Variable Costing and Segment Reporting: Tools for Management

LEARNING OBJECTIVES

After studying Chapter 6, you should be able to:

LO6-1 Explain how variable costing differs from absorption costing and compute unit product costs under each method.

LO6-2 Prepare income statements using both variable and absorption costing.

LO6-3 Reconcile variable costing and absorption costing net operating incomes and explain why the two amounts differ.

LO6-4 Prepare a segmented income statement that differentiates traceable fixed costs from common fixed costs and use it to make decisions.

LO6-5 Compute companywide and segment break-even points for a company with traceable fixed costs.

LO6-6

(Appendix 6A) Prepare an income statement using super-variable costing and reconcile this approach with variable costing.

Misguided Incentives in the Auto Industry

BUSINESS FOCUS

When the economy tanks, automakers, such as **General Motors** and **Chrysler**, often "flood the market" with a supply of vehicles that far exceeds customer demand. They pursue this course of action even though it tarnishes their brand image and increases their auto storage costs, tire replacement costs, customer rebate costs, and advertising costs. This begs the question why would managers knowingly produce more vehicles than are demanded by customers?

In the auto industry, a manager's bonus is often influenced by her company's reported profits; thus, there is a strong incentive to boost profits by producing more units. How can this be done you ask? It would seem logical that producing more units would have no impact on profits unless the units were sold, right? Wrong! As we will discover in this chapter, absorption costing—the most widely used method of determining product costs—can artificially increase profits when managers choose to increase the quantity of units produced. ■

Source: Marielle Segarra, "Lots of Trouble," CFO, *March 2012, pp. 29–30.*

This chapter describes two applications of the contribution format income statements that were introduced in earlier chapters. First, it explains how manufacturing companies can prepare *variable costing* income statements, which rely on the contribution format, for internal decision making purposes. The variable costing approach will be contrasted with *absorption costing* income statements, which were discussed in Chapter 3 and are generally used for external reports. Ordinarily, variable costing and absorption costing produce different net operating income figures, and the difference can be quite large. In addition to showing how these two methods differ, we will describe the advantages of variable costing for internal reporting purposes and we will show how management decisions can be affected by the costing method chosen.

Second, the chapter explains how the contribution format can be used to prepare segmented income statements. In addition to companywide income statements, managers need to measure the profitability of individual *segments* of their organizations. A **segment** is a part or activity of an organization about which managers would like cost, revenue, or profit data. This chapter explains how to create contribution format income statements that report profit data for business segments, such as divisions, individual stores, geographic regions, customers, and product lines.

Overview of Variable and Absorption Costing

LO6-1

Explain how variable costing differs from absorption costing and compute unit product costs under each method.

As you begin to read a bout variable and absorption costing income statements in the coming pages, focus your attention on three key concepts. First, both income statement formats include product costs and period costs, although they define these cost classifications differently. Second, variable costing income statements are grounded in the contribution format. They categorize expenses based on cost behavior—variable expenses are reported separately from fixed expenses. Absorption costing income statements ignore variable and fixed cost distinctions. Third, as mentioned in the paragraph above, variable and absorption costing net operating income figures often differ from one another. The reason for these differences always relates to the fact the variable costing and absorption costing income statements account for fixed manufacturing overhead differently. *Pay very close attention to the two different ways that variable costing and absorption costing account for fixed manufacturing overhead.*

Variable Costing

Under **variable costing**, only those manufacturing costs that vary with output are treated as product costs. This would usually include direct materials, direct labor, and the variable portion of manufacturing overhead. Fixed manufacturing overhead is not treated as a product cost under this

method. Rather, fixed manufacturing overhead is treated as a period cost and, like selling and administrative expenses, it is expensed in its entirety each period. Consequently, the cost of a unit of product in inventory or in cost of goods sold under the variable costing method does not contain any fixed manufacturing overhead cost. Variable costing is sometimes referred to as *direct costing* or *marginal costing.*

Absorption Costing

As discussed in Chapter 3, **absorption costing** treats *all* manufacturing costs as product costs, regardless of whether they are variable or fixed. The cost of a unit of product under the absorption costing method consists of direct materials, direct labor, and *both* variable and fixed manufacturing overhead. Thus, absorption costing allocates a portion of fixed

manufacturing overhead cost to each unit of product, along with the variable manufacturing costs. Because absorption costing includes all manufacturing costs in product costs, it is frequently referred to as the *full cost* method.

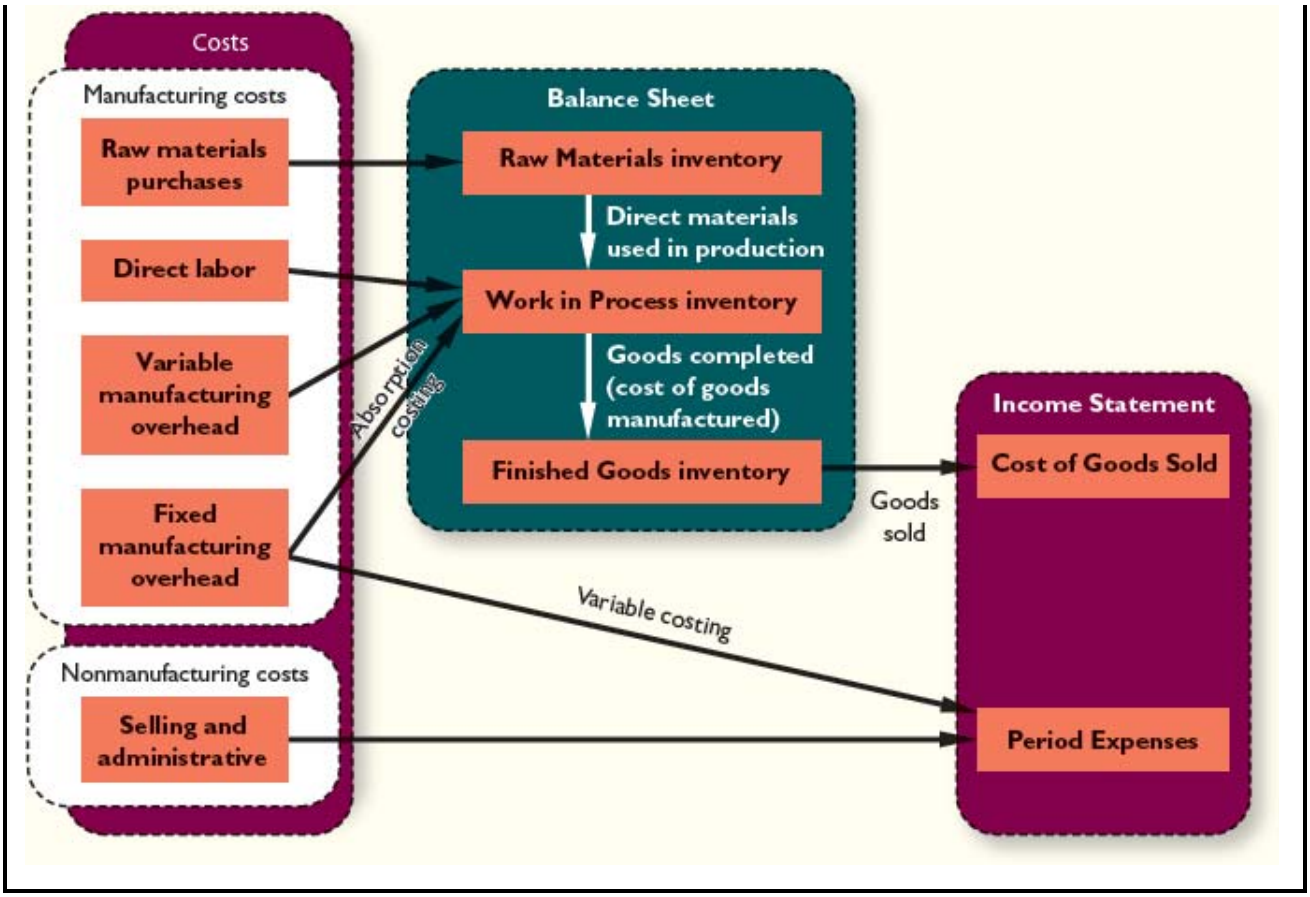
Page 235

Selling and Administrative Expenses

Selling and administrative expenses are never treated as product costs, regardless of the costing method. Thus, under absorption and variable costing, variable and fixed selling and administrative expenses are always treated as period costs and are expensed as incurred.

Summary of Differences The essential difference between variable costing and absorption costing, as illustrated in Exhibit 6-1, is how each method accounts for fixed manufacturing overhead costs—all other costs are treated the same under the two methods. In absorption costing, fixed manufacturing overhead costs are included as part of the costs of work in process inventories. When units are completed, these costs are transferred to finished goods and only when the units are sold do these costs flow through to the income statement as part of cost of goods sold. In variable costing, fixed manufacturing overhead costs are considered to be period costs—just like selling and administrative costs—and are taken immediately to the income statement as period expenses.

EXHIBIT 6-1
Variable Costing versus Absorption Costing


Costs
Manufacturing costs
Raw materials purchases
Direct labor
Variable manufacturing overhead
Fixed manufacturing overhead
Nonmanufacturing costs
Selling and administrative
Balance Sheet
Raw Materials inventory
Direct materials used in production
Work in Process inventory
Goods completed (cost of goods manufactured)
Finished Goods inventory
Absorption costing
Goods sold
Income Statement
Cost of Goods Sold
Variable costing
Period Expenses

Variable and Absorption Costing—An Example

To illustrate the difference between variable costing and absorption costing, consider Weber Light Aircraft, a company that produces light recreational aircraft. Data concerning the company's operations appear below:

	Per Aircraft	Per Month
Selling price	$100,000	
Direct materials	$19,000	
Direct labor	$5,000	
Variable manufacturing overhead	$1,000	
Fixed manufacturing overhead		$70,000
Variable selling and administrative expenses	$10,000	
Fixed selling and administrative expenses		$20,000

	January	February	March
Beginning inventory	0	0	1
Units produced	1	2	4
Units sold	1	1	5
Ending inventory	0	1	0

As you review the data above, it is important to realize that for the months of January, February, and March, the selling price per aircraft, variable cost per aircraft, and total monthly fixed expenses never change. The only variables that change in this example are the number of units produced (January = 1 unit produced; February = 2 units produced; March = 4 units produced) and the number of units sold (January = 1 unit sold; February = 1 unit sold; March = 5 units sold).

We will first construct the company's variable costing income statements for January, February, and March. Then we will show how the company's net operating income would be determined for the same months using absorption costing.

Variable Costing Contribution Format Income Statement

LO6-2

Prepare income statements using both variable and absorption costing.

To prepare the company's variable costing income statements for January, February, and March we begin by computing the unit product cost. Under variable costing, product costs consist solely of variable production costs. At Weber Light Aircraft, the variable production cost per unit is $25,000, determined as follows:

Variable Costing Unit Product Cost	
Direct materials	$19,000
Direct labor	5,000
Variable manufacturing overhead	1,000
Variable costing unit product cost	$25,000

Since each month's variable production cost is $25,000 per aircraft, the variable costing cost of goods sold for all three months can be easily computed as follows:

Variable Costing Cost of Goods Sold	January	February	March
Variable production cost (a)	$25,000	$25,000	$25,000
Units sold (b)	1	1	5
Variable cost of goods sold (a) × (b)	$25,000	$25,000	$125,000

And the company's total selling and administrative expense would be derived as follows:

Page 237

Selling and Administrative Expenses	January	February	March
Variable selling and administrative expense (@ $10,000 per unit sold)	$10,000	$10,000	$50,000
Fixed selling and administrative expense	20,000	20,000	20,000
Total selling and administrative expense	$30,000	$30,000	$70,000

Putting it all together, the variable costing income statements would appear as shown in Exhibit 6-2. Notice, the contribution format has been used in these income statements. Also, the monthly fixed manufacturing overhead costs ($70,000) have been recorded as a period expense in the month incurred.

EXHIBIT 6-2
Variable Costing Income Statements

Variable Costing Contribution Format Income Statements	January	February	March
Sales	$100,000	$100,000	$500,000
Variable expenses:			
Variable cost of goods sold	25,000	25,000	125,000
Variable selling and administrative expense	10,000	10,000	50,000
Total variable expenses	35,000	35,000	175,000
Contribution margin	65,000	65,000	325,000
Fixed expenses:			
Fixed manufacturing overhead	70,000	70,000	70,000
Fixed selling and administrative expense	20,000	20,000	20,000
Total fixed expenses	90,000	90,000	90,000
Net operating income (loss)	$ (25,000)	$ (25,000)	$235,000

A simple method for understanding how Weber Light Aircraft computed its variable costing net operating income figures is to focus on the contribution margin per aircraft sold, which is computed as follows:

Contribution Margin per Aircraft Sold		
Selling price per aircraft		$100,000
Variable production cost per aircraft	$25,000	
Variable selling and administrative expense per aircraft	10,000	35,000
Contribution margin per aircraft		$ 65,000

The variable costing net operating income for each period can always be computed by multiplying the number of units sold by the contribution margin per unit and then subtracting total fixed costs. For Weber Light Aircraft these computations would appear as follows:

	January	February	March
Number of aircraft sold	1	1	5
Contribution margin per aircraft	× $65,000	× $65,000	× $65,000
Total contribution margin	$65,000	$65,000	$325,000
Total fixed expenses	90,000	90,000	90,000
Net operating income (loss)	$(25,000)	$(25,000)	$235,000

Notice, January and February have the same net operating loss. This occurs because one aircraft was sold in each month and, as previously mentioned, the selling price per aircraft, variable cost per aircraft, and total monthly fixed expenses remain constant.

Absorption Costing Income Statement

As we begin the absorption costing portion of the example, remember that the only reason absorption costing income differs from variable costing is that the methods account for fixed manufacturing overhead differently. Under absorption costing, fixed manufacturing overhead is included in product costs. In variable costing, fixed manufacturing overhead is not included in product costs and instead is treated as a period expense just like selling and administrative expenses.

The first step in preparing Weber's absorption costing income statements for January, February, and March is to determine the company's unit product costs for each month as follows[1]:

Absorption Costing Unit Product Cost	January	February	March
Direct materials	$19,000	$19,000	$19,000
Direct labor	5,000	5,000	5,000
Variable manufacturing overhead	1,000	1,000	1,000
Fixed manufacturing overhead ($70,000 ÷ 1 unit produced in January; $70,000 ÷ 2 units produced in February; $70,000 ÷ 4 units produced in March)	70,000	35,000	17,500
Absorption costing unit product cost	$95,000	$60,000	$42,500

Notice that in each month, Weber's fixed manufacturing overhead cost of $70,000 is divided by the number of units produced to determine the fixed manufacturing overhead cost per unit.

Given these unit product costs, the company's absorption costing net operating income in each month would be determined as shown in Exhibit 6-3.

The sales for all three months in Exhibit 6-3 are the same as the sales shown in the variable costing income statements. The January cost of goods sold consists of one unit produced during January at a cost of $95,000 according to the absorption costing system. The February cost of goods sold consists of one unit produced during February at a cost of $60,000 according to the absorption costing system. The March cost of goods sold ($230,000) consists of one unit produced during February at an absorption cost of $60,000 plus four units produced in March with a total absorption cost of $170,000 (= 4 units produced × $42,500 per unit). The selling and administrative expenses equal the amounts reported in the variable costing income statements; however they are reported as one amount rather than being separated into variable and fixed components.

EXHIBIT 6-3
Absorption Costing Income Statements

Absorption Costing Income Statements	January	February	March
Sales	$100,000	$100,000	$500,000
Cost of goods sold ($95,000 × 1 unit; $60,000 × 1 unit; $60,000 × 1 unit + $42,500 × 4 units)	95,000	60,000	230,000
Gross margin	5,000	40,000	270,000
Selling and administrative expenses	30,000	30,000	70,000
Net operating income (loss)	$ (25,000)	$ 10,000	$200,000

Note that even though sales were exactly the same in January and February and the cost structure did not change, net operating income was $35,000 higher in February than in January under absorption costing. This occurs because one aircraft produced in February is not sold until March. This aircraft has $35,000 of fixed manufacturing overhead attached to it that was incurred in February, but will not be recorded as part of cost of goods sold until March.

Page 239

Contrasting the variable costing and absorption costing income statements in Exhibits 6-2 and 6-3, note that net operating income is the same in January under variable costing and absorption costing, but differs in the other two months. We will discuss this in some depth shortly. Also note that the format of the variable costing income statement differs from the absorption costing income statement. An absorption costing income statement categorizes costs by function—manufacturing versus selling and administrative. All of the manufacturing costs flow through the absorption costing cost of goods sold and all of the selling and administrative expenses are listed separately as period expenses. In contrast, in the contribution approach, costs are categorized according to how they behave. All of the variable expenses are listed together and all of the fixed expenses are listed together. The variable expenses category includes manufacturing costs (i.e., variable cost of goods sold) as well as selling and administrative expenses. The fixed expenses category also includes both manufacturing costs and selling and administrative expenses.

