Chapter 6 Variable Costing and Segment Reporting:

Tools for Management

Solutions to Questions

6-1 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 immediately expensed on the income statement.

6-2 Selling and administrative expenses are treated as period costs under both variable costing and absorption costing.

6-3 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.

6-4 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.

6-5 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.

6-6 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.

6-7 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.

6-8 If fixed manufacturing overhead cost is released from inventory, then inventory levels must have decreased and therefore production must have been less than sales.

6-9 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.

6-10 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 tied 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.

6-11 A segment is any part or activity of an organization about which a manager seeks cost, revenue, or profit data. Examples of segments include departments, operations, sales territories, divisions, and product lines.

6-12 Under the contribution approach, costs are assigned to a segment if and only if the costs are traceable to the segment (i.e., could be avoided if the segment were eliminated). Common costs are not allocated to segments under the contribution approach.

6-13 A traceable fixed cost of a segment is a cost that arises specifically because of the existence of that segment. If the segment were eliminated, the cost would disappear. A common fixed cost, by contrast, is a cost that supports more than one segment, but is not traceable in whole or in part to any one of the segments. If the departments of a company are treated as segments, then examples of the traceable fixed costs of a department would include the salary of the department's supervisor and depreciation of machines used exclusively by the department. Examples of common fixed costs would include the salary of the general counsel of the entire company, the lease cost of the headquarters building, corporate image advertising, and depreciation of machines shared by several departments.

6-14 The contribution margin is the difference between sales revenue and variable expenses. The segment margin is the amount remaining after deducting traceable fixed expenses from the contribution margin. The contribution margin is useful as a planning tool for many decisions, particularly those in which fixed costs don't change. The segment margin is useful in assessing the overall profitability of a segment.

6-15 If common fixed costs were allocated to segments, then the costs of segments would be overstated and their margins would be understated. As a consequence, some segments may appear to be unprofitable and managers may be tempted to eliminate them. If a segment were eliminated because of the existence of arbitrarily allocated common fixed costs, the overall profit of the company would decline and the common fixed cost that had been allocated to the segment would be reallocated to the remaining segments—making them appear less profitable.

6-16 There are often limits to how far down an organization a cost can be traced. Therefore, fixed costs that are traceable to a segment may become common as that segment is divided into smaller segment units. For example, the costs of national TV and print advertising might be traceable to a specific product line, but be a common fixed cost of the geographic sales territories in which that product line is sold.

6-17 No, a company should not allocate its common fixed costs to business segments. These costs are not traceable to individual segments and will not be affected by segment-level decisions.

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1. and 2.

The unit product costs under variable costing and absorption costing are computed as follows:

	Variable Costing	*Absorption Costing*
Direct materials	$24	$24
Direct labor	14	14
Variable manufacturing overhead	2	2
Fixed manufacturing overhead ($800,000 ÷ 40,000 units)	—	20
Unit product cost	$40	$60

3. and 4.

The total contribution margin and net operating income (loss) under variable costing are computed as follows:

Sales (35,000 units × $80 per unit)		$2,800,000
Variable expenses:		
Variable cost of goods sold (35,000 units × $40 per unit)	$1,400,000	
Variable selling and administrative (35,000 units × $4 per unit)	140,000	1,540,000
Contribution margin		1,260,000
Fixed expenses:		
Fixed manufacturing overhead	800,000	
Fixed selling and administrative	496,000	1,296,000
Net operating loss		$ (36,000)

5. and 6.

The total gross margin and net operating income under absorption costing are computed as follows:

Sales (35,000 units × $80 per unit)	$2,800,000
Cost of goods sold (35,000 units × $60 per unit)	2,100,000
Gross margin	700,000
Selling and administrative expenses [(35,000 units × $4 per unit) + $496,000]	636,000
Net operating income	$ 64,000

7. The difference between the absorption and variable costing net operating incomes is explained as follows:

Manufacturing overhead deferred in (released from) inventory = Fixed manufacturing overhead in ending inventory – Fixed manufacturing overhead in beginning inventory = ($20 per unit × 5,000 units) – $0 = $100,000

Variable costing net operating loss (see requirement 4)	$(36,000)
Add fixed manufacturing overhead cost deferred in inventory under absorption costing	100,000
Absorption costing net operating income (see requirement 6)	$ 64,000

