

Chapter 7

Variable Costing: A Tool for Management

Solutions to Questions

7-1 The basic difference between absorption and variable costing relates 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 deducted in full from the current period's revenues.

7-2 Selling and administrative expenses are treated as period costs under variable costing, the same as under absorption costing.

7-3 Under absorption costing, as a company manufactures units of product, the fixed manufacturing overhead costs of the period are added to the units, along with direct materials, direct labor, and variable manufacturing overhead. If some of these 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 Many accountants and managers believe 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 the fixed costs of depreciation, taxes, insurance, supervisory salaries, and so on, are just as essential to manufacturing products as are the variable costs.

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 both absorption and variable costing. The reason is that under these conditions inventory will remain unchanged, and therefore fixed manufacturing overhead cost cannot be deferred in inventory or released from inventory under absorption costing.

7-7 If production exceeds sales, absorption costing will show higher net operating income than variable costing. The reason is that inventories will increase and therefore part of the fixed manufacturing overhead cost of the current period will be deferred in inventory to the next period under absorption costing. By contrast, all of the fixed manufacturing overhead cost of the current period will be charged immediately against revenues 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 caused fixed manufacturing overhead cost to be

released from inventory and charged against income as part of cost of goods sold. This added fixed manufacturing overhead cost caused the company to incur a loss even though it sold the break-even volume of sales.

7-10 Under absorption costing it is possible to increase net operating income without increasing sales by increasing the level of production. 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 rise.

7-11 Generally speaking, variable costing cannot be used externally for financial reporting purposes nor can it be used for tax purposes.

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, absorption costing and variable costing will report the same net operating income figures.

Exercise 7-1 (30 minutes)

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

Direct materials	\$18
Direct labor	7
Variable manufacturing overhead	<u>2</u>
Total variable manufacturing costs.....	27
Fixed manufacturing overhead (\$160,000 ÷ 20,000 units)	<u>8</u>
Unit product cost	<u>\$35</u>

- b. The absorption costing income statement:

Sales (16,000 units × \$50 per unit)		\$800,000
Less cost of goods sold:		
Beginning inventory	\$	0
Add cost of goods manufactured		
(20,000 units × \$35 per unit).....		<u>700,000</u>
Goods available for sale.....		700,000
Less ending inventory		
(4,000 units × \$35 per unit)		<u>140,000</u>
		<u>560,000</u>
Gross margin.....		240,000
Less selling and administrative expenses.....		<u>190,000</u> *
Net operating income		<u>\$ 50,000</u>

*(16,000 units × \$5 per unit) + \$110,000 = \$190,000.

Exercise 7-1 (continued)

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

Direct materials	\$18
Direct labor	7
Variable manufacturing overhead	<u>2</u>
Unit product cost	<u>\$27</u>

b. The variable costing income statement:

Sales (16,000 units × \$50 per unit)		\$800,000
Less variable expenses:		
Variable cost of goods sold:		
Beginning inventory	\$	0
Add variable manufacturing costs		
(20,000 units × \$27 per unit)		<u>540,000</u>
Goods available for sale		540,000
Less ending inventory		
(4,000 units × \$27 per unit)		<u>108,000</u>
Variable cost of goods sold		432,000 *
Variable selling expense		
(16,000 units × \$5 per unit)		<u>80,000</u>
Contribution margin		<u>512,000</u>
Less fixed expenses:		288,000
Fixed manufacturing overhead	160,000	
Fixed selling and administrative	<u>110,000</u>	<u>270,000</u>
Net operating income		<u>\$ 18,000</u>

* The variable cost of goods sold could be computed more simply
as: 16,000 units × \$27 per unit = \$432,000.

Exercise 7-2 (20 minutes)

1. Sales (40,000 units × \$33.75 per unit)		\$1,350,000
Less variable expenses:		
Variable cost of goods sold		
(40,000 units × \$16 per unit*).....	\$640,000	
Variable selling and administrative expenses		
(40,000 units × \$3 per unit)	<u>120,000</u>	<u>760,000</u>
Contribution margin.....		590,000
Less fixed expenses:		
Fixed manufacturing overhead.....	250,000	
Fixed selling and administrative expenses.....	<u>300,000</u>	<u>550,000</u>
Net operating income		<u>\$ 40,000</u>
* Direct materials	\$10	
Direct labor	4	
Variable manufacturing overhead.....	<u>2</u>	
Total variable manufacturing cost	<u>\$16</u>	

2. The difference in net operating income can be explained by the \$50,000 in fixed manufacturing overhead deferred in inventory under the absorption costing method:

Variable costing net operating income.....	\$40,000
Add: Fixed manufacturing overhead cost deferred in inventory under absorption costing: 10,000 units × \$5 per unit in fixed manufacturing overhead cost	<u>50,000</u>
Absorption costing net operating income.....	<u>\$90,000</u>

Exercise 7-3 (15 minutes)

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

Direct materials	R120
Direct labor	140
Variable manufacturing overhead	50
Fixed manufacturing overhead (R600,000 ÷ 10,000 units)	<u>60</u>
Unit product cost	<u>R370</u>

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

Direct materials	R120
Direct labor	140
Variable manufacturing overhead	<u>50</u>
Unit product cost	<u>R310</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 7-4 (30 minutes)

- 2,000 units × R60 per unit fixed manufacturing overhead = R120,000
- The variable costing income statement appears below:

Sales		R4,000,000
Less variable expenses:		
Variable cost of goods sold:		
Beginning inventory	R	0
Add variable manufacturing costs		
(10,000 units × R310 per unit)		<u>3,100,000</u>
Goods available for sale		3,100,000
Less ending inventory		
(2,000 units × R310 per unit)		<u>620,000</u>
Variable cost of goods sold*		2,480,000
Variable selling and administrative		
(8,000 units × R20 per unit)		<u>160,000</u>
Contribution margin		<u>1,360,000</u>
Less fixed expenses:		
Fixed manufacturing overhead	600,000	
Fixed selling and administrative	<u>400,000</u>	<u>1,000,000</u>
Net operating income		<u>R 360,000</u>

* The variable cost of goods sold could be computed more simply as:
8,000 units sold × R310 per unit = R2,480,000.