IN BUSINESS

THE BEHAVIORAL SIDE OF CALCULATING UNIT PRODUCT COSTS

Andreas STIHL, a manufacturer of chain saws and other landscaping products, asked its U.S. subsidiary, STIHL Inc., to replace its absorption costing income statements with the variable costing approach. From a computer systems standpoint, the change was not disruptive because STIHL used an enterprise system called SAP that accommodates both absorption and variable costing. However, from a behavioral standpoint, STIHL felt the change could be very disruptive. For example, STIHL's senior managers were keenly aware that the variable costing approach reported lower unit product costs than the absorption costing approach. Given this reality, the sales force might be inclined to erroneously conclude that each product had magically become more profitable, thereby justifying ill-advised price reductions. Because of behavioral concerns such as this, STIHL worked hard to teach its employees how to interpret a variable costing income statement.

Source: Carl S. Smith, "Going for GPK: STIHL Moves Toward This Costing System in the United States," *Strategic Finance,* April 2005, pp. 36–39.

Reconciliation of Variable Costing with Absorption Costing Income

LO6-3

Reconcile variable costing and absorption costing net operating incomes and explain why the two amounts differ.

As noted earlier, variable costing and absorption costing net operating incomes may not be the same. In the case of Weber Light Aircraft, the net operating incomes are the same in January, but differ in the other two months. These differences occur because under absorption costing some fixed manufacturing overhead is capitalized in inventories (i.e., included in product costs) rather than being immediately expensed on the income statement. If inventories increase during a period, under absorption costing some of the fixed manufacturing overhead of the current period will be *deferred* in ending inventories. For example, in February two aircraft were produced and each carried with it $35,000 (= $70,000 ÷ 2 aircraft produced) in fixed manufacturing overhead. Since only one aircraft was sold, $35,000 of this fixed manufacturing overhead was on February's absorption costing income statement as part of cost of goods sold, but $35,000 would have been on the balance sheet as part of finished goods inventories. In contrast, under variable costing *all* of the $70,000 of fixed manufacturing overhead appeared on the February income

statement as a period expense. Consequently, net operating income was higher under absorption costing than under variable costing by $35,000 in February. This was reversed in March when four units were produced, but five were sold. In March, under absorption costing $105,000 of fixed manufacturing overhead was included in cost of goods sold ($35,000 for the unit produced in February and sold in March plus $17,500 for each of the four units produced and sold in March), but only $70,000 was recognized as a period expense under variable costing. Hence, the net operating income in March was $35,000 lower under absorption costing than under variable costing.

In general, when the units produced exceed unit sales and hence inventories increase, net operating income is higher under absorption costing than under variable costing. This occurs because some of the fixed manufacturing overhead of the period is *deferred* in inventories under absorption costing. In contrast, when unit sales exceed the units produced and hence inventories decrease, net operating income is lower under absorption costing than under variable costing. This occurs because some of the fixed manufacturing overhead of previous periods is *released* from inventories under absorption costing. When the units produced and unit sales are equal, no change in inventories occurs and absorption costing and variable costing net operating incomes are the same.[2]

Variable costing and absorption costing net operating incomes can be reconciled by determining how much fixed manufacturing overhead was deferred in, or released from, inventories during the period:

Fixed Manufacturing Overhead Deferred in, or Released from, Inventories under Absorption Costing	January	February	March
Fixed manufacturing overhead in ending inventories	$0	$35,000	$ 0
Fixed manufacturing overhead in beginning inventories	0	0	35,000
Fixed manufacturing overhead deferred in (released from) inventories	$0	$35,000	$(35,000)

In equation form, the fixed manufacturing overhead that is deferred in or released from inventories can be determined as follows:

$$\text{Manufacturing overhead deferred in (released from) inventory} = \text{Fixed manufacturing overhead in ending inventories} - \text{Fixed manufacturing overhead in beginning inventories}$$

The reconciliation would then be reported as shown in Exhibit 6-4:

EXHIBIT 6-4
Reconciliation of Variable Costing and Absorption Costing Net Operating Incomes

Reconciliation of Variable Costing and Absorption Costing Net Operating Incomes	January	February	March
Variable costing net operating income (loss)	$(25,000)	$(25,000)	$235,000
Add (deduct) fixed manufacturing overhead deferred in (released from) inventory under absorption costing	0	35,000	(35,000)
Absorption costing net operating income (loss)	$(25,000)	$ 10,000	$200,000

EXHIBIT 6-5

Comparative Income Effects—Absorption and Variable Costing

Relation between Production and Sales for the Period	Effect on Inventories 	Relation between Absorption and Variable Costing Net Operating Incomes
Units produced = Units sold	No change in inventories 	Absorption costing net operating income = Variable costing net operating income
Units produced > Units sold	Inventories increase 	Absorption costing net operating income > Variable costing net operating income*
Units produced < Units sold	Inventories decrease 	Absorption costing net operating income < Variable costing net operating income†

*Net operating income is higher under absorption costing because fixed manufacturing overhead cost is *deferred* in inventory under absorption costing as inventories increase.
†Net operating income is lower under absorption costing because fixed manufacturing overhead cost is *released* from inventory under absorption costing as inventories decrease.

Again note that the difference between variable costing net operating income and absorption costing net operating income is entirely due to the amount of fixed manufacturing overhead that is deferred in, or released from, inventories during the period under absorption costing. Changes in inventories affect absorption costing net operating income—they do not affect variable costing net operating income, providing that variable manufacturing costs per unit are stable.

The reasons for differences between variable and absorption costing net operating incomes are summarized in Exhibit 6-5. When the units produced equal the units sold, as in January for Weber Light Aircraft, absorption costing net operating income will equal variable costing net operating income. This occurs because when production equals sales, all of the fixed manufacturing overhead incurred in the current period flows through to the income statement under both methods. For companies that use Lean Production, the number of units produced tends to equal the number of units sold. This occurs because goods are produced in response to customer orders, thereby eliminating finished goods inventories and reducing work in process inventory to almost nothing. So, when a company uses Lean Production differences in variable costing and absorption costing net operating income will largely disappear.

When the units produced exceed the units sold, absorption costing net operating income will exceed variable costing net operating income. This occurs because inventories have increased;

therefore, under absorption costing some of the fixed manufacturing overhead incurred in the current period is deferred in ending inventories on the balance sheet, whereas under variable costing all of the fixed manufacturing overhead incurred in the current period flows through to the income statement. In contrast, when the units produced are less than the units sold, absorption costing net operating income will be less than variable costing net operating income. This occurs because inventories have decreased; therefore, under absorption costing fixed manufacturing overhead that had been deferred in inventories during a prior period flows through to the current period's income statement together with all of the fixed manufacturing overhead incurred during the current period. Under variable costing, just the fixed manufacturing overhead of the current period flows through to the income statement.

IN BUSINESS

LEAN MANUFACTURING SHRINKS INVENTORIES

Conmed, a surgical device maker in Utica, New York, switched to lean manufacturing by replacing its assembly lines with U-shaped production cells. It also started producing only enough units to satisfy customer demand rather than producing as many units as possible and storing them in warehouses. The company calculated that its customers use one of its disposable surgical devices every 90 seconds, so that is precisely how often it produces a new unit. Its assembly area for fluid-injection devices used to occupy 3,300 square feet of space and contained $93,000 worth of parts. Now the company produces its fluid-injection devices in 660 square feet of space while maintaining only $6,000 of parts inventory.

When Conmed adopted lean manufacturing, it substantially reduced its finished goods inventories. What impact do you think this initial reduction in inventories may have had on net operating income? Why?

Source: Pete Engardio, "Lean and Mean Gets Extreme," *BusinessWeek*, March 23 and 30, 2009, pp. 60–62.

Advantages of Variable Costing and the Contribution Approach

Variable costing, together with the contribution approach, offers appealing advantages for internal reports. This section discusses three of those advantages.

Enabling CVP Analysis

CVP analysis requires that we break costs down into their fixed and variable components. Because variable costing income statements categorize costs as fixed and variable, it is much easier to use this

income statement format to perform CVP analysis than attempting to use the absorption costing format, which mixes together fixed and variable costs.

Moreover, absorption costing net operating income may or may not agree with the results of CVP analysis. For example, let's suppose that you are interested in computing the sales that would be necessary to generate a target profit of $235,000 at Weber Light Aircraft. A CVP analysis based on the January variable costing income statement from Exhibit 6-2 would proceed as follows:

Sales (a)	$100,000
Contribution margin (b)	$65,000
Contribution margin ratio (b) ÷ (a)	65%
Total fixed expenses	$90,000

$$\text{Dollar sales to attain target profit} = \frac{\text{Target profit} + \text{Fixed expenses}}{\text{CM ratio}}$$

$$= \frac{\$235{,}000 + \$90{,}000}{0.65} = \$500{,}000$$

Thus, a CVP analysis based on the January variable costing income statement predicts that the net operating income would be $235,000 when sales are $500,000. And indeed, the net operating income under variable costing *is* $235,000 when the sales are $500,000

in March. However, the net operating income under absorption costing is *not* $235,000 in March, even though the sales are $500,000. Why is this? The reason is that under absorption costing, net operating income can be distorted by changes in inventories. In March, inventories decreased, so some of the fixed manufacturing overhead that had been deferred in February's ending inventories was released to the March income statement, resulting in a net operating income that is $35,000 lower than the $235,000 predicted by CVP analysis. If inventories had increased in March, the opposite would have occurred—the absorption costing net operating income would have been higher than the $235,000 predicted by CVP analysis.

Page 243

Explaining Changes in Net Operating Income

The variable costing income statements in Exhibit 6-2 are clear and easy to understand. All other things the same, when sales go up, net operating income goes up. When sales go down, net operating income goes down. When sales are constant, net operating income is constant. The number of units produced does not affect net operating income.

Absorption costing income statements can be confusing and are easily misinterpreted. Look again at the absorption costing income statements in Exhibit 6-3; a manager might wonder why net operating income went up from January to February even though sales were exactly the same. Was it a result of lower selling costs, more efficient operations, or was it some other factor? In fact, it was simply because the number of units produced exceeded the number of units sold in February and so some of the fixed manufacturing overhead costs were deferred in inventories in that month. These costs have not gone away—they will eventually flow through to the income statement in a later period when inventories go down. There is no way to tell this from the absorption costing income statements.

To avoid mistakes when absorption costing is used, readers of financial statements should be alert to changes in inventory levels. Under absorption costing, if inventories increase, fixed manufacturing overhead costs are deferred in inventories, which in turn increases net operating income. If inventories decrease, fixed manufacturing overhead costs are released from inventories, which in turn decreases net operating income. Thus, when absorption costing is used, fluctuations in net operating income can be caused by changes in inventories as well as changes in sales.

Supporting Decision Making

The variable costing method correctly identifies the additional variable costs that will be incurred to make one more unit. It also emphasizes the impact of fixed costs on profits. The total amount of fixed manufacturing costs appears explicitly on the income statement, highlighting that the whole amount of fixed manufacturing costs must be covered for the company to be truly profitable. In the Weber Light Aircraft example, the variable costing income statements correctly report that the cost of producing another unit is $25,000 and they explicitly recognize that $70,000 of fixed manufactured overhead must be covered to earn a profit.

Under absorption costing, fixed manufacturing overhead costs appear to be variable with respect to the number of units sold, but they are not. For example, in January, the absorption unit product cost at Weber Light Aircraft is $95,000, but the variable portion of this cost is only $25,000. The fixed overhead costs of $70,000 are commingled with variable production costs, thereby obscuring the impact of fixed overhead costs on profits. Because absorption unit product costs are stated on a

per unit basis, managers may mistakenly believe that if another unit is produced, it will cost the company $95,000. But of course it would not. The cost of producing another unit would be only $25,000. Misinterpreting absorption unit product costs as variable can lead to many problems, including inappropriate pricing decisions and decisions to drop products that are in fact profitable.

Segmented Income Statements and the Contribution Approach

LO6-4

Prepare a segmented income statement that differentiates traceable fixed costs from common fixed costs and use it to make decisions.

In the remainder of the chapter, we'll learn how to use the contribution approach to construct income statements for business segments. These segmented income statements are useful for analyzing the profitability of segments, making decisions, and measuring the performance of segment managers.

Traceable and Common Fixed Costs and the Segment Margin

You need to understand three new terms to prepare segmented income statements using the contribution approach—*traceable fixed cost, common fixed cost,* and *segment margin.*

A **traceable fixed cost** of a segment is a fixed cost that is incurred because of the existence of the segment—if the segment had never existed, the fixed cost would not have been incurred; and if the segment were eliminated, the fixed cost would disappear. Examples of traceable fixed costs include the following:

- The salary of the Fritos product manager at **PepsiCo** is a *traceable* fixed cost of the Fritos business segment of PepsiCo.
- The maintenance cost for the building in which Boeing 747s are assembled is a *traceable* fixed cost of the 747 business segment of **Boeing**.
- The liability insurance at **Disney World** is a *traceable* fixed cost of the Disney World business segment of **The Walt Disney Corporation**.

A **common fixed cost** is a fixed cost that supports the operations of more than one segment, but is not traceable in whole or in part to any one segment. Even if a segment were entirely eliminated, there would be no change in a true common fixed cost. For example:

- The salary of the CEO of **General Motors** is a *common* fixed cost of the various divisions of General Motors.
- The cost of heating a **Safeway** or **Kroger** grocery store is a *common* fixed cost of the store's various departments—groceries, produce, bakery, meat, and so forth.

- The cost of the receptionist's salary at an office shared by a number of doctors is a *common* fixed cost of the doctors. The cost is traceable to the office, but not to individual doctors.

To prepare a segmented income statement, variable expenses are deducted from sales to yield the contribution margin for the segment. The contribution margin tells us what happens to profits as volume changes—holding a segment's capacity and fixed costs constant. The contribution margin is especially useful in decisions involving temporary uses of capacity such as special orders. These types of decisions often involve only variable costs and revenues—the two components of contribution margin.

The **segment margin** is obtained by deducting the traceable fixed costs of a segment from the segment's contribution margin. It represents the margin available after a segment has covered all of its own costs. *The segment margin is the best gauge of the long-run profitability of a segment* because it includes only those costs that are caused by the segment. If a segment can't cover its own costs, then that segment probably should be dropped (unless it has important side effects on other segments). Notice, common fixed costs are not allocated to segments.

From a decision-making point of view, the segment margin is most useful in major decisions that affect capacity such as dropping a segment. By contrast, as we noted earlier, the contribution margin is most useful in decisions involving short-run changes in volume, such as pricing special orders that involve temporary use of existing capacity.

IN BUSINESS

HAS THE INTERNET KILLED CATALOGS?

Smith & Hawken, an outdoor-accessories retailer, has experienced growing Internet sales and declining catalog sales. These trends seem consistent with conventional wisdom, which suggests that the Internet will make catalogs obsolete. Yet, Smith & Hawken, like many retailers with growing Internet sales, has no plans to discontinue its catalogs. In fact, the total number of catalogs mailed in the United States by all companies has jumped from 16.6 billion in 2002 to 19.2 billion in 2005. Why?

Catalog shoppers and Internet shoppers are not independent customer segments. Catalog shoppers frequently choose to complete their sales transactions online rather than placing telephone orders. This explains why catalogs remain a compelling marketing medium even though catalog sales are declining for many companies. If retailers separately analyze catalog sales and Internet sales, they may discontinue the catalogs segment while overlooking the adverse impact of this decision on Internet segment margins.

Source: Louise Lee, "Catalogs, Catalogs, Everywhere," *BusinessWeek*, December 4, 2006, pp. 32–34.

Identifying Traceable Fixed Costs

The distinction between traceable and common fixed costs is crucial in segment reporting because traceable fixed costs are charged to segments and common fixed costs are not. In an actual situation, it is sometimes hard to determine whether a cost should be classified as traceable or common.

The general guideline is to treat as traceable costs *only those costs that would disappear over time if the segment itself disappeared.* For example, if one division within a company were sold or discontinued, it would no longer be necessary to pay that division manager's salary. Therefore the division manager's salary would be classified as a traceable fixed cost of the division. On the other hand, the president of the company undoubtedly would continue to be paid even if one of many divisions was dropped. In fact, he or she might even be paid more if dropping the division was a good

idea. Therefore, the president's salary is common to the company's divisions and should not be charged to them.

