i> | <i>Year 2</i> | <i>Year 3</i> |
|----------------------------------|------------------|--------------------|------------------|
| Unit sales..... | 50,000 | 40,000 | 50,000 |
| Sales..... | <u>\$800,000</u> | <u>\$ 640,000</u> | <u>\$800,000</u> |
| Variable expenses: | | | |
| Variable cost of goods sold | | | |
| @ \$2 per unit..... | 100,000 | 80,000 | 100,000 |
| Variable selling and | | | |
| administrative 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> |
| 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 7-16 (continued)

| | Year 1 | Year 2 | Year 3 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------------|--------------------|
| a2. 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..... | | | 12.00 |
| Absorption costing 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 deferred in (released from) inventory from Year 2 to Year 3 under absorption costing (20,000 units × \$8.00 per unit)..... | | 160,000 | (160,000) |
| Add (deduct) fixed manufacturing overhead cost deferred in (released from) 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 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 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 were sold as in Year 1. | | | |

Problem 7-16 (continued)

5. a. With lean production, 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 lean production 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. If the predetermined overhead rate is based on 50,000 units in each year, the income statements under absorption costing would have appeared as follows:

| | Year 1 | Year 2 | Year 3 |
|--------------------------------|-------------------|--------------------|-------------------|
| Unit sales..... | 50,000 | 40,000 | 50,000 |
| Sales..... | <u>\$ 800,000</u> | <u>\$ 640,000</u> | <u>\$ 800,000</u> |
| Cost of goods sold: | | | |
| Cost of goods | | | |
| manufactured @ \$11.60 | | | |
| per unit..... | 580,000 | 464,000 * | 580,000 |
| Add underapplied overhead | | <u>96,000 **</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 |
| Selling and administrative | | | |
| 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.

Problem 7-17 (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> |

This plan 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 would be shifted between periods through the inventory account and income would 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 would 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 7-17 (continued)

Thus, by producing enough units to build inventory to the maximum level that storage facilities would 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 would be acting against the best interests of the company as a whole. The extra units aren't needed and would be expensive to carry in inventory. Moreover, there is no indication that demand would 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 would obtain his bonus as a result of *producing* rather than as a result of selling. Moreover, he would 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.

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Problem 7-18 (45 minutes)

| 1. a. and b. | <i>Absorption Costing</i> | | <i>Variable Costing</i> | |
|-------------------------------------|-------------------------------|---------------|-------------------------|---------------|
| | <i>Year 1</i> | <i>Year 2</i> | <i>Year 1</i> | <i>Year 2</i> |
| Variable manufacturing 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. | <i>Year 1</i> | | <i>Year 2</i> | |
|------------------------------------------------|------------------|------------------|------------------|------------------|
| Sales..... | <u>\$700,000</u> | | <u>\$700,000</u> | |
| Variable expenses: | | | | |
| Variable cost of goods sold | | | | |
| (20,000 units × \$8 per unit)..... | \$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..... | | <u>520,000</u> | | <u>520,000</u> |
| 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> |

Problem 7-18 (continued)

| | Year 1 | Year 2 |
|--------------------------------------------------------------------------------------------------------------------------|------------------|------------------|
| 3. Variable costing net operating income..... | \$ 40,000 | \$ 40,000 |
| Add fixed manufacturing overhead 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 were 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 lean production, production would have been geared to sales. Hence inventories would not have been built up in Year 2.
- b. Under lean production, 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.

Case 7-19 (90 minutes)

1. Under absorption costing, net operating income depends 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 reducing income.

| | <i>First Quarter</i> | <i>Second Quarter</i> |
|--------------------------------------------------------------------|--------------------------|---------------------------|
| Unit sales..... | 12,000 | 15,000 |
| Sales..... | <u>\$480,000</u> | <u>\$600,000</u> |
| Variable expenses: | | |
| Variable cost of goods sold @ \$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> |
| 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 7-19 (continued)

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

| | <i>Beginning</i> | <i>Units</i> | <i>Units</i> | <i>Ending</i> |
|---------------------|------------------|-----------------|--------------|------------------|
| | <i>Inventory</i> | <i>Produced</i> | <i>Sold</i> | <i>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</i> | <i>Second</i> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|------------------|
| | <i>Quarter</i> | <i>Quarter</i> |
| Variable costing net operating income..... | \$ 4,000 | \$ 85,000 |
| Deduct fixed manufacturing overhead released from inventory during the First Quarter (4,000 units × \$12 per unit)..... | (48,000) | |
| Add (deduct) fixed manufacturing overhead deferred in (released from) inventory from the First Quarter to the Second Quarter (7,000 units × \$12 per unit)..... | 84,000 | (84,000) |
| Add fixed manufacturing overhead deferred 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 deferred in inventory to the Second Quarter (3,000 unit increase × \$12 per unit)..... | 36,000 | |
| Deduct fixed manufacturing overhead 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 7-19 (continued)

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

- Variable costing aids in forecasting and reporting income for decision-making purposes.
- Fixed costs are reported in total which makes them more visible and easier to understand.
- 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 is usually not considered acceptable 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 lean production, 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 lean production..... | <u>8,000</u> |

Case 7-19 (continued)

Although not asked for in the problem, a move to lean production 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 |
| Cost of goods sold: | | |
| Cost of goods manufactured (15,000 | | |
| units × \$20 per unit)..... | 300,000 | |
| Add underapplied overhead*..... | <u>84,000</u> | <u>384,000</u> |
| Gross margin..... | | 216,000 |
| 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 would be 7,000 units × \$12 per unit = \$84,000.

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

Case 7-20 (120 minutes)

1. 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> |

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

2. 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> |
| Absorption costing unit product cost..... | <u>\$94.00</u> |

Case 7-20 (continued)

| | | |
|---------------------------------------------|------------------|---------------------|
| Sales (410,000 units × \$120 per unit)..... | | \$49,200,000 |
| Cost of goods sold | | |
| (410,000 units × \$94 per unit)..... | | <u>38,540,000</u> |
| Gross margin..... | | 10,660,000 |
| Selling and administrative expenses: | | |
| Variable selling and administrative | | |
| (410,000 units × \$10 per unit)..... | \$4,100,000 | |
| Fixed selling and administrative..... | <u>4,560,000</u> | <u>8,660,000</u> |
| Net operating income..... | | <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 because at the current rate of sales, profit will only be \$1,672,000 and they want to achieve 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 7-20 (continued)

Fixed manufacturing overhead deferred in inventory = Fixed manufacturing overhead rate per unit × 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> |
| Absorption costing 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 | | |
| (400,000 units × \$93.60 per unit)..... | | <u>37,440,000</u> |
| Gross margin..... | | 10,560,000 |
| 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 7-20 (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 7-20 (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.

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