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 R120,000 of fixed manufacturing overhead cost has been deferred in inventory to the next period. Thus, net operating income under the absorption costing approach is R120,000 higher than it is under variable costing.

Exercise 7-5 (30 minutes)

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

Direct materials	\$ 60
Direct labor	30
Variable manufacturing overhead	<u>10</u>
Unit product cost	<u>\$100</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		\$1,800,000
Less variable expenses:		
Variable cost of goods sold:		
Beginning inventory	\$ 0	
Add variable manufacturing costs (10,000 units × \$100 per unit)	<u>1,000,000</u>	
Goods available for sale	1,000,000	
Less ending inventory (1,000 units × \$100 per unit)	<u>100,000</u>	
Variable cost of goods sold*	900,000	
Variable selling and administrative (9,000 units × \$20 per unit)	<u>180,000</u>	<u>1,080,000</u>
Contribution margin		720,000
Less fixed expenses:		
Fixed manufacturing overhead	300,000	
Fixed selling and administrative	<u>450,000</u>	<u>750,000</u>
Net operating loss		<u>\$ (30,000)</u>

* The variable cost of goods sold could be computed more simply as:
9,000 units sold × \$100 per unit = \$900,000.

Exercise 7-5 (continued)

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

Selling price per unit.....	\$200
Variable cost per unit.....	<u>120</u>
Contribution margin per unit	<u>\$ 80</u>

$$\begin{aligned}\text{Break-even unit sales} &= \frac{\text{Fixed expenses}}{\text{Unit contribution margin}} \\ &= \frac{\$750,000}{\$80 \text{ per unit}} \\ &= 9,375 \text{ units}\end{aligned}$$

Exercise 7-6 (20 minutes)

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

Direct materials	\$ 60
Direct labor	30
Variable manufacturing overhead	10
Fixed manufacturing overhead (\$300,000 ÷ 10,000 units)	<u>30</u>
Unit product cost.....	<u>\$130</u>

2. The absorption costing income statement appears below:

Sales (9,000 units × \$200 per unit)		\$1,800,000
Cost of goods sold:		
Beginning inventory	\$	0
Add cost of goods manufactured (10,000 units × \$130 per unit)	<u>1,300,000</u>	
Goods available for sale.....	1,300,000	
Less ending inventory (1,000 units × \$130 per unit).....	<u>130,000</u>	<u>1,170,000</u>
Gross margin.....		630,000
Less selling and administrative expenses:		
Variable selling and administrative (9,000 units × \$20 per unit)	180,000	
Fixed selling and administrative	<u>450,000</u>	<u>630,000</u>
Net operating income		<u>\$ 0</u>

Note: While not part of the requirements for the exercise, the instructor may want to point out that under absorption costing, the company apparently has exactly zero net operating income even though its sales are below the break-even point computed in Exercise 7-5. This occurs because \$30,000 of fixed manufacturing overhead has been deferred in inventory and does not appear on the income statement prepared using absorption costing.

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	\$10	\$10
Direct labor	5	5
Variable manufacturing overhead	2	2
Fixed manufacturing overhead (\$90,000 ÷ 30,000 units)	<u>—</u>	<u>3</u>
Unit product cost	<u>\$17</u>	<u>\$20</u>
Total cost, 5,000 units	<u>\$85,000</u>	<u>\$100,000</u>

2. a. No, the \$85,000 figure 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 \$100,000, which represents the absorption cost to manufacture the 5,000 unsold units. Thus, the account should be increased by \$15,000 for external reporting purposes. This \$15,000 consists of the amount of fixed manufacturing overhead cost that is allocated to the 5,000 unsold units under absorption costing:

$$5,000 \text{ units} \times \$3 \text{ per unit fixed manufacturing overhead cost} = \$15,000$$

Problem 7-8 (30 minutes)

1. The unit product cost under the variable costing approach would be computed as follows:

Direct materials	\$ 8
Direct labor	10
Variable manufacturing overhead	<u>2</u>
Unit product cost	<u>\$20</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>\$1,500,000</u>
Less variable expenses:		
Variable cost of goods sold @ \$20 per unit ..	400,000	600,000
Variable selling and administrative @ \$3 per unit	<u>60,000</u>	<u>90,000</u>
Total variable expenses	<u>460,000</u>	<u>690,000</u>
Contribution margin	<u>540,000</u>	<u>810,000</u>
Less fixed expenses:		
Fixed manufacturing overhead	350,000	350,000
Fixed selling and administrative	<u>250,000</u>	<u>250,000</u>
Total fixed expenses	<u>600,000</u>	<u>600,000</u>
Net operating income (loss)	<u>\$ (60,000)</u>	<u>\$ 210,000</u>