When assigning costs to segments, the key point is to resist the temptation to allocate costs (such as depreciation of corporate facilities) that are clearly common and that will continue regardless of whether the segment exists or not. *Any allocation of common costs to segments reduces the value of the segment margin as a measure of long-run segment profitability and segment performance.*

Traceable Costs Can Become Common Costs

Fixed costs that are traceable to one segment may be a common cost of another segment. For example, **United Airlines** might want a segmented income statement that shows the segment margin for a particular flight from Chicago to Paris further broken down into first-class, business-class, and economy-class segment margins. The airline must pay a substantial landing fee at Charles DeGaulle airport in Paris. This fixed landing fee is a traceable cost of the flight, but it is a common cost of the first-class, business-class, and economy-class segments. Even if the first-class cabin is empty, the entire landing fee must be paid. So the landing fee is not a traceable cost of the first-class cabin. But on the other hand, paying the fee is necessary in order to have any first-class, business-class, or economy-class passengers. So the landing fee is a common cost of these three classes.

IN BUSINESS

SEGMENT REPORTING AT THE VILAR PERFORMING ARTS CENTER

The Vilar Performing Arts Center is a 535-seat theater located in Beaver Creek, Colorado, that presents an unusually wide variety of performances categorized into six business segments—Family Series, Broadway Series, Theatre/Comedy Series, Dance Series, Classical Series, and Concert Series. The executive director of the Vilar, Kris Sabel, must decide which shows to book, what financial terms to offer to the artists, what contributions are likely from underwriters (i.e., donors), and what prices to charge for tickets. He evaluates the profitability of the segments using segmented income statements that include traceable costs (such as the costs of transporting, lodging, and feeding the artists) and exclude common costs (such as the salaries of Kris and his staff, depreciation on the theater, and general marketing expenses).

Data concerning the Classical Series segment for one season appears below:

Number of shows	4
Number of seats budgeted	863
Number of seats sold	655
Average seats sold per show	164
Ticket sales	$ 46,800
Underwriting (donors)	65,000
Total income	$111,800
Artists fees	78,870
Other traceable expenses	11,231
Classical Series segment margin	$ 21,699

Although the Classical Series sold an average of only 164 seats per show, its overall segment margin ($21,699) is positive thanks to $65,000 of underwriting revenues from donors. Had common costs been allocated to the Classical Series, it may have appeared unprofitable and been discontinued—resulting in fewer shows during the season; less diverse programming; disappointment among a small, but dedicated, number of fans; and lower overall income for the Vilar due to the loss of its Classical Series segment margin.

Segmented Income Statements—An Example

ProphetMax, Inc., is a rapidly growing computer software company. Exhibit 6-6 shows its variable costing income statement for the most recent month. As the company has grown, its senior managers have asked for segmented income statements that could be used to make decisions and evaluate managerial performance. ProphetMax's controller responded by creating examples of contribution format income statements segmented by the company's divisions, product lines, and sales channels. She created Exhibit 6-7 to explain that ProphetMax's profits can be segmented into its two

divisions—the Business Products Division and the Consumer Products Division. The Consumer Products Division's profits can be further segmented into the Clip Art and Computer Games product lines. Finally, the Computer Games product line's profits (within the Consumer Products Division) can be segmented into the Online and Retail Stores sales channels.

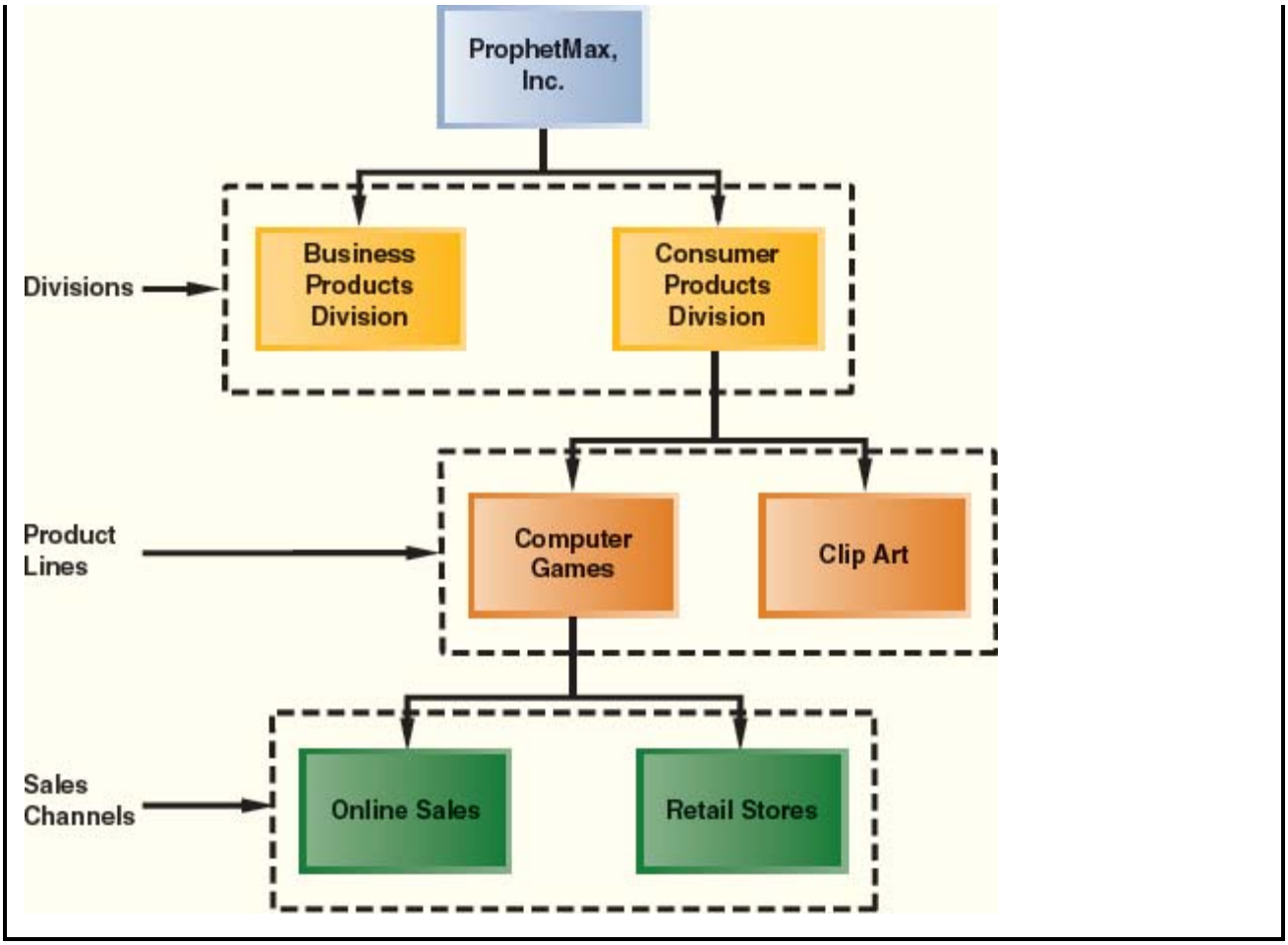
Levels of Segmented Income Statements

Exhibit 6-8, on page 248, contains the controller's segmented income statements for the segments depicted in Exhibit 6-7. The contribution format income statement for the entire company appears at the very top of the exhibit under the column labeled Total Company. Notice, the net operating income shown in this column ($13,500) is the same as the net operating income shown in Exhibit 6-6. Immediately to the right of the Total Company column are two columns—one for each of the two divisions. We can see that the Business Products Division's traceable fixed expenses are $90,000 and the Consumer Products Division's are $81,000. These $171,000 of traceable fixed expenses (as shown in the Total Company column) plus the $85,500 of common fixed expenses not traceable to individual divisions equals ProphetMax's total fixed expenses ($256,500) as shown in Exhibit 6-6. We can also see that the Business Products Division's segment margin is $60,000 and the Consumer Products Division's is $39,000. These segment margins show the company's divisional managers how much each of their divisions is contributing to the company's profits.

EXHIBIT 6-6
ProphetMax, Inc. Variable Costing Income Statement

ProphetMax, Inc. Variable Costing Income Statement	
Sales	$500,000
Variable expenses:	
Variable cost of goods sold	180,000
Other variable expenses	50,000
Total variable expenses	230,000
Contribution margin	270,000
Fixed expenses	256,500
Net operating income	$ 13,500

EXHIBIT 6-7
ProphetMax, Inc.: Examples of Business Segments



The middle portion of Exhibit 6-8 further segments the Consumer Products Division into its two product lines, Clip Art and Computer Games. The dual nature of some fixed costs can be seen in this portion of the exhibit. Notice, in the top portion of Exhibit 6-8 when segments are defined as divisions, the Consumer Products Division has $81,000 in traceable fixed expenses. However, when we drill down to the product lines (in the middle portion of the exhibit), only $70,000 of the $81,000 cost that was traceable to the Consumer Products Division is traceable to the product lines. The other $11,000 becomes a common fixed cost of the two product lines of the Consumer Products Division.

EXHIBIT 6-8

ProphetMax, Inc.—Segmented Income Statements in the Contribution Format

Segments Defined as Divisions

	Total Company	Divisions: Business Products Division	Divisions: Consumer Products Division
Sales	$500,000	$300,000	$200,000
Variable expenses:			
Variable cost of goods sold	180,000	120,000	60,000
Other variable expenses	50,000	30,000	20,000
Total variable expenses	230,000	150,000	80,000
Contribution margin	270,000	150,000	120,000
Traceable fixed expenses	171,000	90,000	81,000
Divisional segment margin	99,000	$ 60,000	$ 39,000
Common fixed expenses not traceable to individual divisions	85,500		
Net operating income	$ 13,500		

Segments Defined as Product Lines of the Consumer Products Division

	Consumer Products Division	Product Line: Clip Art	Product Line: Computer Games
Sales	$200,000	$75,000	$125,000
Variable expenses:			
Variable cost of goods sold	60,000	20,000	40,000
Other variable expenses	20,000	5,000	15,000
Total variable expenses	80,000	25,000	55,000
Contribution margin	120,000	50,000	70,000
Traceable fixed expenses	70,000	30,000	40,000
Product-line segment margin	50,000	$20,000	$ 30,000
Common fixed expenses not traceable to individual product lines	11,000		
Divisional segment margin	$ 39,000		

Segments Defined as Sales Channels for One Product Line, Computer Games, of the Consumer Products Division

	Computer Games	Sales Channels: Online Sales	Sales Channels: Retail Stores

Sales	$125,000	$100,000	$25,000
Variable expenses:			
Variable cost of goods sold	40,000	32,000	8,000
Other variable expenses	15,000	5,000	10,000
Total variable expenses	55,000	37,000	18,000
Contribution margin	70,000	63,000	7,000
Traceable fixed expenses	25,000	15,000	10,000
Sales-channel segment margin	45,000	$ 48,000	$ (3,000)
Common fixed expenses not traceable to individual sales channels	15,000		
Product-line segment margin	$ 30,000		

Why would $11,000 of traceable fixed costs become a common fixed cost when the division is divided into product lines? The $11,000 is the monthly depreciation expense on a machine that is used to encase products in tamper-proof packages for the consumer market. The depreciation expense is a traceable cost of the Consumer Products Division as a whole, but it is a common cost of the division's two product lines. Even if one of the product lines were discontinued entirely, the machine would still be used to wrap the remaining products. Therefore, none of the depreciation expense can really be traced to individual products. Conversely, the $70,000 traceable fixed cost can be traced to the individual product lines because it consists of the costs of product-specific advertising. A total of $30,000 was spent on advertising clip art and $40,000 was spent on advertising computer programs.

Page 249

The bottom portion of Exhibit 6-8 further segments the Computer Games product line into two sales channels, Online Sales and Retail Stores. The dual nature of some fixed costs can also be seen in this portion of the exhibit. In the middle portion of Exhibit 6-8 when segments are defined as product lines, the Computer Games product line has $40,000 in traceable fixed expenses. However, when we look at the sales channels in the bottom portion of the exhibit, only $25,000 of the $40,000 that was traceable to Computer Games is traceable to the sales channels. The other $15,000 becomes a common fixed cost of the two sales channels for the Computer Games product line.

Segmented Income Statements—Decision Making and Break-Even Analysis

Once a company prepares contribution format segmented income statements, it can use those statements to make decisions and perform break-even analysis.

Decision Making

Let's refer again to the bottom portion of Exhibit 6-8 to illustrate how segmented income statements support decision making. Notice that the Online Sales segment has a segment margin of $48,000 and the Retail Stores segment has a segment margin of $(3,000). Let's assume that ProphetMax wants to know the profit impact of discontinuing the sale of computer games through its Retail Stores sales channel. The company believes that online sales of its computer games will increase 10% if it discontinues the Retail Stores sales channel. It also believes that the Business Products Division and Clip Art product line will be unaffected by this decision. How would you compute the profit impact of this decision?

The first step is to calculate the profit impact of the Retail Stores sales channel disappearing. If this sales channel disappears, we assume its sales, variable expenses, and traceable fixed expenses would all disappear. The quickest way to summarize these financial impacts is to focus on the Retail Stores' segment margin. In other words, if the Retail Stores sales channel disappears, then its negative segment margin of $3,000 would also disappear. This would increase ProphetMax's net operating income by $3,000. The second step is to calculate the profit impact of increasing online sales of computer games by 10%. To perform this calculation, we assume that the Online Sales total traceable fixed expenses ($15,000) remain constant and its contribution margin ratio remains constant at 63% (= $63,000 ÷ $100,000). If online sales increase $10,000 (= $100,000 × 10%), then the Online

Sales segment's contribution margin will increase by $6,300 (= $10,000 × 63%). The overall profit impact of discontinuing the Retail Stores sales channel can be summarized as follows:

Avoidance of the retail segment's loss	$3,000
Online Sales additional contribution margin	6,300
Increase in ProphetMax's net operating income	$9,300

Break-Even Analysis

LO6-5

Compute companywide and segment break-even points for a company with traceable fixed costs.

In Chapter 5, we learned how to compute a companywide break-even point for a multiproduct company with no traceable fixed expenses. Now we are going to use the ProphetMax, Inc., data in Exhibit 6-8 to explain how to compute companywide and segment break-even points for a company with traceable fixed expenses. The formula for computing a companywide break-even point is as follows:

$$\text{Dollar sales for company to break even} = \frac{\text{Traceable fixed expenses} + \text{Common fixed expenses}}{\text{Overall CM ratio}}$$

In the case of ProphetMax, we should begin by reviewing the information in the Total Company column in the top portion of Exhibit 6-8. This column of data indicates that ProphetMax's total traceable fixed expenses are $171,000 and its total common fixed expenses are $85,500. Furthermore, the company's overall contribution margin of $270,000 divided by its total sales of $500,000 equals its overall CM ratio of 0.54. Given this information, ProphetMax's companywide break-even point is computed as follows:

$$\begin{aligned}\text{Dollar sales for company to break even} &= \frac{\text{Traceable fixed expenses} + \text{Common fixed expenses}}{\text{Overall CM ratio}} \\ &= \frac{\$171{,}000 + \$85{,}500}{0.54} \\ &= \frac{\$256{,}500}{0.54} \\ &= \$475{,}000\end{aligned}$$

It is important to emphasize that this computation assumes a constant sales mix. In other words, in the ProphetMax example, it assumes that 60% of the total sales ($300,000 ÷ $500,000) will always come from the Business Products Division and 40% of the total sales ($200,000 ÷ $500,000) will always come from the Consumer Products Division.

To compute the break-even point for a business segment, the formula is as follows:

$$\text{Dollar sales for a segment to break even} = \frac{\text{Segment traceable fixed expenses}}{\text{Segment CM ratio}}$$

In the case of ProphetMax's Business Products Division, we should begin by reviewing the information in the Business Products Division column in the top portion of Exhibit 6-8. This column of data indicates that the Business Products Division's traceable fixed expenses are $90,000 and its

CM ratio is 0.50 ($150,000 ÷ $300,000). Given this information, the Business Products Division's break-even point is computed as follows:

$$\begin{aligned}\text{Dollar sales for a segment to break even} &= \frac{\text{Segment traceable fixed expenses}}{\text{Segment CM ratio}} \\ &= \frac{\$90{,}000}{0.50} \\ &= \$180{,}000\end{aligned}$$

The same calculation can be performed for the Consumer Products Division using data from the Consumer Products Division column in the top portion of Exhibit 6-8. Given that the Consumer Products Division's traceable fixed expenses are $81,000 and its CM ratio is 0.60 ($120,000 ÷ $200,000), its break-even point is computed as follows:

$$\begin{aligned}\text{Dollar sales for a segment to break even} &= \frac{\text{Segment traceable fixed expenses}}{\text{Segment CM ratio}} \\ &= \frac{\$81{,}000}{0.60} \\ &= \$135{,}000\end{aligned}$$

Notice that the sum of the segment break-even sales figures of $315,000 ($180,000 + $135,000) is less than the companywide break-even point of $475,000. This occurs because the segment break-even calculations *do not include the company's common fixed expenses.* The exclusion of the company's common fixed expenses can be verified by preparing income statements based on each segment's break-even dollar sales as follows:

	Total Company	Business Products Division	Consumer Products Division
Sales	$315,000	$180,000	$135,000
Variable expenses	144,000	90,000	54,000
Contribution margin	171,000	90,000	81,000
Traceable fixed expenses	171,000	90,000	81,000
Segment margin	0	$ 0	$ 0
Common fixed expenses	85,500		
Net operating loss	$ (85,500)		

When each segment achieves its break-even point, the company's overall net operating loss of $85,500 equals its common fixed expenses of $85,500. This reality can often lead managers astray when making decisions. In an attempt to "cover the company's common fixed expenses," managers will often allocate common fixed expenses to business segments when performing break-even calculations and making decisions. *This is a mistake!* Allocating common fixed expenses to business segments artificially inflates each segment's break-even point. This may cause managers to erroneously discontinue business segments where the inflated break-even point appears unobtainable. The decision to retain or discontinue a business segment should be based on the sales and expenses that would disappear if the segment were dropped. Because common fixed expenses *will persist even if a business segment is dropped,* they should not be allocated to business segments when making decisions.