8. The break-even point in units is computed as follows:

$$\begin{aligned}\text{Profit} &= \text{Unit CM} \times Q - \text{Fixed expenses}\\ \$0 &= (\$80 - \$44) \times Q - \$1{,}296{,}000\\ \$0 &= (\$36) \times Q - \$1{,}296{,}000\\ \$36Q &= \$1{,}296{,}000\\ Q &= \$1{,}296{,}000 \div \$36\\ Q &= 36{,}000 \text{ units}\end{aligned}$$

The break-even point is above the actual sales volume; however, in question 6, the absorption costing net operating income is $64,000. This counter-intuitive result emerges because $100,000 of fixed manufacturing overhead is deferred in inventory under absorption costing.

9. The break-even point of 36,000 units would remain the same. This occurs because the contribution margin per unit is the same regardless of whether a unit is sold in the East or West region. The total fixed cost also remains unchanged so the break-even point stays at 36,000 units.

10. and 11.

The variable costing net operating income would be the same as the answer to question 4 as shown below:

Sales		$2,800,000
Variable expenses:		
Variable cost of goods sold (35,000 units × $40 per unit)	$1,400,000	
Variable selling and administrative (35,000 units × $4 per unit)	140,000	1,540,000
Contribution margin		1,260,000
Fixed expenses:		
Fixed manufacturing overhead	800,000	
Fixed selling and administrative	496,000	1,296,000
Net operating loss		$ (36,000)

When the number of units produced equals the number of units sold, absorption costing net operating income equals the variable costing net operating income. Therefore, the answer to question 11 is that the absorption costing net operating loss would be $36,000.

12. Absorption costing income will be lower than variable costing income. The variable costing income statement will only include the fixed manufacturing overhead costs incurred during the second year of operations, whereas the absorption costing cost of goods sold will include all of the fixed manufacturing overhead costs incurred during the second year of operations plus some of the fixed manufacturing overhead costs that were deferred in inventory at the end of the prior year.

13. The segment margins for the East and West regions are computed as follows:

	Total Company	*East*	*West*
Sales*	$2,800,000	$2,000,000	$800,000
Variable expenses**	1,540,000	1,100,000	440,000
Contribution margin	1,260,000	900,000	360,000

Traceable fixed expenses	400,000	150,000	250,000
Region segment margin	860,000	$ 750,000	$110,000
Common fixed expenses not traceable to regions ($800,000 + $96,000).....	896,000		
Net operating loss	$ (36,000)		

* East: 25,000 units × $80 per unit = $2,000,000;
West: 10,000 units × $80 per unit = $800,000.
** East: 25,000 units × $44 per unit = $1,100,000;
West: 10,000 units × $44 per unit = $440,000.

14. Diego has apparently determined that the total *gross margin* in the West region equals $200,000. As computed in requirement 1, the unit product cost under absorption costing is $60; therefore, the gross margin per unit is $20 ($80 – $60). The West region's total gross margin of $200,000 (10,000 units × $20 per unit) is less than its traceable fixed expenses of $250,000. This mode of analysis creates the illusion that the West region should be discontinued.

The correct way to answer this question is to focus on the information in the contribution format segmented income statements as follows:

Forgone segment margin in the West region	$(110,000)
Additional contribution margin in East region*	45,000
Decrease in profits if the West region is dropped	$ (65,000)

* $900,000 × 5% = $45,000.

15. The profit impact is computed as follows:

Additional advertising	$(30,000)
Additional contribution margin in the West region*	72,000
Increase in profits	$ 42,000

* $360,000 × 20% = $72,000.

Exercise 6-1 (15 minutes)

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

Direct materials	$100
Direct labor	320
Variable manufacturing overhead	40
Fixed manufacturing overhead ($60,000 ÷ 250 units)	240
Absorption costing unit product cost	$700

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

Direct materials	$100
Direct labor	320
Variable manufacturing overhead	40
Variable costing unit product cost	$460

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 6-2 (20 minutes)

1. Fixed manufacturing overhead cost deferred in inventory = 25 units in ending inventory × $240 per unit* = $6,000

   * $60,000 ÷ 250 units = $240 per unit

2. The variable costing income statement appears below:

Sales		$191,250
Variable expenses:		
Variable cost of goods sold (225 units sold × $460* per unit)	$103,500	
Variable selling and administrative expenses (225 units × $20 per unit)	4,500	108,000
Contribution margin		83,250
Fixed expenses:		
Fixed manufacturing overhead	60,000	
Fixed selling and administrative expenses	20,000	80,000
Net operating income		$ 3,250

* Variable cost of goods sold per unit:	
Direct materials	$100
Direct labor	320
Variable manufacturing overhead	40
Variable costing unit product cost	$460

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 $6,000 of fixed manufacturing overhead cost has been deferred in inventory to the next period. Thus, net operating income under the absorption costing approach is $6,000 higher than it is under variable costing.