2. Variable costing net operating income (loss) .. \$ (60,000) \$ 210,000
- Add: Fixed manufacturing overhead cost
deferred in inventory under absorption
costing (5,000 units × \$14 per unit) 70,000
- Deduct: Fixed manufacturing overhead cost
released from inventory under absorption
costing (5,000 units × \$14 per unit) (70,000)
- Absorption costing net operating income \$ 10,000 \$ 140,000

Problem 7-9 (45 minutes)

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

Direct materials	\$15
Direct labor	7
Variable manufacturing overhead	2
Fixed manufacturing overhead (640,000 ÷ 40,000 units)	<u>16</u>
Unit product cost	<u>\$40</u>

- b. The absorption costing income statement follows:

Sales (35,000 units × \$60 per unit)		\$2,100,000
Less cost of goods sold:		
Beginning inventory	\$	0
Add cost of goods manufactured (40,000 units × \$40 per unit)		<u>1,600,000</u>
Goods available for sale		1,600,000
Less ending inventory (5,000 units × \$40 per unit)		<u>200,000</u>
Gross margin		<u>1,400,000</u>
Less selling and administrative expenses ...		700,000
Net operating income		<u>630,000</u> *
		<u>\$ 70,000</u>

*(35,000 units × \$2 per unit) + \$560,000 = \$630,000.

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

Direct materials	\$15
Direct labor	7
Variable manufacturing overhead	<u>2</u>
Unit product cost	<u>\$24</u>

Problem 7-9 (continued)

b. The variable costing income statement follows:

Sales (35,000 units × \$60 per unit)		\$2,100,000
Less variable expenses:		
Variable cost of goods sold:		
Beginning inventory	\$	0
Add variable manufacturing costs		
(40,000 units × \$24 per unit)		<u>960,000</u>
Goods available for sale		960,000
Less ending inventory		
(5,000 units × \$24 per unit)		<u>120,000</u>
Variable cost of goods sold		840,000
Variable selling expense		
(35,000 units × \$2 per unit)		<u>70,000</u>
Contribution margin		<u>910,000</u>
Less fixed expenses:		1,190,000
Fixed manufacturing overhead	640,000	
Fixed selling and administrative expense	<u>560,000</u>	<u>1,200,000</u>
Net operating loss		<u>\$ (10,000)</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 \$16 per unit ($\$640,000 \div 40,000$ units produced = \$16 per unit). Thus, under absorption costing a portion of the \$640,000 fixed manufacturing overhead cost of the month has been added to the inventory account rather than expensed on the income statement:

Added to the ending inventory		
(5,000 units × \$16 per unit)	\$	80,000
Expensed as part of cost of goods sold		
(35,000 units × \$16 per unit)		<u>560,000</u>
Total fixed manufacturing overhead cost for the month		<u>\$640,000</u>

Problem 7-9 (continued)

Since \$80,000 of fixed manufacturing overhead cost has been deferred in inventory under absorption costing, the net operating income reported under that costing method is \$80,000 higher than the net operating income under variable costing, as shown in parts (1) and (2) above.

Problem 7-10 (45 minutes)

	<i>Absorption Costing</i>	<i>Variable Costing</i>
1. a. and b.		
Direct materials.....	\$ 86	\$86
Variable manufacturing overhead	4	4
Fixed manufacturing overhead (\$240,000 ÷ 4,000 units)	<u>60</u>	<u>—</u>
Unit product cost.....	<u>\$150</u>	<u>\$90</u>
2. Absorption costing income statement:		
Sales (3,200 units × \$250 per unit)		\$800,000
Less cost of goods sold:		
Beginning inventory	\$ 0	
Add cost of goods manufactured (4,000 units × \$150 per unit).....	<u>600,000</u>	
Goods available for sale.....	600,000	
Less ending inventory (800 units × \$150 per unit)	<u>120,000</u>	<u>480,000</u>
Gross margin.....		320,000
Less selling and administrative expenses.....		<u>280,000*</u>
Net operating income		<u>\$ 40,000</u>
*Variable (15% × \$800,000).....	\$120,000	
Fixed	<u>160,000</u>	
Total	<u>\$280,000</u>	

Problem 7-10 (continued)

3. Variable costing income statement:

Sales (3,200 units × \$250 per unit)		\$800,000
Less variable expenses:		
Variable cost of goods sold:		
Beginning inventory	\$ 0	
Add variable manufacturing costs		
(4,000 units × \$90 per unit)	<u>360,000</u>	
Goods available for sale	360,000	
Less ending inventory		
(800 units × \$90 per unit)	<u>72,000</u>	
Variable cost of goods sold	288,000*	
Variable selling and administrative		
expense (\$800,000 × 15%)	<u>120,000</u>	<u>408,000</u>
Contribution margin		392,000
Less fixed expenses:		
Fixed manufacturing overhead	240,000	
Fixed selling and administrative	<u>160,000</u>	<u>400,000</u>
Net operating loss		<u>\$ (8,000)</u>

* This figure could be computed more simply as:

$$3,200 \text{ units} \times \$90 \text{ per unit} = \$288,000.$$

4. Most managers would 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.

5. Variable costing net operating income (loss)	\$ (8,000)
Add: Fixed manufacturing overhead cost deferred in	
inventory under absorption costing	
(800 units × \$60 per unit)	<u>48,000</u>
Absorption costing net operating income	<u>\$40,000</u>

Problem 7-11 (45 minutes)

1. a. and b.