Segmented Income Statements—Common Mistakes

All of the costs attributable to a segment—and only those costs—should be assigned to the segment. Unfortunately, companies often make mistakes when assigning costs to segments. They omit some costs, inappropriately assign traceable fixed costs, and arbitrarily allocate common fixed costs.

Omission of Costs

The costs assigned to a segment should include all costs attributable to that segment from the company's entire value chain. All of these functions, from research and development, through product design, manufacturing, marketing, distribution, and customer service, are required to bring a product or service to the customer and generate revenues.

However, only manufacturing costs are included in product costs under absorption costing, which is widely regarded as required for external financial reporting. To avoid having to maintain two

costing systems and to provide consistency between internal and external reports, many companies also use absorption costing for their internal reports such as segmented income statements. As a result, such companies omit from their profitability analysis part or all of the “upstream” costs in the value chain, which consist of research and development and product design, and the “downstream” costs, which consist of marketing, distribution, and customer service. Yet these nonmanufacturing costs are just as essential in determining product profitability as are the manufacturing costs. These upstream and downstream costs, which are usually included in selling and

administrative expenses on absorption costing income statements, can represent half or more of the total costs of an organization. If either the upstream or downstream costs are omitted in profitability analysis, then the product is undercosted and management may unwittingly develop and maintain products that in the long run result in losses.

Inappropriate Methods for Assigning Traceable Costs among Segments

In addition to omitting costs, many companies do not correctly handle traceable fixed expenses on segmented income statements. First, they do not trace fixed expenses to segments even when it is feasible to do so. Second, they use inappropriate allocation bases to allocate traceable fixed expenses to segments.

Failure to Trace Costs Directly Costs that can be traced directly to a specific segment should be charged directly to that segment and should not be allocated to other segments. For example, the rent for a branch office of an insurance company should be charged directly to the branch office rather than included in a companywide overhead pool and then spread throughout the company.

Inappropriate Allocation Base Some companies use arbitrary allocation bases to allocate costs to segments. For example, some companies allocate selling and administrative expenses on the basis of sales revenues. Thus, if a segment generates 20% of total company sales, it would be allocated 20% of the company's selling and administrative expenses as its "fair share." This same basic procedure is followed if cost of goods sold or some other measure is used as the allocation base.

Costs should be allocated to segments for internal decision-making purposes only when the allocation base actually drives the cost being allocated (or is very highly correlated with the real cost driver). For example, sales should be used to allocate selling and administrative expenses only if a 10% increase in sales will result in a 10% increase in selling and administrative expenses. To the extent that selling and administrative expenses are not driven by sales volume, these expenses will be improperly allocated—with a disproportionately high percentage of the selling and administrative expenses assigned to the segments with the largest sales.

Arbitrarily Dividing Common Costs among Segments

The third business practice that leads to distorted segment costs is the practice of assigning nontraceable costs to segments. For example, some companies allocate the common costs of the corporate headquarters building to products on segment reports. However, in a multiproduct company, no single product is likely to be responsible for any significant amount of this cost. Even if a product were eliminated entirely, there would usually be no significant effect on any of the costs of the corporate headquarters building. In short, there is no cause-and-effect relation between the cost of the corporate headquarters building and the existence of any one product. As a consequence, any allocation of the cost of the corporate headquarters building to the products must be arbitrary.

Common costs like the costs of the corporate headquarters building are necessary, of course, to have a functioning organization. The practice of arbitrarily allocating common costs to segments is often justified on the grounds that "someone" has to "cover the common costs." While it is

undeniably true that a company must cover its common costs to earn a profit, arbitrarily allocating common costs to segments does not ensure that this will happen. In fact, adding a share of common costs to the real costs of a segment may make an otherwise profitable segment appear to be unprofitable. If a manager eliminates the apparently unprofitable segment, the real traceable costs of the segment will be saved, but its revenues will be lost. And what happens to the common fixed costs that were allocated to the segment? They don't disappear; they are reallocated to the remaining segments of the company. That makes all of the remaining segments appear to be less profitable—possibly

resulting in dropping other segments. The net effect will be to reduce the overall profits of the company and make it even more difficult to "cover the common costs." Page 253

Additionally, common fixed costs are not manageable by the manager to whom they are arbitrarily allocated; they are the responsibility of higher-level managers. When common fixed costs are allocated to managers, they are held responsible for those costs even though they cannot control them.

Income Statements—An External Reporting Perspective

Companywide Income Statements

Practically speaking, absorption costing is required for external reports according to U.S. generally accepted accounting principles (GAAP).[3] Furthermore, International Financial Reporting Standards (IFRS) explicitly require companies to use absorption costing. Probably because of the cost and possible confusion of maintaining two separate costing systems—one for external reporting and one for internal reporting—most companies use absorption costing for their external and internal reports.

With all of the advantages of the contribution approach, you may wonder why the absorption approach is used at all. While the answer is partly due to adhering to tradition, absorption costing is also attractive to many accountants and managers because they believe it better matches costs with revenues. Advocates of absorption costing argue that *all* manufacturing costs must be assigned to products in order to properly match the costs of producing units of product with their revenues when they are sold. The fixed costs of depreciation, taxes, insurance, supervisory salaries, and so on, are just as essential to manufacturing products as are the variable costs.

Advocates of variable costing argue that fixed manufacturing costs are not really the costs of any particular unit of product. These costs are incurred to have the *capacity* to make products during a particular period and will be incurred even if nothing is made during the period. Moreover, whether a unit is made or not, the fixed manufacturing costs will be exactly the same. Therefore, variable costing advocates argue that fixed manufacturing costs are not part of the costs of producing a particular unit of product, and thus, the matching principle dictates that fixed manufacturing costs should be charged to the current period.

Segmented Financial Information

U.S. GAAP and IFRS require that publicly traded companies include segmented financial and other data in their annual reports and that the segmented reports prepared for external users *must use the*

same methods and definitions that the companies use in internal segmented reports that are prepared to aid in making operating decisions. This is a very unusual stipulation because companies are not ordinarily required to report the same data to external users that are used for internal decision-making purposes. This requirement creates incentives for publicly traded companies to avoid using the contribution format for internal segmented reports. Segmented contribution format income statements contain vital information that companies are often very reluctant to release to the public (and hence competitors). In addition, this requirement creates problems in reconciling internal and external reports.

IN BUSINESS

3M REPORTS SEGMENTED PROFITABILITY TO SHAREHOLDERS

In 2009, 3M Company reported segmented profitability to its shareholders by product lines and geographic areas. A portion of the company's segmented information is summarized below (all numbers are in millions):

	Net Sales	Net Operating Income
Product Lines:		
Industrial and transportation	$7,116	$1,238
Health care	$4,294	$1,350
Consumer and office	$3,471	$748
Safety, security, and protection services	$3,180	$745
Display and graphics	$3,132	$590
Electro and communications	$2,276	$322
Geographic Areas:		
United States	$8,509	$1,640
Asia Pacific	$6,120	$1,528
Europe, Middle East and Africa	$5,972	$1,003
Latin America and Canada	$2,516	$631

3M's annual report does not report the gross margins or contribution margins for its business segments. Why do you think this is the case?

Source: 3M Company, 2009 Annual Report.

Summary

Variable and absorption costing are alternative methods of determining unit product costs. Under variable costing, only those manufacturing costs that vary with output are treated as product costs. This includes direct materials, variable overhead, and ordinarily direct labor. Fixed manufacturing overhead is treated as a period cost and it is expensed on the income statement as incurred. By contrast, absorption costing treats fixed manufacturing overhead as a product cost, along with direct materials, direct labor, and variable overhead. Under both costing methods, selling and administrative expenses are treated as period costs and they are expensed on the income statement as incurred.

Because absorption costing treats fixed manufacturing overhead as a product cost, a portion of fixed manufacturing overhead is assigned to each unit as it is produced. If units of product are unsold at the end of a period, then the fixed manufacturing overhead cost attached to those units is carried with them into the inventory account and deferred to a future period. When these units are later sold, the fixed manufacturing overhead cost attached to them is released from the inventory account and charged against income as part of cost of goods sold. Thus, under absorption costing, it is possible to defer a portion of the fixed manufacturing overhead cost from one period to a future period through the inventory account.

Unfortunately, this shifting of fixed manufacturing overhead cost between periods can cause erratic fluctuations in net operating income and can result in confusion and unwise decisions. To guard against mistakes when they interpret income statement data, managers should be alert to changes in inventory levels or unit product costs during the period.

Segmented income statements provide information for evaluating the profitability and performance of divisions, product lines, sales territories, and other segments of a company. Under the contribution approach, variable costs and fixed costs are clearly distinguished from each other and only those costs that are traceable to a segment are assigned to the segment. A cost is considered

traceable to a segment only if the cost is caused by the segment and could be avoided by eliminating the segment. Fixed common costs are not allocated to segments. The segment margin consists of revenues, less variable expenses, less traceable fixed expenses of the segment.

Page 255

The dollar sales required for a segment to break even is computed by dividing the segment's traceable fixed expenses by its contribution margin ratio. A company's common fixed expenses should not be allocated to segments when performing break-even calculations because they will not change in response to segment-level decisions.

Review Problem 1: Contrasting Variable and Absorption Costing

Dexter Corporation produces and sells a single product, a wooden hand loom for weaving small items such as scarves. Selected cost and operating data relating to the product for two years are given below:

Selling price per unit	$50
Manufacturing costs:	
Variable per unit produced:	
Direct materials	$11
Direct labor	$6
Variable manufacturing overhead	$3
Fixed manufacturing overhead per year	$120,000
Selling and administrative expenses:	
Variable per unit sold	$4
Fixed per year	$70,000

	Year 1	Year 2
Units in beginning inventory	0	2,000
Units produced during the year	10,000	6,000
Units sold during the year	8,000	8,000
Units in ending inventory	2,000	0

Required:

1. Assume the company uses absorption costing.
    a. Compute the unit product cost in each year.
    b. Prepare an income statement for each year.
2. Assume the company uses variable costing.
    a. Compute the unit product cost in each year.
    b. Prepare an income statement for each year.
3. Reconcile the variable costing and absorption costing net operating incomes.

Solution to Review Problem 1

1.

a. Under absorption costing, all manufacturing costs, variable and fixed, are included in unit product costs:

	Year 1	Year 2
Direct materials	$11	$11
Direct labor	6	6
Variable manufacturing overhead	3	3
Fixed manufacturing overhead		
($120,000 ÷ 10,000 units)	12	
($120,000 ÷ 6,000 units)		20
Absorption costing unit product cost	$32	$40

b.

The absorption costing income statements follow:

Page 256

	Year 1	Year 2
Sales (8,000 units × $50 per unit)	$400,000	$400,000
Cost of goods sold (8,000 units × $32 per unit); (2,000 units × $32 per unit) + (6,000 units × $40 per unit)	256,000	304,000
Gross margin	144,000	96,000
Selling and administrative expenses (8,000 units × $4 per unit + $70,000)	102,000	102,000
Net operating income (loss)	$ 42,000	$ (6,000)

2.

a. Under variable costing, only the variable manufacturing costs are included in unit product costs:

	Year 1	Year 2
Direct materials	$11	$11
Direct labor	6	6
Variable manufacturing overhead	3	3
Variable costing unit product cost	$20	$20

b. The variable costing income statements follow:

	Year 1		Year 2	
Sales (8,000 units × $50 per unit)		$400,000		$400,000
Variable expenses:				
Variable cost of goods sold (8,000 units × $20 per unit)	$160,000		$160,000	
Variable selling and administrative expenses (8,000 units × $4 per unit)	32,000	192,000	32,000	192,000
Contribution margin		208,000		208,000
Fixed expenses:				
Fixed manufacturing overhead	120,000		120,000	
Fixed selling and administrative expenses	70,000	190,000	70,000	190,000
Net operating income		$ 18,000		$ 18,000

3. The reconciliation of the variable and absorption costing net operating incomes follows:

	Year 1	Year 2
Fixed manufacturing overhead in ending inventories	$24,000	$ 0
Fixed manufacturing overhead in beginning inventories	0	24,000
Fixed manufacturing overhead deferred in (released from) inventories	$24,000	$(24,000)

	Year 1	Year 2
Variable costing net operating income	$18,000	$18,000
Add fixed manufacturing overhead costs deferred in inventory under absorption costing (2,000 units × $12 per unit)	24,000	
Deduct fixed manufacturing overhead costs released from inventory under absorption costing (2,000 units × $12 per unit)		(24,000)
Absorption costing net operating income (loss)	$42,000	$ (6,000)

Review Problem 2: Segmented Income Statements

The business staff of the law firm Frampton, Davis & Smythe has constructed the following report that breaks down the firm's overall results for last month into two business segments—family law and commercial law:

	Company Total	Family Law	Commercial Law
Revenues from clients	$1,000,000	$400,000	$600,000
Variable expenses	220,000	100,000	120,000
Contribution margin	780,000	300,000	480,000
Traceable fixed expenses	670,000	280,000	390,000
Segment margin	110,000	20,000	90,000
Common fixed expenses	60,000	24,000	36,000
Net operating income (loss)	$ 50,000	$ (4,000)	$ 54,000

However, this report is not quite correct. The common fixed expenses such as the managing partner's salary, general administrative expenses, and general firm advertising have been allocated to the two segments based on revenues from clients.

Required:

1. Redo the segment report, eliminating the allocation of common fixed expenses. Would the firm be better off financially if the family law segment were dropped? (Note: Many of the firm's commercial law clients also use the firm for their family law requirements such as drawing up wills.
2. The firm's advertising agency has proposed an ad campaign targeted at boosting the revenues of the family law segment. The ad campaign would cost $20,000, and the advertising agency claims that it would increase family law revenues by $100,000. The managing partner of Frampton, Davis & Smythe believes this increase in business could be accommodated without any increase in fixed expenses. Estimate the effect this ad campaign would have on the family law segment margin and on the firm's overall net operating income.
3. Compute the companywide break-even point in dollar sales and the dollar sales required for each business segment to break even.

Solution to Review Problem 2

1. The corrected segmented income statement appears below:

	Company Total	Family Law	Commercial Law
Revenues from clients	$1,000,000	$400,000	$600,000
Variable expenses	220,000	100,000	120,000
Contribution margin	780,000	300,000	480,000
Traceable fixed expenses	670,000	280,000	390,000
Segment margin	110,000	$ 20,000	$ 90,000
Common fixed expenses	60,000		
Net operating income	$ 50,000		

No, the firm would not be financially better off if the family law practice were dropped. The family law segment is covering all of its own costs and is contributing $20,000 per month to covering the common fixed expenses of the firm. While the segment margin for family law

is much lower than for commercial law, it is still profitable. Moreover, family law may be a service that the firm must provide to its commercial clients in order to remain competitive.

Page 258

2. The ad campaign would increase the family law segment margin by $55,000 as follows:

Increased revenues from clients	$100,000
Family law contribution margin ratio ($300,000 ÷ $400,000)	× 75%
Increased contribution margin	$ 75,000
Less cost of the ad campaign	20,000
Increased segment margin	$ 55,000

Because there would be no increase in fixed expenses (including common fixed expenses), the increase in overall net operating income is also $55,000.