Exercise 6-3 (20 minutes)

1.

	Year 1	*Year 2*	*Year 3*
Beginning inventories	200	170	180
Ending inventories	170	180	220
Change in inventories	(30)	10	40
Fixed manufacturing overhead in ending inventories (@$560 per unit)	$ 95,200	$100,800	$123,200
Fixed manufacturing overhead in beginning inventories (@$560 per unit)	112,000	95,200	100,800
Fixed manufacturing overhead deferred in (released from) inventories (@$560 per unit)	$(16,800)	$ 5,600	$ 22,400
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	(16,800)	5,600	22,400
Absorption costing net operating income	$1,063,600	$1,038,000	$1,018,800

2a. and 2b.

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.

Problem 6-19 (30 minutes)

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

Direct materials	$ 4
Direct labor	7
Variable manufacturing overhead	1
Variable costing unit product cost	$12

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

	Year 1	*Year 2*
Sales (@ $25 per unit)	$1,000,000	$1,250,000
Variable expenses:		
Variable cost of goods sold (@ $12 per unit)	480,000	600,000
Variable selling and administrative expenses (@ $2 per unit)	80,000	100,000
Total variable expenses	560,000	700,000
Contribution margin	440,000	550,000
Fixed expenses:		
Fixed manufacturing overhead	270,000	270,000
Fixed selling and administrative expenses	130,000	130,000
Total fixed expenses	400,000	400,000
Net operating income	$ 40,000	$ 150,000

3. The reconciliation of absorption and variable costing follows:

	Year 1	*Year 2*
Units in beginning inventory	0	5,000
+ Units produced	45,000	45,000
− Units sold	40,000	50,000
= Units in ending inventory	5,000	0

	Year 1	*Year 2*
Fixed manufacturing overhead in ending inventory (5,000 units × $6 per unit)	$30,000	$ 0
Deduct: Fixed manufacturing overhead in beginning inventory (5,000 units × $6 per unit)		30,000
Manufacturing overhead deferred in (released from) inventory	$30,000	$(30,000)

	Year 1	*Year 2*
Variable costing net operating income (loss)	$40,000	$150,000
Add: Fixed manufacturing overhead cost deferred in inventory under absorption costing	30,000	
Deduct: Fixed manufacturing overhead cost released from inventory under absorption costing		(30,000)
Absorption costing net operating income	$70,000	$120,000

Problem 6-20 (45 minutes)

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

Direct materials	$20
Direct labor	8
Variable manufacturing overhead	2
Fixed manufacturing overhead ($100,000 ÷ 10,000 units)	10
Absorption costing unit product cost	$40

   b. The absorption costing income statement is:

Sales (8,000 units × $75 per unit)	$600,000
Cost of goods sold (8,000 units × $40 per unit)	320,000
Gross margin	280,000
Selling and administrative expenses [$200,000 + (8,000 units × $6 per unit)]	248,000
Net operating income	$ 32,000

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

Direct materials	$20
Direct labor	8
Variable manufacturing overhead	2
Variable costing unit product cost	$30

   b. The variable costing income statement is:

Sales (8,000 units × $75 per unit)		$600,000
Variable expenses:		
Variable cost of goods sold (8,000 units × $30 per unit)	$240,000	
Variable selling expenses (8,000 units × $6 per unit)	48,000	288,000
Contribution margin		312,000
Fixed expenses:		
Fixed manufacturing overhead	100,000	
Fixed selling and administrative expenses	200,000	300,000
Net operating income		$ 12,000

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

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

   Because $20,000 of fixed manufacturing overhead cost has been deferred in inventory under absorption costing, the net operating income reported under that costing method is $20,000 (= $32,000 – $12,000) higher than the net operating income under variable costing, as shown in parts (1) and (2) above.