	<i>Absorption Costing</i>	<i>Variable Costing</i>
Direct materials.....	\$ 6	\$ 6
Direct labor.....	12	12
Variable manufacturing overhead	4	4
Fixed manufacturing overhead (\$240,000 ÷ 30,000 units)	<u>8</u>	<u>—</u>
Unit product cost.....	<u>\$30</u>	<u>\$22</u>

2.

	<i>May</i>	<i>June</i>
Sales	<u>\$1,040,000</u>	<u>\$1,360,000</u>
Less variable expenses:		
Variable production costs @ \$22 per unit	572,000	748,000
Variable selling and administrative @ \$3 per unit	<u>78,000</u>	<u>102,000</u>
Total variable expenses.....	<u>650,000</u>	<u>850,000</u>
Contribution margin.....	<u>390,000</u>	<u>510,000</u>
Less fixed expenses:		
Fixed manufacturing overhead.....	240,000	240,000
Fixed selling and administrative	<u>180,000</u>	<u>180,000</u>
Total fixed expenses.....	<u>420,000</u>	<u>420,000</u>
Net operating income (loss)	<u>\$ (30,000)</u>	<u>\$ 90,000</u>

3.

	<i>May</i>	<i>June</i>
Variable costing net operating income (loss) ...	\$ (30,000)	\$ 90,000
Add: Fixed manufacturing overhead cost deferred in inventory under absorption costing (4,000 units × \$8 per unit)	32,000	
Deduct: Fixed manufacturing overhead cost released from inventory under absorption costing (4,000 units × \$8 per unit)		<u>(32,000)</u>
Absorption costing net operating income	<u>\$ 2,000</u>	<u>\$ 58,000</u>

Problem 7-11 (continued)

4. As shown in the reconciliation in part (3) above, \$32,000 of fixed manufacturing overhead cost was deferred in inventory under absorption costing at the end of May, since \$8 of fixed manufacturing overhead cost "attached" to each of the 4,000 unsold units that went into inventory at the end of that month. This \$32,000 was part of the \$420,000 total fixed cost that has to be covered each month in order for the company to break even. Since the \$32,000 was added to the inventory account, and thus did not appear on the income statement for May 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 \$388,000 of fixed cost ($\$420,000 - \$32,000$) was expensed for May, rather than the full \$420,000 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 7-12 (60 minutes)

1. a.	Direct materials.....	\$1.00	
	Direct labor.....	0.80	
	Variable manufacturing overhead	0.20	
	Fixed manufacturing overhead (\$75,000 ÷ 50,000 units).....	<u>1.50</u>	
	Unit product cost.....	<u>\$3.50</u>	
b.	Sales (40,000 units)		\$200,000
	Less cost of goods sold:		
	Beginning inventory	\$	0
	Add cost of goods manufactured (50,000 units × \$3.50 per unit)	<u>175,000</u>	
	Goods available for sale	175,000	
	Less ending inventory (10,000 units × \$3.50 per unit)	<u>35,000</u>	<u>140,000</u>
	Gross margin		60,000
	Less selling and administrative expenses		<u>50,000*</u>
	Net operating income		<u>\$ 10,000</u>
	*\$30,000 variable plus \$20,000 fixed = \$50,000.		
c.	Variable costing net operating loss		\$ (5,000)
	Add: Fixed manufacturing overhead cost deferred in inventory under absorption costing (10,000 units × \$1.50 per unit)	<u>15,000</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 month. 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 month, 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 expense until the units are sold. Therefore, if the selling price of a unit is greater than the unit 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.

Problem 7-12 (continued)

3. a. Sales (60,000 units × \$5 per unit).....		\$300,000
Less variable expenses:		
Variable cost of goods sold		
(60,000 units × \$2 per unit)	\$120,000	
Variable selling and administrative expenses		
(60,000 units × \$0.75 per unit).....	<u>45,000</u>	<u>165,000</u>
Contribution margin		135,000
Less fixed expense:		
Fixed manufacturing overhead.....	75,000	
Fixed selling and administrative expense	<u>20,000</u>	<u>95,000</u>
Net operating income		<u>\$ 40,000</u>

- b. The absorption costing unit product cost will remain at \$3.50, the same as in part (1).

Sales (60,000 units × \$5 per unit).....		\$300,000
Less cost of goods sold:		
Beginning inventory		
(10,000 units × \$3.50 per unit)	\$ 35,000	
Add cost of goods manufactured		
(50,000 units × \$3.50 per unit)	<u>175,000</u>	
Goods available for sale	210,000	
Less ending inventory	<u>0</u>	<u>210,000</u>
Gross margin		90,000
Less selling and administrative expenses		<u>65,000*</u>
Net operating income		<u>\$ 25,000</u>

*\$45,000 variable plus \$20,000 fixed = \$65,000.

c. Variable costing net operating income	\$ 40,000
Deduct: Fixed manufacturing overhead cost released	
from inventory under absorption costing (10,000 units	
× \$1.50 per unit).....	<u>15,000</u>
Absorption costing net operating income	<u>\$ 25,000</u>

Problem 7-13 (75 minutes)