3. The companywide break-even point is computed as follows:

$$\text{Dollar sales for company to break even} = \frac{\text{Traceable fixed expenses} + \text{Common fixed expenses}}{\text{Overall CM ratio}}$$

$$= \frac{\$670{,}000 + \$60{,}000}{0.78}$$

$$= \frac{\$730{,}000}{0.78}$$

$$= \$935{,}897 \text{ (rounded)}$$

The break-even point for the family law segment is computed as follows:

$$\text{Dollar sales for a segment to break even} = \frac{\text{Segment traceable fixed expenses}}{\text{Segment CM ratio}}$$

$$= \frac{\$280{,}000}{0.75}$$

$$= \$373{,}333 \text{ (rounded)}$$

The break-even point for the commercial law segment is computed as follows:

$$\text{Dollar sales for a segment to break even} = \frac{\text{Segment traceable fixed expenses}}{\text{Segment CM ratio}}$$

$$= \frac{\$390{,}000}{0.80}$$

$$= \$487{,}500$$

Glossary

Absorption costing A costing method that includes all manufacturing costs—direct materials, direct labor, and both variable and fixed manufacturing overhead—in unit product costs. (p. 234)

Common fixed cost A fixed cost that supports more than one business segment, but is not traceable in whole or in part to any one of the business segments. (p. 244)

Segment Any part or activity of an organization about which managers seek cost, revenue, or profit data. (p. 234)

Segment margin A segment's contribution margin less its traceable fixed costs. It represents the margin available after a segment has covered all of its own traceable costs. (p. 244)

Traceable fixed cost A fixed cost that is incurred because of the existence of a particular business segment and that would be eliminated if the segment were eliminated. (p. 244)

Variable costing A costing method that includes only variable manufacturing costs—direct materials, direct labor, and variable manufacturing overhead—in unit product costs. (p. 234)

Questions

6-1 What is the basic difference between absorption costing and variable costing?

6-2 Are selling and administrative expenses treated as product costs or as period costs under variable costing?

6-3 Explain how fixed manufacturing overhead costs are shifted from one period to another under absorption costing.

6-4 What are the arguments in favor of treating fixed manufacturing overhead costs as product costs?

6-5 What are the arguments in favor of treating fixed manufacturing overhead costs as period costs?

6-6 If the units produced and unit sales are equal, which method would you expect to show the higher net operating income, variable costing or absorption costing? Why?

6-7 If the units produced exceed unit sales, which method would you expect to show the higher net operating income, variable costing or absorption costing? Why?

6-8 If fixed manufacturing overhead costs are released from inventory under absorption costing, what does this tell you about the level of production in relation to the level of sales?

6-9 Under absorption costing, how is it possible to increase net operating income without increasing sales?

6-10 How does Lean Production reduce or eliminate the difference in reported net operating income between absorption and variable costing?

6-11 What is a segment of an organization? Give several examples of segments.

6-12 What costs are assigned to a segment under the contribution approach?

6-13 Distinguish between a traceable cost and a common cost. Give several examples of each.

6-14 Explain how the segment margin differs from the contribution margin.

6-15 Why aren't common costs allocated to segments under the contribution approach?

6-16 How is it possible for a cost that is traceable to a segment to become a common cost if the segment is divided into further segments?

6-17 Should a company allocate its common fixed expenses to business segments when computing the break-even point for those segments? Why?

Multiple-choice questions are provided on the text website at **www.mhhe.com/garrison15e**.

Applying Excel

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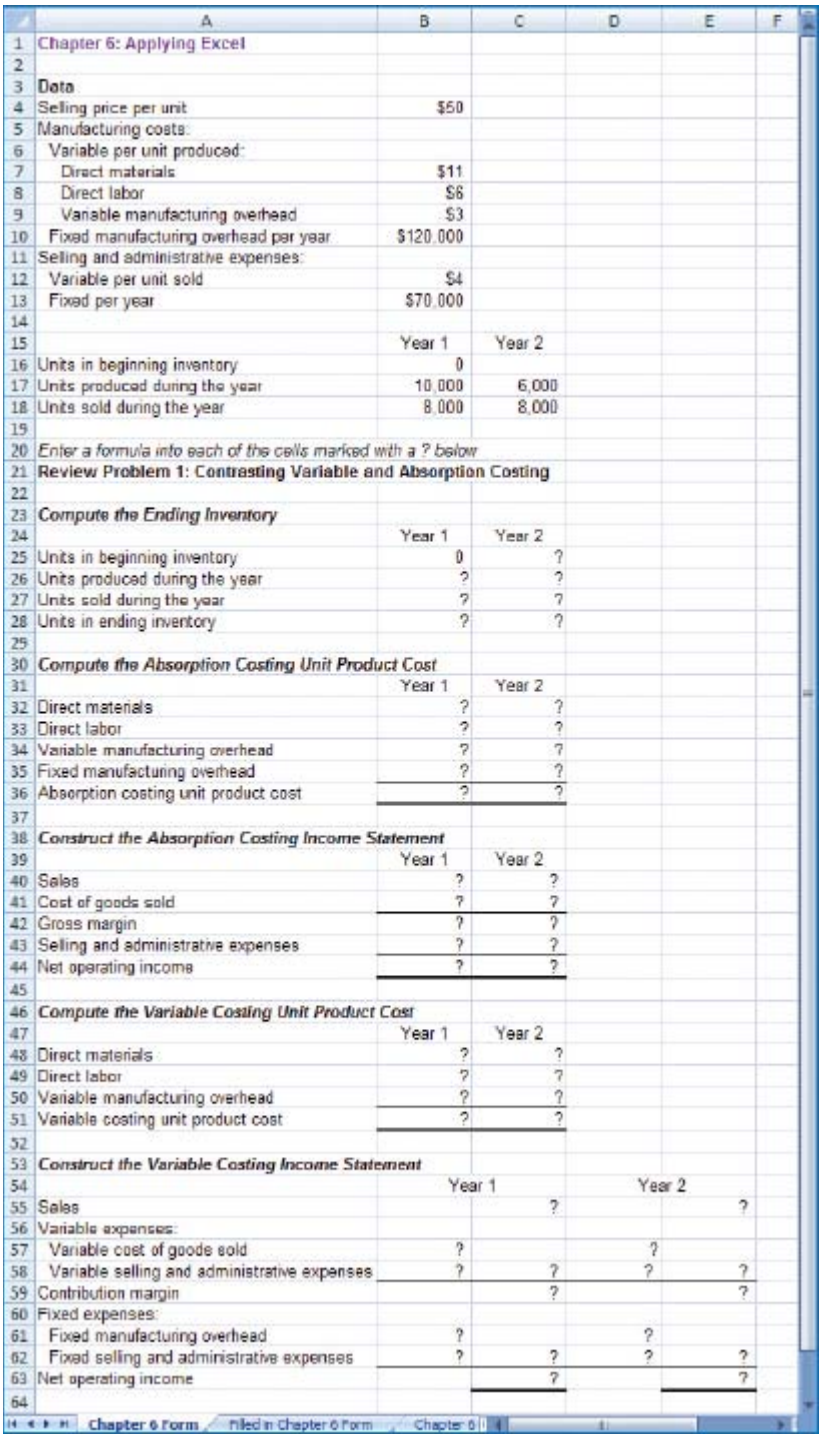
LO6-2

The Excel worksheet form that appears on the next page is to be used to recreate portions of Review Problem 1 on pages 255–256. Download the workbook containing this form from the Online Learning Center at **www.mhhe.com/garrison15e**. *On the website you will also receive instructions about how to use this worksheet form.*



	A	B	C	D	E	F
1	Chapter 6: Applying Excel					
2						
3	Data					
4	Selling price per unit	$50				
5	Manufacturing costs:					
6	Variable per unit produced:					
7	Direct materials	$11				
8	Direct labor	$6				
9	Variable manufacturing overhead	$3				
10	Fixed manufacturing overhead per year	$120,000				
11	Selling and administrative expenses:					
12	Variable per unit sold	$4				
13	Fixed per year	$70,000				
14						
15		Year 1	Year 2			
16	Units in beginning inventory	0				
17	Units produced during the year	10,000	6,000			
18	Units sold during the year	8,000	8,000			
19						
20	*Enter a formula into each of the cells marked with a ? below*					
21	**Review Problem 1: Contrasting Variable and Absorption Costing**					
22						
23	***Compute the Ending Inventory***					
24		Year 1	Year 2			
25	Units in beginning inventory	0	?			
26	Units produced during the year	?	?			
27	Units sold during the year	?	?			
28	Units in ending inventory	?	?			
29						
30	***Compute the Absorption Costing Unit Product Cost***					
31		Year 1	Year 2			
32	Direct materials	?	?			
33	Direct labor	?	?			
34	Variable manufacturing overhead	?	?			
35	Fixed manufacturing overhead	?	?			
36	Absorption costing unit product cost	?	?			
37						
38	***Construct the Absorption Costing Income Statement***					
39		Year 1	Year 2			
40	Sales	?	?			
41	Cost of goods sold	?	?			
42	Gross margin	?	?			
43	Selling and administrative expenses	?	?			
44	Net operating income	?	?			
45						
46	***Compute the Variable Costing Unit Product Cost***					
47		Year 1	Year 2			
48	Direct materials	?	?			
49	Direct labor	?	?			
50	Variable manufacturing overhead	?	?			
51	Variable costing unit product cost	?	?			
52						
53	***Construct the Variable Costing Income Statement***					
54		Year 1		Year 2		
55	Sales		?		?	
56	Variable expenses:					
57	Variable cost of goods sold	?		?		
58	Variable selling and administrative expenses	?	?	?	?	
59	Contribution margin		?		?	
60	Fixed expenses:					
61	Fixed manufacturing overhead	?		?		
62	Fixed selling and administrative expenses	?	?	?	?	
63	Net operating income		?		?	
64						

Chapter 6 Form | Filled in Chapter 6 Form | Chapter 6

You should proceed to the requirements below only after completing your worksheet. The LIFO inventory flow assumption is used throughout this problem.

Required:

1. Check your worksheet by changing the units sold in the Data to 6,000 for Year 2. The cost of goods sold under absorption costing for Year 2 should now be $240,000. If it isn't, check cell C41. The formula in this cell should be = IF(C26 Why is the absorption costing net operating income now equal to the variable costing net operating income in Year 2?

2.

Enter the following data from a different company into your worksheet:

Page 261

Data		
Selling price per unit	$75	
Manufacturing costs:		
Variable per unit produced:		
Direct materials	$12	
Direct labor	$5	
Variable manufacturing overhead	$7	
Fixed manufacturing overhead per year	$150,000	
Selling and administrative expenses:		
Variable per unit sold	$1	
Fixed per year	$60,000	
	Year 1	Year 2
Units in beginning inventory	0	
Units produced during the year	15,000	10,000
Units sold during the year	12,000	12,000

Is the net operating income under variable costing different in Year 1 and Year 2? Why or why not? Explain the relation between the net operating income under absorption costing and variable costing in Year 1. Explain the relation between the net operating income under absorption costing and variable costing in Year 2.

3. At the end of Year 1, the company's board of directors set a target for Year 2 of net operating income of $500,000 under absorption costing. If this target is met, a hefty bonus would be paid to the CEO of the company. Keeping everything else the same from part (2) above, change the units produced in Year 2 to 50,000 units. Would this change result in a bonus being paid to the CEO? Do you think this change would be in the best interests of the company? What is likely to happen in Year 3 to the absorption costing net operating income if sales remain constant at 12,000 units per year?

The Foundational 15

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LO6-1, LO6-2, LO6-3, LO6-4

Diego Company manufactures one product that is sold for $80 per unit in two geographic regions—the East and West regions. The following information pertains to the company's first year of operations in which it produced 40,000 units and sold 35,000 units.

Variable costs per unit:	
Manufacturing:	
Direct materials	$24
Direct labor	$14
Variable manufacturing overhead	$2
Variable selling and administrative	$4
Fixed costs per year:	
Fixed manufacturing overhead	$800,000
Fixed selling and administrative expenses	$496,000

The company sold 25,000 units in the East region and 10,000 units in the West region. It determined that $250,000 of its fixed selling and administrative expenses is traceable to the West region, $150,000 is traceable to the East region, and the remaining $96,000 is a common fixed cost. The company will continue to incur the total amount of its fixed manufacturing overhead costs as long as it continues to produce any amount of its only product.

Required:

Page 262

Answer each question independently based on the original data unless instructed otherwise. You do not need to prepare a segmented income statement until question 13.

1. What is the unit product cost under variable costing?
2. What is the unit product cost under absorption costing?
3. What is the company's total contribution margin under variable costing?
4. What is the company's net operating income under variable costing?
5. What is the company's total gross margin under absorption costing?
6. What is the company's net operating income under absorption costing?
7. What is the amount of the difference between the variable costing and absorption costing net operating incomes? What is the cause of this difference?
8. What is the company's break-even point in unit sales? Is it above or below the actual sales volume? Compare the break-even sales volume to your answer for question 6 and comment.
9. If the sales volumes in the East and West regions had been reversed, what would be the company's overall break-even point in unit sales?
10. What would have been the company's variable costing net operating income if it had produced and sold 35,000 units? You do not need to perform any calculations to answer this question.
11. What would have been the company's absorption costing net operating income if it had produced and sold 35,000 units? You do not need to perform any calculations to answer this question.
12. If the company produces 5,000 fewer units than it sells in its second year of operations, will absorption costing net operating income be higher or lower than variable costing net operating income in Year 2? Why? No calculations are necessary.
13. Prepare a contribution format segmented income statement that includes a Total column and columns for the East and West regions.
14. Diego is considering eliminating the West region because an internally generated report suggests the region's total *gross margin* in the first year of operations was $50,000 less than its traceable fixed selling and administrative expenses. Diego believes that if it drops the West region, the East region's sales will grow by 5% in Year 2. Using the contribution approach for analyzing segment profitability and assuming all else remains constant in Year 2, what would be the profit impact of dropping the West region in Year 2?
15. Assume the West region invests $30,000 in a new advertising campaign in Year 2 that increases its unit sales by 20%. If all else remains constant, what would be the profit impact of pursuing the advertising campaign?

Exercises

All applicable exercises are available with McGraw-Hill's *Connect*® *Accounting.*

EXERCISE 6-1 Variable and Absorption Costing Unit Product Costs [LO6-1]

Ida Sidha Karya Company is a family-owned company located in the village of Gianyar on the island of Bali in Indonesia. The company produces a handcrafted Balinese musical instrument called a gamelan that is similar to a xylophone. The gamelans are sold for $850. Selected data for the company's operations last year follow:

Units in beginning inventory	0
Units produced	250
Units sold	225
Units in ending inventory	25
Variable costs per unit:	
Direct materials	$100
Direct labor	$320
Variable manufacturing overhead	$40
Variable selling and administrative	$20
Fixed costs:	
Fixed manufacturing overhead	$60,000
Fixed selling and administrative	$20,000

Required:

Page 263

1. Assume that the company uses absorption costing. Compute the unit product cost for one gamelan.
2. Assume that the company uses variable costing. Compute the unit product cost for one gamelan.

EXERCISE 6-2 Variable Costing Income Statement; Explanation of Difference in Net Operating Income [LO6-2]

Refer to the data in Exercise 6-1 for Ida Sidha Karya Company. The absorption costing income statement prepared by the company's accountant for last year appears below:

Sales	$191,250
Cost of goods sold	157,500
Gross margin	33,750
Selling and administrative expense	24,500
Net operating income	$ 9,250

Required:

1. Determine how much of the ending inventory consists of fixed manufacturing overhead cost deferred in inventory to the next period.
2. Prepare an income statement for the year using variable costing. Explain the difference in net operating income between the two costing methods.

EXERCISE 6-3 Reconciliation of Absorption and Variable Costing Net Operating Incomes [LO6-3]

Jorgansen Lighting, Inc., manufactures heavy-duty street lighting systems for municipalities. The company uses variable costing for internal management reports and absorption costing for external reports to shareholders, creditors, and the government. The company has provided the following data:

	Year 1	Year 2	Year 3
Inventories:			
Beginning (units)	200	170	180
Ending (units)	170	180	220
Variable costing net operating income	$1,080,400	$1,032,400	$996,400

The company's fixed manufacturing overhead per unit was constant at $560 for all three years.

Required:

1. Determine each year's absorption costing net operating income. Present your answer in the form of a reconciliation report.
2. In Year 4, the company's variable costing net operating income was $984,400 and its absorption costing net operating income was $1,012,400. Did inventories increase or decrease during Year 4? How much fixed manufacturing overhead cost was deferred or released from inventory during Year 4?

EXERCISE 6-4 Basic Segmented Income Statement [LO6-4]

Royal Lawncare Company produces and sells two packaged products, Weedban and Greengrow. Revenue and cost information relating to the products follow:

	Product	
	Weedban	Greengrow
Selling price per unit	$6.00	$7.50
Variable expenses per unit	$2.40	$5.25
Traceable fixed expenses per year	$45,000	$21,000

Common fixed expenses in the company total $33,000 annually. Last year the company produced and sold 15,000 units of Weedban and 28,000 units of Greengrow.

Required:

Prepare a contribution format income statement segmented by product lines.

EXERCISE 6-5 Companywide and Segment Break-Even Analysis [LO6-5]

Page 264

Piedmont Company segments its business into two regions—North and South. The company prepared the contribution format segmented income statement shown below:

	Total Company	North	South
Sales	$600,000	$400,000	$200,000
Variable expenses	360,000	280,000	80,000
Contribution margin	240,000	120,000	120,000
Traceable fixed expenses	120,000	60,000	60,000
Segment margin	120,000	$ 60,000	$ 60,000
Common fixed expenses	50,000		
Net operating income	$ 70,000		

Required:

1. Compute the companywide break-even point in dollar sales.
2. Compute the break-even point in dollar sales for the North region.
3. Compute the break-even point in dollar sales for the South region.

EXERCISE 6-6 Variable and Absorption Costing Unit Product Costs and Income Statements [LO6-1, LO6-2]

Lynch Company manufactures and sells a single product. The following costs were incurred during the company's first year of operations:

Variable costs per unit:	
Manufacturing:	
Direct materials	$6
Direct labor	$9
Variable manufacturing overhead	$3
Variable selling and administrative	$4
Fixed costs per year:	
Fixed manufacturing overhead	$300,000
Fixed selling and administrative	$190,000

During the year, the company produced 25,000 units and sold 20,000 units. The selling price of the company's product is $50 per unit.

Required:

1. Assume that the company uses absorption costing:
   a. Compute the unit product cost.
   b. Prepare an income statement for the year.
2. Assume that the company uses variable costing:
   a. Compute the unit product cost.
   b. Prepare an income statement for the year.

EXERCISE 6-7 Segmented Income Statement [LO6-4]

Shannon Company segments its income statement into its North and South Divisions. The company's overall sales, contribution margin ratio, and net operating income are $500,000, 46%, and $10,000, respectively. The North Division's contribution margin and contribution margin ratio are $150,000 and 50%, respectively. The South Division's segment margin is $30,000. The company has $90,000 of common fixed expenses that cannot be traced to either division.

Required:

Prepare an income statement for Shannon Company that uses the contribution format and is segmented by divisions. In addition, for the company as a whole and for each segment, show each item on the segmented income statements as a percent of sales.

EXERCISE 6-8 Deducing Changes in Inventories [LO6-3]

Parker Products Inc, a manufacturer, reported $123 million in sales and a loss of $18 million in its annual report to shareholders. According to a CVP analysis prepared for management, the company's break-even point is $115 million in sales.

Required:

Assuming that the CVP analysis is correct, is it likely that the company's inventory level increased, decreased, or remained unchanged during the year? Explain.

Page 265

EXERCISE 6-9 Variable and Absorption Costing Unit Product Costs and Income Statements [LO6-1, LO6-2, LO6-3]

Walsh Company manufactures and sells one product. The following information pertains to each of the company's first two years of operations:

Variable costs per unit:	
Manufacturing:	
Direct materials	$25
Direct labor	$15
Variable manufacturing overhead	$5
Variable selling and administrative	$2
Fixed costs per year:	
Fixed manufacturing overhead	$250,000
Fixed selling and administrative expenses	$80,000

During its first year of operations, Walsh produced 50,000 units and sold 40,000 units. During its second year of operations, it produced 40,000 units and sold 50,000 units. The selling price of the company's product is $60 per unit.

Required:

1. Assume the company uses variable costing:
   a. Compute the unit product cost for Year 1 and Year 2.
   b. Prepare an income statement for Year 1 and Year 2.
2. Assume the company uses absorption costing:
   a. Compute the unit product cost for Year 1 and Year 2.
   b. Prepare an income statement for Year 1 and Year 2.
3. Explain the difference between variable costing and absorption costing net operating income in Year 1. Also, explain why the two net operating income figures differ in Year 2.

EXERCISE 6-10 Companywide and Segment Break-Even Analysis [LO6-5]

Crossfire Company segments its business into two regions—East and West. The company prepared the contribution format segmented income statement shown below:

	Total Company	East	West
Sales	$900,000	$600,000	$300,000
Variable expenses	675,000	480,000	195,000
Contribution margin	225,000	120,000	105,000
Traceable fixed expenses	141,000	50,000	91,000
Segment margin	84,000	$ 70,000	$ 14,000
Common fixed expenses	59,000		
Net operating income	$ 25,000		

Required:

1. Compute the companywide break-even point dollar in sales.
2. Compute the break-even point in dollar sales for the East region.
3. Compute the break-even point in dollar sales for the West region.
4. Prepare a new segmented income statement based on the break-even dollar sales that you computed in requirements 2 and 3. Use the same format as shown above. What is Crossfire's net operating income in your new segmented income statement?
5. Do you think that Crossfire should allocate its common fixed expenses to the East and West regions when computing the break-even points for each region? Why?

EXERCISE 6-11 Segmented Income Statement [LO6-4]

Wingate Company, a wholesale distributor of electronic equipment, has been experiencing losses for some time, as shown by its most recent monthly contribution format income statement, which follows:

Sales	$1,000,000
Variable expenses	390,000
Contribution margin	610,000
Fixed expenses	625,000
Net operating income (loss)	$ (15,000)

In an effort to isolate the problem, the president has asked for an income statement segmented by division. Accordingly, the Accounting Department has developed the following information:

	Division		
	East	Central	West
Sales	$250,000	$400,000	$350,000
Variable expenses as a percentage of sales	52%	30%	40%
Traceable fixed expenses	$160,000	$200,000	$175,000

Required:

1. Prepare a contribution format income statement segmented by divisions, as desired by the president.
2. As a result of a marketing study, the president believes that sales in the West Division could be increased by 20% if monthly advertising in that division were increased by $15,000. Would you recommend the increased advertising? Show computations to support your answer.

EXERCISE 6-12 Variable Costing Income Statement; Reconciliation [LO6-2, LO6-3]

Whitman Company has just completed its first year of operations. The company's absorption costing income statement for the year appears below:

Whitman Company Income Statement	
Sales (35,000 units × $25 per unit)	$875,000
Cost of goods sold (35,000 units × $16 per unit)	560,000
Gross margin	315,000
Selling and administrative expenses	280,000
Net operating income	$ 35,000

The company's selling and administrative expenses consist of $210,000 per year in fixed expenses and $2 per unit sold in variable expenses. The $16 per unit product cost given above is computed as follows:

Direct materials	$ 5
Direct labor	6
Variable manufacturing overhead	1
Fixed manufacturing overhead ($160,000 ÷ 40,000 units)	4
Absorption costing unit product cost	$16

Required:

1. Redo the company's income statement in the contribution format using variable costing.
2. Reconcile any difference between the net operating income on your variable costing income statement and the net operating income on the absorption costing income statement above.

EXERCISE 6-13 Inferring Costing Method; Unit Product Cost [LO6-1]

Sierra Company incurs the following costs to produce and sell a single product.

Variable costs per unit:	
Direct materials	$9
Direct labor	$10
Variable manufacturing overhead	$5
Variable selling and administrative expenses	$3
Fixed costs per year:	
Fixed manufacturing overhead	$150,000
Fixed selling and administrative expenses	$400,000

During the last year, 25,000 units were produced and 22,000 units were sold. The Finished Goods inventory account at the end of the year shows a balance of $72,000 for the 3,000 unsold units.

Required:

1. Is the company using absorption costing or variable costing to cost units in the Finished Goods inventory account? Show computations to support your answer.
2. Assume that the company wishes to prepare financial statements for the year to issue to its stockholders.
    a. Is the $72,000 figure for Finished Goods inventory the correct amount to use on these statements for external reporting purposes? Explain.
    b. At what dollar amount *should* the 3,000 units be carried in the inventory for external reporting purposes?

EXERCISE 6-14 Variable Costing Unit Product Cost and Income Statement; Break-Even [LO6-1, LO6-2]

Chuck Wagon Grills, Inc., makes a single product—a handmade specialty barbecue grill that it sells for $210. Data for last year's operations follow:

Units in beginning inventory	0
Units produced	20,000
Units sold	19,000
Units in ending inventory	1,000
Variable costs per unit:	
Direct materials	$ 50
Direct labor	80
Variable manufacturing overhead	20
Variable selling and administrative	10
Total variable cost per unit	$160
Fixed costs:	
Fixed manufacturing overhead	$700,000
Fixed selling and administrative	285,000
Total fixed costs	$985,000

Required:

1. Assume that the company uses variable costing. Compute the unit product cost for one barbecue grill.
2. Assume that the company uses variable costing. Prepare a contribution format income statement for the year.
3. What is the company's break-even point in terms of the number of barbecue grills sold?

EXERCISE 6-15 Absorption Costing Unit Product Cost and Income Statement [LO6-1, LO6-2]
Refer to the data in Exercise 6-14 for Chuck Wagon Grills. Assume in this exercise that the company uses absorption costing.

Required:

1. Compute the unit product cost for one barbecue grill.
2. Prepare an income statement.

EXERCISE 6-16 Working with a Segmented Income Statement; Break-Even Analysis [LO6-4, LO6-5]

Page 268

Raner, Harris, & Chan is a consulting firm that specializes in information systems for medical and dental clinics. The firm has two offices—one in Chicago and one in Minneapolis. The firm classifies the direct costs of consulting jobs as variable costs. A contribution format segmented income statement for the company's most recent year is given below:

	Total Company		Office			
			Chicago		Minneapolis	
Sales	$450,000	100%	$150,000	100%	$300,000	100%
Variable expenses	225,000	50%	45,000	30%	180,000	60%
Contribution margin	225,000	50%	105,000	70%	120,000	40%
Traceable fixed expenses	126,000	28%	78,000	52%	48,000	16%
Office segment margin	99,000	22%	$ 27,000	18%	$ 72,000	24%
Common fixed expenses not traceable to offices	63,000	14%				
Net operating income	$ 36,000	8%				

Required:

1. Compute the companywide break-even point in dollar sales. Also, compute the break-even point for the Chicago office and for the Minneapolis office. Is the companywide break-even point greater than, less than, or equal to the sum of the Chicago and Minneapolis break-even points? Why?
2. By how much would the company's net operating income increase if Minneapolis increased its sales by $75,000 per year? Assume no change in cost behavior patterns.
3. Refer to the original data. Assume that sales in Chicago increase by $50,000 next year and that sales in Minneapolis remain unchanged. Assume no change in fixed costs.
    a. Prepare a new segmented income statement for the company using the above format. Show both amounts and percentages.
    b. Observe from the income statement you have prepared that the contribution margin ratio for Chicago has remained unchanged at 70% (the same as in the above data) but that the segment margin ratio has changed. How do you explain the change in the segment margin ratio?

EXERCISE 6-17 Working with a Segmented Income Statement [LO6-4]

Refer to the data in Exercise 6-16. Assume that Minneapolis' sales by major market are:

	Minneapolis		Market			
			Medical		Dental	
Sales	$300,000	100%	$200,000	100%	$100,000	100%
Variable expenses	180,000	60%	128,000	64%	52,000	52%
Contribution margin	120,000	40%	72,000	36%	48,000	48%
Traceable fixed expenses	33,000	11%	12,000	6%	21,000	21%
Market segment margin	87,000	29%	$ 60,000	30%	$ 27,000	27%
Common fixed expenses not traceable to markets	15,000	5%				
Office segment margin	$ 72,000	24%				


The company would like to initiate an intensive advertising campaign in one of the two market segments during the next month. The campaign would cost $5,000. Marketing studies indicate that such a campaign would increase sales in the Medical market by $40,000 or increase sales in the Dental market by $35,000.

Required:

1. In which of the markets would you recommend that the company focus its advertising campaign? Show computations to support your answer.
2. In Exercise 6-16, Minneapolis shows $48,000 in traceable fixed expenses. What happened to the $48,000 in this exercise?

Problems

All applicable problems are available with McGraw-Hill's *Connect*® *Accounting.*

PROBLEM 6-18 Variable and Absorption Costing Unit Product Costs and Income Statements [LO6-1, LO6-2]

Haas Company manufactures and sells one product. The following information pertains to each of the company's first three years of operations:

Variable costs per unit:	
Manufacturing:	
Direct materials	$20
Direct labor	$12
Variable manufacturing overhead	$4
Variable selling and administrative	$2
Fixed costs per year:	
Fixed manufacturing overhead	$960,000
Fixed selling and administrative expenses	$240,000

During its first year of operations, Haas produced 60,000 units and sold 60,000 units. During its second year of operations, it produced 75,000 units and sold 50,000 units. In its third year, Haas produced 40,000 units and sold 65,000 units. The selling price of the company's product is $58 per unit.

Required:

1. Compute the company's break-even point in units sold.
2. Assume the company uses variable costing:
    a. Compute the unit product cost for Year 1, Year 2, and Year 3.
    b. Prepare an income statement for Year 1, Year 2, and Year 3.
3. Assume the company uses absorption costing:
    a. Compute the unit product cost for Year 1, Year 2, and Year 3.
    b. Prepare an income statement for Year 1, Year 2, and Year 3.
4. Compare the net operating income figures that you computed in requirements 2 and 3 to the break-even point that you computed in requirement 1. Which net operating income figures seem counterintuitive? Why?

PROBLEM 6-19 Variable Costing Income Statement; Reconciliation [LO6-2, LO6-3]

During Heaton Company's first two years of operations, the company reported absorption costing net operating income as follows:

	Year 1	Year 2
Sales (@ $25 per unit)	$1,000,000	$1,250,000
Cost of goods sold (@ $18 per unit)	720,000	900,000
Gross margin	280,000	350,000
Selling and administrative expenses*	210,000	230,000
Net operating income	$ 70,000	$ 120,000

*$2 per unit variable; $130,000 fixed each year.

The company's $18 unit product cost is computed as follows:

Direct materials	$ 4
Direct labor	7
Variable manufacturing overhead	1
Fixed manufacturing overhead ($270,000 ÷ 45,000 units)	6
Absorption costing unit product cost	$18

Forty percent of fixed manufacturing overhead consists of wages and salaries; the remainder consists of depreciation charges on production equipment and buildings.

Production and cost data for the two years are:

Page 270

	Year 1	Year 2
Units produced	45,000	45,000
Units sold	40,000	50,000

Required:

1. Prepare a variable costing contribution format income statement for each year.
2. Reconcile the absorption costing and the variable costing net operating income figures for each year.

PROBLEM 6-20 Variable and Absorption Costing Unit Product Costs and Income Statements; Explanation of Difference in Net Operating Income [LO6-1, LO6-2, LO6-3]

High Country, Inc., produces and sells many recreational products. The company has just opened a new plant to produce a folding camp cot that will be marketed throughout the United States. The following cost and revenue data relate to May, the first month of the plant's operation:

Beginning inventory	0
Units produced	10,000
Units sold	8,000
Selling price per unit	$75
Selling and administrative expenses:	
Variable per unit	$6
Fixed (per month)	$200,000
Manufacturing costs:	
Direct materials cost per unit	$20
Direct labor cost per unit	$8
Variable manufacturing overhead cost per unit	$2
Fixed manufacturing overhead cost (per month)	$100,000

Management is anxious to see how profitable the new camp cot will be and has asked that an income statement be prepared for May.

Required:

1. Assume that the company uses absorption costing.
   a. Determine the unit product cost.
   b. Prepare an income statement for May.
2. Assume that the company uses variable costing.
   a. Determine the unit product cost.
   b. Prepare a contribution format income statement for May.
3. Explain the reason for any difference in the ending inventory balances under the two costing methods and the impact of this difference on reported net operating income.

PROBLEM 6-21 Segment Reporting and Decision-Making [LO6-4]

Vulcan Company's contribution format income statement for June is given below:

Vulcan Company Income Statement For the Month Ended June 30	
Sales	$750,000
Variable expenses	336,000
Contribution margin	414,000
Fixed expenses	378,000
Net operating income	$ 36,000

Management is disappointed with the company's performance and is wondering what can be done to improve profits. By examining sales and cost records, you have determined the following:

a. The company is divided into two sales territories—Northern and Southern. The Northern territory recorded $300,000 in sales and $156,000 in variable expenses during June; the remaining sales and variable expenses were recorded in the Southern territory. Fixed expenses of $120,000 and $108,000 are traceable to the Northern and Southern territories, respectively. The rest of the fixed expenses are common to the two territories.

b.

The company is the exclusive distributor for two products—Paks and Tibs. Sales of Paks and Tibs totaled $50,000 and $250,000, respectively, in the Northern territory during June. Variable expenses are 22% of the selling price for Paks and 58% for Tibs. Cost records show that $30,000 of the Northern territory's fixed expenses are traceable to Paks and $40,000 to Tibs, with the remainder common to the two products.

Page 271

Required:

1. Prepare contribution format segmented income statements first showing the total company broken down between sales territories and then showing the Northern territory broken down by product line. In addition, for the company as a whole and for each segment, show each item on the segmented income statements as a percent of sales.
2. Look at the statement you have prepared showing the total company segmented by sales territory. What insights revealed by this statement should be brought to the attention of management?
3. Look at the statement you have prepared showing the Northern territory segmented by product lines. What insights revealed by this statement should be brought to the attention of management?