1.	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>
Sales	<u>\$1,000,000</u>	<u>\$ 800,000</u>	<u>\$1,000,000</u>
Less variable expenses:			
Variable cost of goods sold @			
\$4 per unit.....	200,000	160,000	200,000
Variable selling and			
administrative @ \$2 per unit....	<u>100,000</u>	<u>80,000</u>	<u>100,000</u>
Total variable expenses.....	<u>300,000</u>	<u>240,000</u>	<u>300,000</u>
Contribution margin.....	<u>700,000</u>	<u>560,000</u>	<u>700,000</u>
Less fixed expenses:			
Fixed manufacturing overhead....	600,000	600,000	600,000
Fixed selling and administrative ..	<u>70,000</u>	<u>70,000</u>	<u>70,000</u>
Total fixed expenses.....	<u>670,000</u>	<u>670,000</u>	<u>670,000</u>
Net operating income (loss)	<u>\$ 30,000</u>	<u>\$(110,000)</u>	<u>\$ 30,000</u>

Problem 7-13 (continued)

2. a.	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>
Variable manufacturing cost.....	\$ 4	\$ 4	\$ 4
Fixed manufacturing cost:			
\$600,000 ÷ 50,000 units.....	12		
\$600,000 ÷ 60,000 units.....		10	
\$600,000 ÷ 40,000 units.....			<u>15</u>
Unit product cost.....	<u>\$16</u>	<u>\$14</u>	<u>\$19</u>
b. Variable costing net operating			
income (loss)	\$30,000	\$(110,000)	\$ 30,000
Add (Deduct): Fixed manufacturing			
overhead cost deferred in			
inventory from Year 2 to Year 3			
under absorption costing (20,000			
units × \$10 per unit)		200,000	(200,000)
Add: Fixed manufacturing overhead			
cost deferred in inventory from			
Year 3 to the future under			
absorption costing (10,000 units ×			
\$15 per unit).....	<u> </u>	<u> </u>	<u>150,000</u>
Absorption costing net operating			
income (loss)	<u>\$30,000</u>	<u>\$ 90,000</u>	<u>\$(20,000)</u>
3. Production went up sharply in Year 2 thereby reducing the unit product			
cost, as shown in (2a). This reduction in cost, 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 rose even though sales were down.			

Problem 7-13 (continued)

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 was 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.
5. a. Several things would have been different if the company had been using JIT inventory methods. First, in each year production would have been geared to sales so that little or no inventory of finished goods would have been built up in either Year 2 or Year 3. Second, unit product costs probably would have been the same in all three years, since these costs would have been established on the basis of *expected* sales (50,000 units) for each year. Third, since only 40,000 units were sold in Year 2, the company would have produced only that number of units and therefore would have had some underapplied overhead cost for the year. (See the discussion on underapplied overhead in the following paragraph.)
- 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. The reason is that with production geared to sales, there would have been no ending inventory on hand, 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:

Problem 7-13 (continued)

	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>
Sales.....	<u>\$1,000,000</u>	<u>\$ 800,000</u>	<u>\$1,000,000</u>
Less cost of goods sold:			
Cost of goods manufactured			
@ \$16 per unit	800,000	640,000 *	800,000
Add underapplied overhead		<u>120,000 **</u>	
Cost of goods sold	<u>800,000</u>	<u>760,000</u>	<u>800,000</u>
Gross margin	200,000	40,000	200,000
Selling and administrative			
expenses	<u>170,000</u>	<u>150,000</u>	<u>170,000</u>
Net operating income (loss).....	<u>\$ 30,000</u>	<u>\$(110,000)</u>	<u>\$ 30,000</u>

* 40,000 units × \$16 per unit = \$640,000.

** 10,000 units *not* produced × \$12 per unit fixed manufacturing overhead cost = \$120,000 fixed manufacturing overhead cost not applied to products.

Problem 7-14 (30 minutes)

1. Because of soft demand for the Australian Division's product, the inventory should be drawn down to the minimum level of 1,500 units. Drawing inventory down to the minimum level would require production as follows during the last quarter:

Desired inventory, December 31	1,500 units
Expected sales, last quarter	<u>18,000 units</u>
Total needs	19,500 units
Less inventory, September 30.....	<u>12,000 units</u>
Required production	<u>7,500 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 Australian Division's operating income, Mr. Constantinos could produce as many units as storage facilities will allow. By building inventory to the maximum level, Mr. Constantinos 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 deductions on the current year's income statement. Building inventory to the maximum level of 30,000 units would require production as follows during the last quarter:

Desired inventory, December 31	30,000 units
Expected sales, last quarter	<u>18,000 units</u>
Total needs	48,000 units
Less inventory, September 30.....	<u>12,000 units</u>
Required production	<u>36,000 units</u>

Problem 7-14 (continued)

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

3. By setting a production schedule that will maximize his division's net operating income—and maximize his own bonus—Mr. Constantinos 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. Constantinos 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 7-15 (45 minutes)

1. a. and b.

	<u>Absorption Costing</u>		<u>Variable Costing</u>	
	<u>Year 1</u>	<u>Year 2</u>	<u>Year 1</u>	<u>Year 2</u>
Variable production costs	\$ 6	\$ 6	\$6	\$6
Fixed manufacturing overhead costs:				
\$600,000 ÷ 40,000 units	15		—	
\$600,000 ÷ 50,000 units		<u>12</u>		<u>—</u>
Unit product cost.....	<u>\$21</u>	<u>\$18</u>	<u>\$6</u>	<u>\$6</u>

2.

	<u>Year 1</u>		<u>Year 2</u>	
Sales	\$1,250,000		\$1,250,000	
Less variable expenses:				
Variable cost of goods sold:				
Beginning inventory	\$ 0		\$ 0	
Add variable manufacturing costs.....	<u>240,000</u>		<u>300,000</u>	
Goods available for sale	240,000		300,000	
Less ending inventory	<u>0</u>		<u>60,000</u>	
Variable cost of goods sold	240,000		240,000	
Variable selling and administrative expenses				
(40,000 units × \$2 per unit)	<u>80,000</u>	<u>320,000</u>	<u>80,000</u>	<u>320,000</u>
Contribution margin.....		930,000		930,000
Less fixed expenses:				
Fixed manufacturing overhead.....	600,000		600,000	
Fixed selling and administrative expenses.....	<u>270,000</u>	<u>870,000</u>	<u>270,000</u>	<u>870,000</u>
Net operating income		<u>\$ 60,000</u>		<u>\$ 60,000</u>

Problem 7-15 (continued)

	<i>Year 1</i>	<i>Year 2</i>
3. Variable costing net operating income	\$ 60,000	\$ 60,000
Add: Fixed manufacturing overhead cost deferred in inventory under absorption costing (10,000 units × \$12 per unit).....	<u>—</u>	<u>120,000</u>
Absorption costing net operating income ..	<u>\$ 60,000</u>	<u>\$180,000</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 \$120,000 (10,000 units × \$12 per unit) of fixed manufacturing overhead cost that it otherwise would have borne. Thus, net operating income was \$120,000 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 sales or reduction in costs. This is a major criticism of the absorption costing approach.
5. a. Two things would have been different under JIT. First, production would have been geared to sales, rather than production exceeding sales in order to have a stock of goods on hand. Second, the unit costs under absorption costing would have been the same as in Year 1, since the same number of units would have been produced in each year.
- b. Under JIT, the net operating income for Year 2 using absorption costing would have been \$60,000—the same as in Year 1. The reason is that with production geared to sales and no ending inventory, no fixed manufacturing overhead costs would have been deferred in inventory. The entire \$600,000 in fixed manufacturing overhead costs would have been charged against Year 2 operations, rather than having \$120,000 of it deferred to future periods through the inventory account. Thus, net operating income would have been the same in each year under *both* variable and absorption costing.

Case 7-16 (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 (\$40,000,000 ÷ 200,000 units).....	\$200
Less variable costs per unit	<u>120</u>
Unit contribution margin	<u>\$ 80</u>

$$\begin{aligned}\text{Unit sales to attain target profit} &= \frac{\text{Fixed expenses} + \text{Target net profit}}{\text{Unit contribution margin}} \\ &= \frac{\$12,000,000 + \$4,800,000}{\$80 \text{ per unit}} \\ &= 210,000 \text{ units}\end{aligned}$$

2. The unit product cost at a production level of 210,000 units would be calculated as follows:

Direct materials	\$ 50
Direct labor	40
Variable manufacturing overhead	20
Fixed manufacturing overhead (\$8,400,000 ÷ 210,000 units).....	<u>40</u>
Unit product cost.....	<u>\$150</u>

Case 7-16 (continued)

Sales (210,000 units × \$200 per unit)		\$42,000,000
Cost of goods sold:		
Beginning inventory	\$	0
Add cost of goods manufactured		
(210,000 units × \$150 per unit)	<u>31,500,000</u>	
Goods available for sale	31,500,000	
Less ending inventory	<u>0</u>	<u>31,500,000</u>
Gross margin		10,500,000
Less selling and administrative expenses:		
Variable selling and administrative		
(210,000 units × \$10 per unit)	2,100,000	
Fixed selling and administrative	<u>3,600,000</u>	<u>5,700,000</u>
Net operating income		<u>\$ 4,800,000</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 \$800,000 since at the current rate of sales, profit will only be \$4,000,000 and they want to hit the target profit of \$4,800,000.

The amount of production, Q , required to defer \$800,000 can be determined as follows:

Units in beginning inventory	0
Units produced	<u>Q</u>
Units available for sale	Q
Units sold	<u>200,000</u>
Units in ending inventory	<u>$Q - 200,000$</u>

Case 7-16 (continued)

$$\text{Fixed manufacturing overhead per unit} = \frac{\$8,400,000}{Q}$$

Fixed manufacturing overhead
deferred in inventory

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

$$\$800,000 = \frac{\$8,400,000}{Q} (Q - 200,000)$$

$$\$800,000Q = \$8,400,000 (Q - 200,000)$$

$$\$7,600,000Q = \$8,400,000 \times 200,000$$

$$Q = 221,053 \text{ units (rounded up)}$$

4. The unit product cost at a production level of 221,053 units would be calculated as follows:

Direct materials	\$ 50
Direct labor	40
Variable manufacturing overhead	20
Fixed manufacturing overhead (\$8,400,000 ÷ 221,053 units)	<u>38</u>
Unit product cost	<u>\$148</u>

Case 7-16 (continued)

Sales (200,000 units × \$200 per unit)		\$40,000,000
Cost of goods sold:		
Beginning inventory	\$	0
Add cost of goods manufactured		
(221,053 units × \$148 per unit)		<u>32,715,844</u>
Goods available for sale		32,715,844
Less ending inventory		
(21,053 units × \$148 per unit)		<u>3,115,844</u>
Gross margin		<u>29,600,000</u>
Less selling and administrative expenses:		10,400,000
Variable selling and administrative		
(200,000 units × \$10 per unit)	2,000,000	
Fixed selling and administrative	<u>3,600,000</u>	<u>5,600,000</u>
Net operating income		<u>\$ 4,800,000</u>

5. As a practical matter, the scheme of building inventories to increase profits will work. However, the \$800,000 in fixed manufacturing overhead is only *deferred* in inventory. It is an axe 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 target profits, 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.

Case 7-16 (continued)

Apart from this practical consideration, behavioral and ethical issues should be addressed. Taking the ethical issue first, it is unlikely that this is the kind of action the Board of Directors had in mind when they set the target profit. 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 additional costs 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 Michael 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. Michael needs to set a new moral climate in the company or there will likely be even bigger problems down the road. Michael should firmly turn down the managers' request and let them know why.

Having said all of that, it would not be easy for Michael to turn down \$50,000—which is precisely what Michael 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.

Case 7-16 (continued)

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, managers may be tempted 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 7-17 (90 minutes)

1.	<i>April</i>	<i>May</i>	<i>June</i>
Sales	<u>\$1,500,000</u>	<u>\$1,625,000</u>	<u>\$1,750,000</u>
Less variable expenses:			
Variable manufacturing costs @ \$6 per unit	360,000	390,000	420,000
Variable selling and administrative @ \$9 per unit	<u>540,000</u>	<u>585,000</u>	<u>630,000</u>
Total variable expenses.....	<u>900,000</u>	<u>975,000</u>	<u>1,050,000</u>
Contribution margin.....	<u>600,000</u>	<u>650,000</u>	<u>700,000</u>
Less fixed expenses:			
Fixed manufacturing overhead	560,000 *	560,000	560,000
Fixed selling and administrative	<u>80,000 **</u>	<u>80,000</u>	<u>80,000</u>
Total fixed expenses.....	<u>640,000</u>	<u>640,000</u>	<u>640,000</u>
Net operating income (loss) ...	<u>\$ (40,000)</u>	<u>\$ 10,000</u>	<u>\$ 60,000</u>

* $\$1,680,000 \div 3 \text{ months} = \$560,000$ per month.

** Fixed selling and administrative expenses (from April's figures):

$\$620,000 - (60,000 \text{ units} \times \$9 \text{ per unit}) = \$80,000$.

Note how clearer and easy to follow the variable costing statements are than the absorption costing statements.

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

	<i>April</i>	<i>May</i>	<i>June</i>
Fixed manufacturing overhead cost applied	\$600,000	\$560,000	\$400,000
Underapplied or (overapplied) overhead.....	<u>(40,000)</u>	<u>—</u>	<u>160,000</u>
Fixed manufacturing overhead cost ..	<u>\$560,000</u>	<u>\$560,000</u>	<u>\$560,000</u>

Case 7-17 (continued)

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

$$\frac{\text{Fixed expenses}}{\text{Unit contribution margin}} = \frac{\$640,000}{\$25 - (\$6 + \$9) = \$10 \text{ per unit}} = 64,000 \text{ units.}$$

On the surface this answer appears to be incorrect, since the company sold *less* than 64,000 units in April and showed a profit for the month on the absorption costing statement. In fact, when a student gives an answer of 64,000 units as the break-even point, you should ask him or her, "How can 64,000 units be the break-even point when the company sold only 60,000 units in April and reported a profit for the month?"

The answer to this apparent inconsistency is that production exceeded sales in April, thereby deferring a portion of the fixed manufacturing overhead costs of that month to the future rather than showing the cost as an expense on the income statement. In April, this deferral of fixed manufacturing overhead cost was great enough to allow the company to report a profit, even though less than the break-even volume of units was sold.

Case 7-17 (continued)

3. Under absorption costing, profits are affected by both sales and production. If production exceeds sales in a given period, then a portion of the fixed manufacturing overhead cost of that period will be deferred to the future, as explained in part (2) above. In periods when these deferrals of fixed manufacturing overhead cost take place, profits will tend to be high, as in April for Visic Company. If production is less than sales in a given period, 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 of the current period. 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 often cause profits to be abnormally low or even nonexistent, even though sales may be increasing. We can see this happening in June in Visic Company, where production was planned to be 70,000 units for the month, but only 50,000 units were produced.

In sum, with profits dependent on both sales and production under absorption costing, profits can move erratically, depending on how the sales and production figures move in relation to each other in a given month.

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

	<i>Beginning Inventory</i>	<i>Units Produced</i>	<i>Units Sold</i>	<i>Ending Inventory</i>
April	5,000	75,000	60,000	20,000
May	20,000	70,000	65,000	25,000
June	25,000	50,000	70,000	5,000

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

$$\frac{\text{Monthly fixed manufacturing overhead cost}}{\text{Planned monthly production}} = \frac{\$560,000}{70,000 \text{ units}} = \$8 \text{ per unit.}$$

Case 7-17 (continued)

Given these data, the reconciliation would be:

	<i>April</i>	<i>May</i>	<i>June</i>
Variable costing net operating income (loss).....	\$ (40,000)	\$ 10,000	\$ 60,000
Deduct: Fixed manufacturing overhead cost released from inventory during April (5,000 units × \$8 per unit)	(40,000)		
Add (Deduct): Fixed manufacturing overhead cost deferred in inventory from April to May (20,000 units × \$8 per unit).....	160,000	(160,000)	
Add (Deduct): Fixed manufacturing overhead cost deferred in inventory from May to June (25,000 units × \$8 per unit).....		200,000	(200,000)
Add: Fixed manufacturing overhead cost deferred in inventory from June to the future (5,000 units × \$8 per unit).....	<u> </u>	<u> </u>	<u>40,000</u>
Absorption costing net operating income (loss).....	<u>\$ 80,000</u>	<u>\$ 50,000</u>	<u>\$(100,000)</u>

Case 7-17 (continued)

An alternative approach to the reconciliation would be as follows:

	<i>April</i>	<i>May</i>	<i>June</i>
Variable costing net operating income (loss).....	\$ (40,000)	\$10,000	\$ 60,000
Add: Fixed manufacturing overhead cost deferred in inventory at the end of April (15,000 unit increase × \$8 per unit).....	120,000		
Add: Fixed manufacturing overhead cost deferred in inventory at the end of May (5,000 unit increase × \$8 per unit).....		40,000	
Deduct: Fixed manufacturing overhead cost released from inventory during June (20,000 unit decrease × \$8 per unit).....			<u>(160,000)</u>
Absorption costing net operating income (loss).....	<u>\$ 80,000</u>	<u>\$50,000</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 June to meet sales needs beyond the inventory of units on hand at the start of the month. The computation is as follows:

Units sold during June	70,000
Less units in inventory at the beginning of the month	<u>25,000</u>
Units produced during June under JIT.....	<u>45,000</u>

Although not asked for in the question, a move to JIT during June would have resulted in an even deeper loss for the month. The reason is that producing only 45,000 units (rather than 50,000 units, as in the problem) would have resulted in \$40,000 more in underapplied overhead (see the computation below), or a loss of \$140,000 instead of a loss of \$100,000 for the month.

Case 7-17 (continued)

Units produced during June.....	50,000
Units that would have been produced under JIT	<u>45,000</u>
Decrease in production	5,000
Fixed manufacturing overhead rate per unit	<u>× \$8</u>
Increased loss for the month.....	<u>\$40,000</u>

- b. Starting with the next quarter, there will be little or no difference between the net operating income reported under variable costing and 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 7-18 (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 curtailment 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 slashing income sharply.

	<i>First Quarter</i>	<i>Second Quarter</i>
Sales	<u>\$1,600,000</u>	<u>\$2,000,000</u>
Less variable expenses:		
Variable manufacturing @ \$30 per unit.....	480,000	600,000
Variable selling and administrative @ \$5 per unit	<u>80,000</u>	<u>100,000</u>
Total variable expenses.....	<u>560,000</u>	<u>700,000</u>
Contribution margin.....	<u>1,040,000</u>	<u>1,300,000</u>
Less fixed expenses:		
Fixed manufacturing overhead.....	800,000	800,000
Fixed selling and administrative	<u>230,000*</u>	<u>230,000*</u>
Total fixed expenses.....	<u>1,030,000</u>	<u>1,030,000</u>
Net operating income	<u>\$ 10,000</u>	<u>\$ 270,000</u>

* Selling and administrative expenses,	
First Quarter	\$310,000
Less variable portion (16,000 units × \$5 per unit)	<u>80,000</u>
Fixed selling and administrative expenses	<u>\$230,000</u>

Case 7-18 (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	3,000	20,000	16,000	7,000
Second Quarter	7,000	14,000	20,000	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.....	\$ 10,000	\$270,000
Deduct: Fixed manufacturing overhead cost released from inventory during the First Quarter (3,000 units × \$40 per unit).....	(120,000)	
Add (deduct): Fixed manufacturing overhead cost deferred in inventory from the First Quarter to the Second Quarter (7,000 units × \$40 per unit)	280,000	(280,000)
Add: Fixed overhead manufacturing cost deferred in inventory from the Second Quarter to the future (1,000 units × \$40 per unit).....		<u>40,000</u>
Absorption costing net operating income.....	<u>\$170,000</u>	<u>\$ 30,000</u>

Alternative solution:

Variable costing net operating income.....	\$ 10,000	\$270,000
Add: Fixed manufacturing overhead cost deferred in inventory to the Second Quarter (4,000 unit increase × \$40 per unit).....	160,000	
Deduct: Fixed manufacturing overhead cost released from inventory due to a decrease in inventory during the Second Quarter (6,000 unit decrease × \$40 per unit)		<u>(240,000)</u>
Absorption costing net operating income.....	<u>\$170,000</u>	<u>\$ 30,000</u>

Case 7-18 (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 above the inventory of units on hand at the start of the quarter. The computations are:

Units sold.....	20,000
Less units in inventory at the beginning of the quarter....	<u>7,000</u>
Units produced during the quarter under JIT	<u><u>13,000</u></u>

Case 7-18 (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 loss for the quarter would have been:

Sales		\$2,000,000
Less cost of goods sold:		
Beginning inventory	\$ 490,000	
Add cost of goods manufactured		
(13,000 units × \$70 per unit).....	<u>910,000</u>	
Goods available for sale.....	1,400,000	
Ending inventory	<u>0</u>	
Cost of goods sold	1,400,000	
Add underapplied overhead.....	<u>280,000*</u>	<u>1,680,000</u>
Gross margin.....		320,000
Less selling and administrative		
expenses.....		<u>330,000</u>
Net operating loss		<u>\$ (10,000)</u>

* Overhead rates are based on 20,000 units produced each quarter. If only 13,000 units are produced, then the underapplied fixed manufacturing overhead will be: 7,000 units × \$40 per unit = \$280,000.

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

Group Exercise 7-19

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 firm with sales below the break-even point may still 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, a portion of the fixed manufacturing costs will be included as part of ending inventories on the balance sheet rather 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 7-20

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 liquidations 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.