PROBLEM 6-22 Prepare and Reconcile Variable Costing Statements [LO6-1, LO6-2, LO6-3]

Denton Company manufactures and sells a single product. Cost data for the product are given below:

Variable costs per unit:	
Direct materials	$ 7
Direct labor	10
Variable manufacturing overhead	5
Variable selling and administrative	3
Total variable cost per unit	$25
Fixed costs per month:	
Fixed manufacturing overhead	$315,000
Fixed selling and administrative	245,000
Total fixed cost per month	$560,000

The product sells for $60 per unit. Production and sales data for July and August, the first two months of operations, follow:

	Units Produced	Units Sold
July	17,500	15,000
August	17,500	20,000

The company's Accounting Department has prepared absorption costing income statements for July and August as presented below:

	July	August
Sales	$900,000	$1,200,000
Cost of goods sold	600,000	800,000
Gross margin	300,000	400,000
Selling and administrative expenses	290,000	305,000
Net operating income	$ 10,000	$ 95,000

Required:

1. Determine the unit product cost under:
   a. Absorption costing.
   b. Variable costing.
2. Prepare contribution format variable costing income statements for July and August.
3. Reconcile the variable costing and absorption costing net operating income figures.
4. The company's Accounting Department has determined the company's break-even point to be 16,000 units per month, computed as follows:

$$\frac{\text{Fixed cost per month}}{\text{Unit contribution margin}} = \frac{\$560{,}000}{\$35 \text{ per unit}} = 16{,}000 \text{ units}$$

"I'm confused," said the president. "The accounting people say that our break-even point is 16,000 units per month, but we sold only 15,000 units in July, and the income statement they prepared shows a $10,000 profit for that month. Either the income statement is wrong or the break-even point is wrong." Prepare a brief memo for the president, explaining what happened on the July absorption costing income statement.

PROBLEM 6-23 Absorption and Variable Costing; Production Constant, Sales Fluctuate [LO6-1, LO6-2, LO6-3]

Tami Tyler opened Tami's Creations, Inc., a small manufacturing company, at the beginning of the year. Getting the company through its first quarter of operations placed a considerable strain on Ms. Tyler's personal finances. The following income statement for the first quarter was prepared by a friend who has just completed a course in managerial accounting at State University.

Tami's Creations, Inc.
Income Statement
For the Quarter Ended March 31

Sales (28,000 units)		$1,120,000
Variable expenses:		
Variable cost of goods sold	$462,000	
Variable selling and administrative	168,000	630,000
Contribution margin		490,000
Fixed expenses:		
Fixed manufacturing overhead	300,000	
Fixed selling and administrative	200,000	500,000
Net operating loss		$ (10,000)

Ms. Tyler is discouraged over the loss shown for the quarter, particularly because she had planned to use the statement as support for a bank loan. Another friend, a CPA, insists that the company should be using absorption costing rather than variable costing and argues that if absorption costing had been used the company probably would have reported at least some profit for the quarter.

At this point, Ms. Tyler is manufacturing only one product, a swimsuit. Production and cost data relating to the swimsuit for the first quarter follow:

Units produced	30,000
Units sold	28,000
Variable costs per unit:	
Direct materials	$3.50
Direct labor	$12.00
Variable manufacturing overhead	$1.00
Variable selling and administrative	$6.00

Required:

1. Complete the following:

a. Compute the unit product cost under absorption costing.
b. Redo the company's income statement for the quarter using absorption costing.
c. Reconcile the variable and absorption costing net operating income (loss) figures.

2. Was the CPA correct in suggesting that the company really earned a "profit" for the quarter? Explain.
3. During the second quarter of operations, the company again produced 30,000 units but sold 32,000 units. (Assume no change in total fixed costs.)
    a. Prepare a contribution format income statement for the quarter using variable costing.
    b. Prepare an income statement for the quarter using absorption costing.
    c. Reconcile the variable costing and absorption costing net operating incomes.

PROBLEM 6-24 Companywide and Segment Break-Even Analysis; Decision Making [LO6-4, LO6-5]


Toxaway Company is a merchandiser that segments its business into two divisions—Commercial and Residential. The company's accounting intern was asked to prepare segmented income statements that the company's divisional managers could use to calculate their break-even points and

make decisions. She took the prior month's companywide income statement and prepared the absorption format segmented income statement shown below:

Page 273

	Total Company	Commercial	Residential
Sales	$750,000	$250,000	$500,000
Cost of goods sold	500,000	140,000	360,000
Gross margin	250,000	110,000	140,000
Selling and administrative expenses	240,000	104,000	136,000
Net operating income	$ 10,000	$ 6,000	$ 4,000

In preparing these statements, the intern determined that Toxaway's only variable selling and administrative expense is a 10% sales commission on all sales. The company's total fixed expenses include $72,000 of common fixed expenses that would continue to be incurred even if the Commercial or Residential segments are discontinued, $38,000 of fixed expenses that would be avoided if the Residential segment is dropped, and $55,000 of fixed expenses that would be avoided if the Commericial segment is dropped.

Required:

1. Do you agree with the intern's decision to use an absorption format for her segmented income statement? Why?
2. Based on the intern's segmented income statement, can you determine how she allocated the company's common fixed expenses to the Commercial and Residential segments? Do you agree with her decision to allocate the common fixed expenses to the Commercial and Residential segments?
3. Redo the intern's segmented income statement using the contribution format.
4. Compute the companywide break-even point in dollar sales.
5. Compute the break-even point in dollar sales for the Commercial Division and for the Residential Division.
6. Assume the company decided to pay its sales representatives in the Commercial and Residential Divisions a total monthly salary of $15,000 and $30,000, respectively, and to lower its companywide sales commission percentage from 10% to 5%. Calculate the new break-even point in dollar sales for the Commercial Division and the Residential Division.

PROBLEM 6-25 Prepare and Interpret Income Statements; Changes in Both Sales and Production; Lean Production [LO6-1, LO6-2, LO6-3]

Starfax, Inc., manufactures a small part that is widely used in various electronic products such as home computers. Operating results for the first three years of activity were as follows (absorption costing basis):

	Year 1	Year 2	Year 3
Sales	$800,000	$640,000	$800,000
Cost of goods sold	580,000	400,000	620,000
Gross margin	220,000	240,000	180,000
Selling and administrative expenses	190,000	180,000	190,000
Net operating income (loss)	$ 30,000	$ 60,000	$ (10,000)

In the latter part of Year 2, a competitor went out of business and in the process dumped a large number of units on the market. As a result, Starfax's sales dropped by 20% during Year 2 even though production increased during the year. Management had expected sales to remain constant at 50,000 units; the increased production was designed to provide the company with a buffer of protection against unexpected spurts in demand. By the start of Year 3, management could see that inventory was excessive and that spurts in demand were unlikely. To reduce the excessive inventories, Starfax cut back production during Year 3, as shown below:

	Year 1	Year 2	Year 3
Production in units	50,000	60,000	40,000
Sales in units	50,000	40,000	50,000

Additional information about the company follows:

a. The company's plant is highly automated. Variable manufacturing expenses (direct materials, direct labor, and variable manufacturing overhead) total only $2 per unit, and fixed manufacturing overhead expenses total $480,000 per year.
b. Fixed manufacturing overhead costs are applied to units of product on the basis of each year's production. That is, a new fixed manufacturing overhead rate is computed each year.
c. Variable selling and administrative expenses were $1 per unit sold in each year. Fixed selling and administrative expenses totaled $140,000 per year.
d. The company uses a FIFO inventory flow assumption.

Starfax's management can't understand why profits doubled during Year 2 when sales dropped by 20% and why a loss was incurred during Year 3 when sales recovered to previous levels.

Required:

1. Prepare a contribution format variable costing income statement for each year.
2. Refer to the absorption costing income statements above.
    a. Compute the unit product cost in each year under absorption costing. (Show how much of this cost is variable and how much is fixed.)
    b. Reconcile the variable costing and absorption costing net operating income figures for each year.
3. Refer again to the absorption costing income statements. Explain why net operating income was higher in Year 2 than it was in Year 1 under the absorption approach, in light of the fact that fewer units were sold in Year 2 than in Year 1.
4. Refer again to the absorption costing income statements. Explain why the company suffered a loss in Year 3 but reported a profit in Year 1 although the same number of units was sold in each year.
5.
    a. Explain how operations would have differed in Year 2 and Year 3 if the company had been using Lean Production, with the result that ending inventory was zero.
    b. If Lean Production had been used during Year 2 and Year 3 and the predetermined overhead rate is based on 50,000 units per year, what would the company's net operating income (or loss) have been in each year under absorption costing? Explain the reason for any differences between these income figures and the figures reported by the company in the statements above.

PROBLEM 6-26 Restructuring a Segmented Income Statement [LO6-4]


Losses have been incurred at Millard Corporation for some time. In an effort to isolate the problem and improve the company's performance, management has requested that the monthly income statement be segmented by sales region. The company's first effort at preparing a segmented statement is given below. This statement is for May, the most recent month of activity.

	Sales Region		
	West	Central	East
Sales	$450,000	$800,000	$ 750,000
Regional expenses (traceable):			
Cost of goods sold	162,900	280,000	376,500
Advertising	108,000	200,000	210,000
Salaries	90,000	88,000	135,000
Utilities	13,500	12,000	15,000
Depreciation	27,000	28,000	30,000
Shipping expense	17,100	32,000	28,500
Total regional expenses	418,500	640,000	795,000
Regional income (loss) before corporate expenses	31,500	160,000	(45,000)
Corporate expenses:			
Advertising (general)	18,000	32,000	30,000
General administrative expense	50,000	50,000	50,000
Total corporate expenses	68,000	82,000	80,000
Net operating income (loss)	$ (36,500)	$ 78,000	$(125,000)

Cost of goods sold and shipping expense are both variable; other costs are all fixed.

Millard Corporation is a wholesale distributor of office products. It purchases office products from manufacturers and distributes them in the three regions given above. The three regions are about the same size, and each has its own manager and sales staff. The products that the company distributes vary widely in profitability.

Required:

1. List any disadvantages or weaknesses that you see to the statement format illustrated on the previous page.
2. Explain the basis that is apparently being used to allocate the corporate expenses to the regions. Do you agree with these allocations? Explain.
3. Prepare a new contribution format segmented income statement for May. Show a Total column as well as data for each region. In addition, for the company as a whole and for each sales region, show each item on the segmented income statement as a percent of sales.
4. Analyze the statement that you prepared in part (3) above. What points that might help to improve the company's performance would you bring to management's attention?

PROBLEM 6-27 Incentives Created by Absorption Costing; Ethics and the Manager [LO6-2]


Carlos Cavalas, the manager of Echo Products' Brazilian Division, is trying to set the production schedule for the last quarter of the year. The Brazilian Division had planned to sell 3,600 units during the year, but by September 30 only the following activity had been reported:

	Units
Inventory, January 1	0
Production	2,400
Sales	2,000
Inventory, September 30	400

The division can rent warehouse space to store up to 1,000 units. The minimum inventory level that the division should carry is 50 units. Mr. Cavalas is aware that production must be at least 200 units per quarter in order to retain a nucleus of key employees. Maximum production capacity is 1,500 units per quarter.

Demand has been soft, and the sales forecast for the last quarter is only 600 units. Due to the nature of the division's operations, fixed manufacturing overhead is a major element of product cost.

Required:

1. Assume that the division is using variable costing. How many units should be scheduled for production during the last quarter of the year? (The basic formula for computing the required production for a period in a company is: Expected sales + Desired ending inventory − Beginning inventory = Required production.) Show computations and explain your answer. Will the number of units scheduled for production affect the division's reported income or loss for the year? Explain.
2. Assume that the division is using absorption costing and that the divisional manager is given an annual bonus based on divisional operating income. If Mr. Cavalas wants to maximize his division's

operating income for the year, how many units should be scheduled for production during the last quarter? [See the formula in (1) above.] Explain.

3. Identify the ethical issues involved in the decision Mr. Cavalas must make about the level of production for the last quarter of the year.

PROBLEM 6-28 Basic Segment Reporting; Activity-Based Cost Assignment [LO6-4]

Diversified Products, Inc., has recently acquired a small publishing company that offers three books for sale—a cookbook, a travel guide, and a handy speller. Each book sells for $10. The publishing company's most recent monthly income statement is given on the next page:

	Total Company	Product Line		
		Cookbook	Travel Guide	Handy Speller
Sales	$300,000	$90,000	$150,000	$60,000
Expenses:				
Printing costs	102,000	27,000	63,000	12,000
Advertising	36,000	13,500	19,500	3,000
General sales	18,000	5,400	9,000	3,600
Salaries	33,000	18,000	9,000	6,000
Equipment depreciation	9,000	3,000	3,000	3,000
Sales commissions	30,000	9,000	15,000	6,000
General administration	42,000	14,000	14,000	14,000
Warehouse rent	12,000	3,600	6,000	2,400
Depreciation—office facilities	3,000	1,000	1,000	1,000
Total expenses	285,000	94,500	139,500	51,000
Net operating income (loss)	$ 15,000	$ (4,500)	$ 10,500	$ 9,000

The following additional information is available about the company:

a. Only printing costs and sales commissions are variable; all other costs are fixed. The printing costs (which include materials, labor, and variable overhead) are traceable to the three product lines as shown in the statement above. Sales commissions are 10% of sales for any product.
b. The same equipment is used to produce all three books, so the equipment depreciation cost has been allocated equally among the three product lines. An analysis of the company's activities indicates that the equipment is used 30% of the time to produce cookbooks, 50% of the time to produce travel guides, and 20% of the time to produce handy spellers.
c. The warehouse is used to store finished units of product, so the rental cost has been allocated to the product lines on the basis of sales dollars. The warehouse rental cost is $3 per square foot per year. The warehouse contains 48,000 square feet of space, of which 7,200 square feet is used by the cookbook line, 24,000 square feet by the travel guide line, and 16,800 square feet by the handy speller line.
d. The general sales cost above includes the salary of the sales manager and other sales costs not traceable to any specific product line. This cost has been allocated to the product lines on the basis of sales dollars.
e. The general administration cost and depreciation of office facilities both relate to administration of the company as a whole. These costs have been allocated equally to the three product lines.
f. All other costs are traceable to the three product lines in the amounts shown on the statement above.

The management of Diversified Products, Inc., is anxious to improve the publishing company's 5% return on sales.

Required:

1. Prepare a new contribution format segmented income statement for the month. Adjust allocations of equipment depreciation and of warehouse rent as indicated by the additional information provided.

2. After seeing the income statement in the main body of the problem, management has decided to eliminate the cookbook because it is not returning a profit, and to focus all available resources on promoting the travel guide.
    a. Based on the statement you have prepared, do you agree with the decision to eliminate the cookbook? Explain.
    b. Based on the statement you have prepared, do you agree with the decision to focus all available resources on promoting the travel guide? Assume that an ample market is available for all three product lines. (*Hint:* Compute the contribution margin ratio for each product.)

Cases

All applicable cases are available with McGraw-Hill's *Connect*® *Accounting.*

CASE 6-29 Variable and Absorption Costing Unit Product Costs and Income Statements [LO6-1, LO6-2]

O'Brien Company manufactures and sells one product. The following information pertains to each of the company's first three years of operations:

Variable costs per unit:	
Manufacturing:	
Direct materials	$32
Direct labor	$20
Variable manufacturing overhead	$4
Variable selling and administrative	$3
Fixed costs per year:	
Fixed manufacturing overhead	$660,000
Fixed selling and administrative expenses	$120,000

During its first year of operations, O'Brien produced 100,000 units and sold 80,000 units. During its second year of operations, it produced 75,000 units and sold 90,000 units. In its third year, O'Brien produced 80,000 units and sold 75,000 units. The selling price of the company's product is $75 per unit.

Required:

1. Assume the company uses variable costing and a FIFO inventory flow assumption (FIFO means first-in first-out. In other words, it assumes that the oldest units in inventory are sold first):
   a. Compute the unit product cost for Year 1, Year 2, and Year 3.
   b. Prepare an income statement for Year 1, Year 2, and Year 3.
2. Assume the company uses variable costing and a LIFO inventory flow assumption (LIFO means last-in first-out. In other words, it assumes that the newest units in inventory are sold first):
   a. Compute the unit product cost for Year 1, Year 2, and Year 3.
   b. Prepare an income statement for Year 1, Year 2, and Year 3.
3. Assume the company uses absorption costing and a FIFO inventory flow assumption (FIFO means first-in first-out. In other words, it assumes that the oldest units in inventory are sold first):
   a. Compute the unit product cost for Year 1, Year 2, and Year 3.
   b. Prepare an income statement for Year 1, Year 2, and Year 3.
4. Assume the company uses absorption costing and a LIFO inventory flow assumption (LIFO means last-in first-out. In other words, it assumes that the newest units in inventory are sold first):
   a. Compute the unit product cost for Year 1, Year 2, and Year 3.
   b. Prepare an income statement for Year 1, Year 2, and Year 3.

CASE 6-30 Service Organization; Segment Reporting [LO6-4]


Music Teachers, Inc., is an educational association for music teachers that has 20,000 members. The association operates from a central headquarters but has local membership chapters throughout the United States. Monthly meetings are held by the local chapters to discuss recent developments on topics of interest to music teachers. The association's journal, Teachers' Forum, is issued monthly with features about recent developments in the field. The association publishes books and reports and also sponsors professional courses that qualify for continuing

professional education credit. The association's statement of revenues and expenses for the current year is presented below.

Page 278

Music Teachers, Inc. Statement of Revenues and Expenses For the Year Ended November 30	
Revenues	$3,275,000
Expenses:	
Salaries	920,000
Personnel costs	230,000
Occupancy costs	280,000
Reimbursement of member costs to local chapters	600,000
Other membership services	500,000
Printing and paper	320,000
Postage and shipping	176,000
Instructors' fees	80,000
General and administrative	38,000
Total expenses	3,144,000
Excess of revenues over expenses	$ 131,000

The board of directors of Music Teachers, Inc., has requested that a segmented income statement be prepared showing the contribution of each segment to the association. The association has four segments: Membership Division, Magazine Subscriptions Division, Books and Reports Division, and Continuing Education Division. Mike Doyle has been assigned responsibility for preparing the segmented income statement, and he has gathered the following data prior to its preparation.

a. Membership dues are $100 per year, of which $20 is considered to cover a one-year subscription to the association's journal. Other benefits include membership in the association and chapter affiliation. The portion of the dues covering the magazine subscription ($20) should be assigned to the Magazine Subscription Division.
b. One-year subscriptions to Teachers' Forum were sold to nonmembers and libraries at $30 per subscription. A total of 2,500 of these subscriptions were sold last year. In addition to subscriptions, the magazine generated $100,000 in advertising revenues. The costs per magazine subscription were $7 for printing and paper and $4 for postage and shipping.
c. A total of 28,000 technical reports and professional texts were sold by the Books and Reports Division at an average unit selling price of $25. Average costs per publication were $4 for printing and paper and $2 for postage and shipping.
d. The association offers a variety of continuing education courses to both members and nonmembers. The one-day courses had a tuition cost of $75 each and were attended by 2,400 students. A total of 1,760 students took two-day courses at a tuition cost of $125 for each student. Outside instructors were paid to teach some courses.
e. Salary costs and space occupied by division follow:

	Salaries	Space Occupied (square feet)
Membership	$210,000	2,000
Magazine Subscriptions	150,000	2,000
Books and Reports	300,000	3,000
Continuing Education	180,000	2,000
Corporate staff	80,000	1,000
Total	$920,000	10,000

Personnel costs are 25% of salaries in the separate divisions as well as for the corporate staff. The $280,000 in occupancy costs includes $50,000 in rental cost for a warehouse used by the Books and Reports Division for storage purposes.

f. Printing and paper costs other than for magazine subscriptions and for books and reports relate to the Continuing Education Division.

Page 279

g. General and administrative expenses include costs relating to overall administration of the association as a whole. The company's corporate staff does some mailing of materials for general administrative purposes.

The expenses that can be traced or assigned to the corporate staff, as well as any other expenses that are not traceable to the segments, will be treated as common costs. It is not necessary to distinguish between variable and fixed costs.

Required:

1. Prepare a contribution format segmented income statement for Music Teachers, Inc. This statement should show the segment margin for each division as well as results for the association as a whole.
2. Give arguments for and against allocating all costs of the association to the four divisions.

(CMA, adapted)

Appendix 6A: Super-Variable Costing

LO6-6

Prepare an income statement using super-variable costing and reconcile this approach with variable costing.

In the discussion of variable costing in this chapter we have assumed that direct labor and a portion of manufacturing overhead are variable costs that should be attached to products. However, these assumptions about cost behavior may not be true. For example, it may be easier and more accurate to assume that *all* manufacturing overhead costs are fixed costs because the variable portion of these costs is insignificant or too difficult to estimate. Furthermore, many companies' labor costs (including direct and indirect labor) are more fixed than variable due to labor regulations, labor contracts, or management policy. In countries such as France, Germany, Spain, and Japan, management often has little flexibility in adjusting the labor force to changes in business activity. Even in countries such as the United States and the United Kingdom, where management usually has greater latitude to adjust the size of its labor force, many managers choose to view labor as a fixed cost. They make this choice because the cost savings from terminating or laying off employees during a short-term business downturn may be swamped by the negative effects on employee morale and by the costs of later finding and training suitable replacements. Moreover, treating employees as variable costs subtly fosters the attitude that employees are expendable and replaceable like materials rather than unique, difficult-to-replace assets.

S*uper-variable costing* is a variation on variable costing in which direct labor and manufacturing overhead costs are considered to be fixed. **Super-variable costing** classifies all direct labor and manufacturing overhead costs as fixed period costs and *only direct materials as a variable product*

cost. To simplify, in this appendix we also assume that selling and administrative expenses are entirely fixed.

Super-Variable Costing and Variable Costing—An Example

To illustrate the difference between treating direct labor as a fixed cost (as in super-variable costing) and treating direct labor as a variable cost (as in variable costing), we will use a modified version of the Weber Light Aircraft example from the main body of the chapter. Data concerning the company's operations appear below:

	Per Aircraft	Per Month
Selling price	$100,000	
Direct materials	$19,000	
Direct labor		$20,000
Fixed manufacturing overhead		$74,000
Fixed selling and administrative expense		$40,000

	January	February	March
Beginning inventory	0	0	1
Units produced	2	2	2
Units sold	2	1	3
Ending inventory	0	1	0

The key thing to notice here is that direct labor is a fixed cost—$20,000 per month. Also, notice that Weber Light Aircraft has no variable manufacturing overhead costs and no variable selling and administrative expenses. For the months of January, February, and March, the company's selling price per aircraft, variable cost per aircraft, monthly production in units, and total monthly fixed expenses never change. The only thing that changes in this example is the number of units sold (January = 2 units sold; February = 1 unit sold; March = 3 units sold).

We will first construct the company's super-variable costing income statements for January, February, and March. Then we will show how the company's net operating income would be determined for the same months using variable costing if it were incorrectly assumed that direct labor is a variable cost. As you'll see, both income statements rely on the contribution format.

Super-Variable Costing Income Statements

To prepare the company's super-variable costing income statements for each month we follow four steps. First, we compute sales by multiplying the number of units sold by the selling price per unit, which in this example is $100,000 per unit. Second, we compute the variable cost of goods sold by multiplying the number of units sold by the unit product cost, which in this example is the direct materials cost of $19,000 per unit. Third, we compute the contribution margin by subtracting the variable cost of goods sold from sales. Fourth, we compute net operating income by subtracting all fixed expenses from the contribution margin.

Using these four steps, Weber's super-variable costing income statements for each month would appear as shown in Exhibit 6A-1. Notice that the only variable expense is variable cost of goods sold, which is the $19,000 of direct materials per unit sold. For example, in March, the unit product cost of $19,000 is multiplied by three units sold to obtain the variable cost of goods sold of $57,000. The total monthly fixed manufacturing expenses of $94,000 include $20,000 of direct labor and $74,000 of fixed manufacturing overhead.

EXHIBIT 6A-1
Super-Variable Costing Income Statements

	January	February	March
Sales (@ $100,000 per unit)	$200,000	$100,000	$300,000
Variable cost of goods sold (@ $19,000 per unit)	38,000	19,000	57,000
Contribution margin	162,000	81,000	243,000
Fixed expenses:			
Fixed manufacturing expenses	94,000	94,000	94,000
Fixed selling and administrative expenses	40,000	40,000	40,000
Total fixed expenses	134,000	134,000	134,000
Net operating income (loss)	$ 28,000	$ (53,000)	$109,000

Variable Costing Income Statements

The variable costing income statements in this example differ from the super-variable costing income statements in one important respect—we will assume that direct labor is incorrectly classified as a variable cost and is included in unit product costs. Because the monthly direct labor cost is $20,000 and two aircraft are produced each month, if direct labor costs are included in unit product costs, then Weber Light Aircraft will assign $10,000 of direct labor cost to each aircraft that it produces. Thus, the company's unit product costs under variable costing would be computed as follows:

EXHIBIT 6A-2
Variable Costing Income Statements

	January	February	March
Sales (@ $100,000 per unit)	$200,000	$100,000	$300,000
Variable cost of goods sold (@ $29,000 per unit)	58,000	29,000	87,000
Contribution margin	142,000	71,000	213,000
Fixed expenses:			
Fixed manufacturing overhead	74,000	74,000	74,000
Fixed selling and administrative expenses	40,000	40,000	40,000
Total fixed expenses	114,000	114,000	114,000
Net operating income (loss)	$ 28,000	$ (43,000)	$ 99,000

	January	February	March
Direct materials	$19,000	$19,000	$19,000
Direct labor	10,000	10,000	10,000
Unit product cost	$29,000	$29,000	$29,000

Given these unit product cost figures, the company's variable costing income statements would be computed as shown in Exhibit 6A-2. For example, in March, the unit product cost of $29,000 is multiplied by three units sold to obtain the variable cost of goods sold of $87,000. The total fixed manufacturing overhead of $74,000 and total fixed selling and administrative expenses of $40,000 are both recorded as period expenses.

Reconciliation of Super-Variable Costing and Variable Costing Income

The super-variable costing and variable costing net operating incomes are both $28,000 in January. However, in February, the super-variable costing income is $10,000 lower than the variable costing income and the opposite holds true in March. In other words, the super-variable costing income in March is $10,000 higher than the variable costing income.

Why do these two costing methods produce different net operating incomes? The answer can be found in the accounting for direct labor costs. Super-variable costing treats direct labor as a fixed period expense whereas variable costing treats direct labor as a variable product cost. In other words, super-variable costing records the entire direct labor cost of $20,000 as an expense on each month's income statement. Conversely, variable costing assigns $10,000 of direct labor cost to each unit produced. The $10,000 assigned to each unit produced remains in inventory on the balance sheet until the unit is sold—at which point the $10,000 assigned to it is transferred to variable cost of goods sold on the income statement. Given this background, the super-variable costing and variable costing incomes for each month can be reconciled as follows:

	January	February	March
Direct labor cost in ending inventory (@ $10,000 per unit)	$ 0	$10,000	$ 0
− Direct labor cost in beginning inventory (@ $10,000 per unit)	0	0	10,000
= Direct labor cost deferred in (released from) inventory	$ 0	$10,000	$(10,000)

	January	February	March
Super-variable costing net operating income (loss)	$28,000	$(53,000)	$109,000
Direct labor deferred in (released from) inventory	0	10,000	(10,000)
Variable costing net operating income (loss)	$28,000	$(43,000)	$ 99,000

In January, both costing methods report the same net operating income ($28,000). This occurs because each method expenses $20,000 of direct labor in the income statement. In February, super-variable costing income is $10,000 less than variable costing income. This difference arises because super-variable costing expenses $20,000 of direct labor in the income statement, whereas variable costing expenses only $10,000 of direct labor in the income statement ($10,000 per unit × 1 unit sold) and defers $10,000 of direct labor on the balance sheet ($10,000 per unit × 1 unit produced but not sold). In March, super-variable costing income is $10,000 greater than variable costing income. This difference arises because super-variable costing expenses $20,000 of direct labor on the income statement, whereas variable costing expenses $30,000 of direct labor on the income statement ($10,000 per unit × 3 unit sold). Notice that one of the units sold in March was actually produced in February. Under variable costing, the $10,000 of direct labor attached to the unit produced in February is released from inventory and included in variable cost of goods sold for March.

In summary, the key issue considered in this appendix is how a company treats direct labor costs. If a company treats direct labor as a variable cost, the cost system may encourage managers to treat labor costs as an expense to be minimized when sales decline and this may result in reduced morale and eventual problems when business picks up. Second, in practice management may have little ability to adjust the direct labor force even if they wanted to, resulting in a situation in which direct labor costs are in fact fixed. In either case, treating direct labor costs as variable can lead to bad decisions. The supervariable costing approach overcomes this problem by treating labor costs as fixed costs.

Glossary (Appendix 6A)

Super-variable costing A costing method that classifies all direct labor and manufacturing overhead costs as fixed period costs and *only direct materials as a variable product cost.* (p. 279)

Appendix 6A Exercises and Problems

All applicable exercises and problems are available with McGraw-Hill's *Connect*® *Accounting.*

EXERCISE 6A-1 Super-Variable Costing Income Statement [LO6-6]

Zola Company manufactures and sells one product. The following information pertains to the company's first year of operations:

Variable cost per unit:	
Direct materials	$18
Fixed costs per year:	
Direct labor	$200,000
Fixed manufacturing overhead	$250,000
Fixed selling and administrative expenses	$80,000

The company does not incur any variable manufacturing overhead costs or variable selling and administrative expenses. During its first year of operations, Zola produced 25,000 units and sold 20,000 units. The selling price of the company's product is $50 per unit.

Required:

1. Assume the company uses super-variable costing:
    a. Compute the unit product cost for the year.
    b. Prepare an income statement for the year.

EXERCISE 6A-2 Super-Variable Costing and Variable Costing Unit Product Costs and Income Statements [LO6-2, LO6-6]

Lyons Company manufactures and sells one product. The following information pertains to the company's first year of operations:

Variable cost per unit:	
Direct materials	$13
Fixed costs per year:	
Direct labor	$750,000
Fixed manufacturing overhead	$420,000
Fixed selling and administrative expenses	$110,000

The company does not incur any variable manufacturing overhead costs or variable selling and administrative expenses. During its first year of operations, Lyons produced 60,000 units and sold 52,000 units. The selling price of the company's product is $40 per unit.

Required:

1. Assume the company uses super-variable costing:
    a. Compute the unit product cost for the year.
    b. Prepare an income statement for the year.
2. Assume the company uses a variable costing system that assigns $12.50 of direct labor cost to each unit produced:
    a. Compute the unit product cost for the year.
    b. Prepare an income statement for the year.
3. Prepare a reconciliation that explains the difference between the super-variable costing and variable costing net operating incomes.

EXERCISE 6A-3 Super-Variable Costing and Variable Costing Unit Product Costs and Income Statements [LO6-2, LO6-6]

Kelly Company manufactures and sells one product. The following information pertains to each of the company's first two years of operations:

Variable cost per unit:	
Direct materials	$12
Fixed costs per year:	
Direct labor	$500,000
Fixed manufacturing overhead	$450,000
Fixed selling and administrative expenses	$180,000

The company does not incur any variable manufacturing overhead costs or variable selling and administrative expenses. During its first year of operations, Kelly produced 50,000 units and sold 40,000 units. During its second year of operations, it produced 50,000 units and sold 60,000 units. The selling price of the company's product is $50 per unit.

Required:

1. Assume the company uses super-variable costing:
    a. Compute the unit product cost for Year 1 and Year 2.
    b. Prepare an income statement for Year 1 and Year 2.

2. Assume the company uses a variable costing system that assigns $10 of direct labor cost to each unit produced:
   a. Compute the unit product cost for Year 1 and Year 2.
   b. Prepare an income statement for Year 1 and Year 2.
3. Prepare a reconciliation that explains the difference between the super-variable costing and variable costing net operating incomes in Years 1 and 2.

PROBLEM 6A-4 Super-Variable Costing and Variable Costing Unit Product Costs and Income Statements [LO6-2, LO6-6]

Ogilvy Company manufactures and sells one product. The following information pertains to each of the company's first three years of operations:

Variable cost per unit:	
Direct materials	$16
Fixed costs per year:	
Direct labor	$540,000
Fixed manufacturing overhead	$822,000
Fixed selling and administrative expenses	$370,000

The company does not incur any variable manufacturing overhead costs or variable selling and administrative expenses. During its first year of operations, Ogilvy produced 60,000 units and sold 60,000 units. During its second year of operations, it produced 60,000 units and sold 55,000 units. In its third year, Ogilvy produced 60,000 units and sold 65,000 units. The selling price of the company's product is $45 per unit.

Required:

1. Assume the company uses super-variable costing:
   a. Compute the unit product cost for Year 1, Year 2, and Year 3.
   b. Prepare an income statement for Year 1, Year 2, and Year 3.
2. Assume the company uses a variable costing system that assigns $9 of direct labor cost to each unit produced:
   a. Compute the unit product cost for Year 1, Year 2, and Year 3.
   b. Prepare an income statement for Year 1, Year 2, and Year 3.
3. Prepare a reconciliation that explains the difference between the super-variable costing and variable costing net operating incomes in Years 1, 2, and 3.

PROBLEM 6A-5 Super-Variable Costing, Variable Costing, and Absorption Costing Income Statements [LO6-2, LO6-6]

Bracey Company manufactures and sells one product. The following information pertains to the company's first year of operations:

Variable cost per unit:	
Direct materials	$19
Fixed costs per year:	
Direct labor	$250,000
Fixed manufacturing overhead	$300,000
Fixed selling and administrative expenses	$90,000

The company does not incur any variable manufacturing overhead costs or variable selling and administrative expenses. During its first year of operations, Bracey produced 20,000 units and sold 18,000 units. The selling price of the company's product is $55 per unit.

Required: