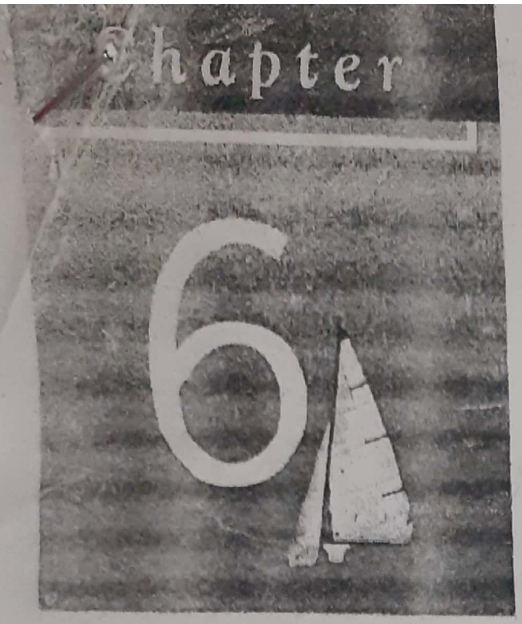
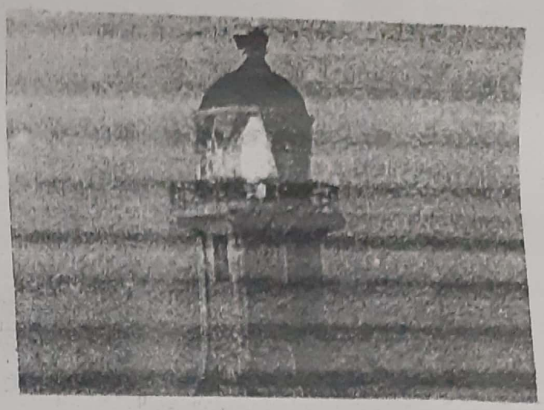




Learning Objectives

After studying Chapter 6, you should be able to:

LO1 *Explain how changes in activity affect contribution margin and net operating income.*

LO2 *Prepare and interpret a cost-volume-profit (CVP) graph.*

LO3 *Use the contribution margin ratio (CM ratio) to compute changes in contribution margin and net operating income resulting from changes in sales volume.*

LO4 Show the effects on contribution margin of changes in variable costs, fixed costs, selling price, and volume.

LO5 Compute the break-even point in unit sales and sales dollars.

LO6 Determine the level of sales needed to achieve a desired target profit.

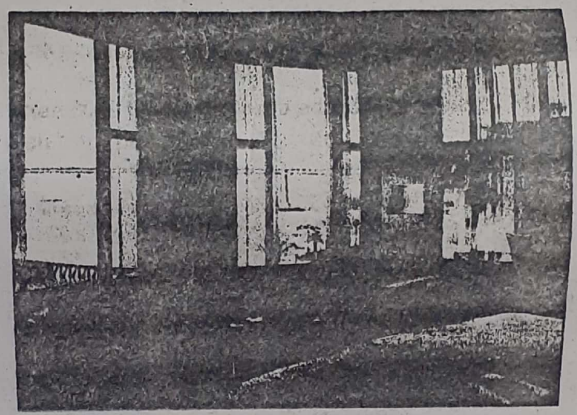
LO7 Compute the margin of safety and explain its significance.

LO8 Compute the degree of operating leverage at a particular level of sales and explain how it can be used to predict changes in net operating income.

LO9 Compute the break-even point for a multiproduct company and explain the effects of shifts in the sales mix on contribution margin and the break-even point.

Cost-Volume-Profit Relationships

What Happened to the Profit?



Chip Conley is CEO of Joie de Vivre Hospitality, a company that owns and operates 28 hospitality businesses in northern California. Conley summed up the company's experience after the dot.com crash and 9/11 as follows: *"In the history of American hotel markets, no hotel market has ever seen a drop in revenues as precipitous as the one in San Francisco and Silicon Valley in the last two years. On average, hotel revenues . . . dropped 40% to 45%. . . . We've been fortunate that our breakeven point is lower than our competition's. . . . But the problem is that the hotel business is a fixed-cost business. So in an environment where you have those precipitous drops and our costs are moderately fixed, our net incomes—well, they're not incomes anymore, they're losses."* ■

Source: Karen Dillon, "Shop Talk," *Inc* magazine, December 2002, pp. 111–114.

Cost-volume-profit (CVP) analysis is a powerful tool that helps managers understand the relationships among cost, volume, and profit. CVP analysis focuses on how profits are affected by the following five factors:

1. Selling prices.
2. Sales volume.
3. Unit variable costs.
4. Total fixed costs.
5. Mix of products sold.

Because CVP analysis helps managers understand how profits are affected by these key factors, it is a vital tool in many business decisions. These decisions include what products and services to offer, what prices to charge, what marketing strategy to use, and what cost structure to implement. To help understand the role of CVP analysis in business decisions, consider the case of Acoustic Concepts, Inc., a company founded by Prem Narayan.

MANAGERIAL ACCOUNTING IN ACTION
The Issue

Prem, who was a graduate student in engineering at the time, started Acoustic Concepts to market a radical new speaker he had designed for automobile sound systems. The speaker, called the Sonic Blaster, uses an advanced microprocessor and proprietary software to boost amplification to awesome levels. Prem contracted with a Taiwanese electronics manufacturer to produce the speaker. With seed money provided by his family, Prem placed an order with the manufacturer and ran advertisements in auto magazines.

The Sonic Blaster was an almost immediate success, and sales grew to the point that Prem moved the company's headquarters out of his apartment and into rented quarters in a nearby industrial park. He also hired a receptionist, an accountant, a sales manager, and a small sales staff to sell the speakers to retail stores. The accountant, Bob Luchinni, had worked for several small companies where he had acted as a business advisor as well as accountant and bookkeeper. The following discussion occurred soon after Bob was hired:

Prem: Bob, I've got a lot of questions about the company's finances that I hope you can help answer.

Bob: We're in great shape. The loan from your family will be paid off within a few months.

Prem: I know, but I am worried about the risks I've taken on by expanding operations. What would happen if a competitor entered the market and our sales slipped? How far could sales drop without putting us into the red? Another question I've been trying to resolve is how much our sales would have to increase to justify the big marketing campaign the sales staff is pushing for.

Bob: Marketing always wants more money for advertising.

Prem: And they are always pushing me to drop the selling price on the speaker. I agree with them that a lower price will boost our volume, but I'm not sure the increased volume will offset the loss in revenue from the lower price.

Bob: It sounds like these questions are all related in some way to the relationships among our selling prices, our costs, and our volume. I shouldn't have a problem coming up with some answers.

Prem: Can we meet again in a couple of days to see what you have come up with?

Bob: Sounds good. By then I'll have some preliminary answers for you as well as a model you can use for answering similar questions in the future.

The Basics of Cost-Volume-Profit (CVP) Analysis

Bob Luchinni's preparation for his forthcoming meeting with Prem begins where our study of cost behavior in the preceding chapter left off—with the contribution income statement. The contribution income statement emphasizes the behavior of costs and therefore is extremely helpful to managers in judging the impact on profits of changes in selling price,

cost, or volume. Bob will base his analysis on the following contribution income statement he prepared last month:

Acoustic Concepts, Inc.
Contribution Income Statement
For the Month of June

	Total	Per Unit
Sales (400 speakers)	$100,000	$250
Variable expenses	60,000	150
Contribution margin	40,000	$100
Fixed expenses	35,000	
Net operating income	$ 5,000	

Notice that sales, variable expenses, and contribution margin are expressed on a per unit basis as well as in total on this contribution income statement. The per unit figures will be very helpful to Bob in some of his calculations. Note that this contribution income statement has been prepared for management's use inside the company and would not ordinarily be made available to those outside the company.

Contribution Margin

LEARNING OBJECTIVE 1
Explain how changes in sales affect contribution margin and net operating income.

As explained in the previous chapter, contribution margin is the amount remaining from sales revenue after variable expenses have been deducted. Thus, it is the amount available to cover fixed expenses and then to provide profits for the period. Notice the sequence here—contribution margin is used *first* to cover the fixed expenses, and then whatever remains goes toward profits. If the contribution margin is not sufficient to cover the fixed expenses, then a loss occurs for the period. To illustrate with an extreme example, assume that Acoustic Concepts sells only one speaker during a particular month. The company's income statement would appear as follows:

Contribution Income Statement
Sales of 1 Speaker

	Total	Per Unit
Sales (1 speaker)	$ 250	$250
Variable expenses	150	150
Contribution margin	100	$100
Fixed expenses	35,000	
Net operating loss	$(34,900)	

For each additional speaker the company sells during the month, $100 more in contribution margin becomes available to help cover the fixed expenses. If a second speaker is sold, for example, then the total contribution margin will increase by $100 (to a total of $200) and the company's loss will decrease by $100, to $34,800:

Contribution Income Statement
Sales of 2 Speakers

	Total	Per Unit
Sales (2 speakers)	$ 500	$250
Variable expenses	300	150
Contribution margin	200	$100
Fixed expenses	35,000	
Net operating loss	$(34,800)	

If enough speakers can be sold to generate $35,000 in contribution margin, then all of the fixed expenses will be covered and the company will *break even* for the month—that is, it will show neither profit nor loss but just cover all of its costs. To reach the break-even point, the company will have to sell 350 speakers in a month, since each speaker sold yields $100 in contribution margin:

Contribution Income Statement
Sales of 350 Speakers

	Total	Per Unit
Sales (350 speakers)	$87,500	$250
Variable expenses	52,500	150
Contribution margin	35,000	$100
Fixed expenses	35,000	
Net operating income	$ 0	

Computation of the break-even point is discussed in detail later in the chapter; for the moment, note that the **break-even point** is the level of sales at which profit is zero.

Once the break-even point has been reached, net operating income will increase by the amount of the unit contribution margin for each additional unit sold. For example, if 351 speakers are sold in a month, then the net operating income for the month will be $100, since the company will have sold 1 speaker more than the number needed to break even:

Contribution Income Statement
Sales of 351 Speakers

	Total	Per Unit
Sales (351 speakers)	$87,750	$250
Variable expenses	52,650	150
Contribution margin	35,100	$100
Fixed expenses	35,000	
Net operating income	$ 100	

If 352 speakers are sold (2 speakers above the break-even point), the net operating income for the month will be $200. If 353 speakers are sold (3 speakers above the break-even point), the net operating income for the month will be $300, and so forth. To estimate the profit at any sales volume above the break-even point, simply multiply the number of units sold in excess of the break-even point by the unit contribution margin. The result represents the anticipated profits for the period. Or, to estimate the effect of a planned increase in sales on profits, simply multiply the increase in units sold by the unit contribution margin. The result will be the expected increase in profits. To illustrate, if Acoustic Concepts is currently selling 400 speakers per month and plans to increase sales to 425 speakers per month, the anticipated impact on profits can be computed as follows:

Increased number of speakers to be sold	25
Contribution margin per speaker	× $100
Increase in net operating income	$2,500

These calculations can be verified as follows:

	Sales Volume			
	400 Speakers	425 Speakers	Difference (25 Speakers)	Per Unit
Sales (@ $250 per speaker)	$100,000	$106,250	$6,250	$250
Variable expenses (@ $150 per speaker)	60,000	63,750	3,750	150
Contribution margin	40,000	42,500	2,500	$100
Fixed expenses	35,000	35,000	0	
Net operating income	$ 5,000	$ 7,500	$2,500	

To summarize, if sales are zero, the company's loss would equal its fixed expenses. Each unit that is sold reduces the loss by the amount of the unit contribution margin. Once the break-even point has been reached, each additional unit sold increases the company's profit by the amount of the unit contribution margin.

CVP Relationships in Graphic Form

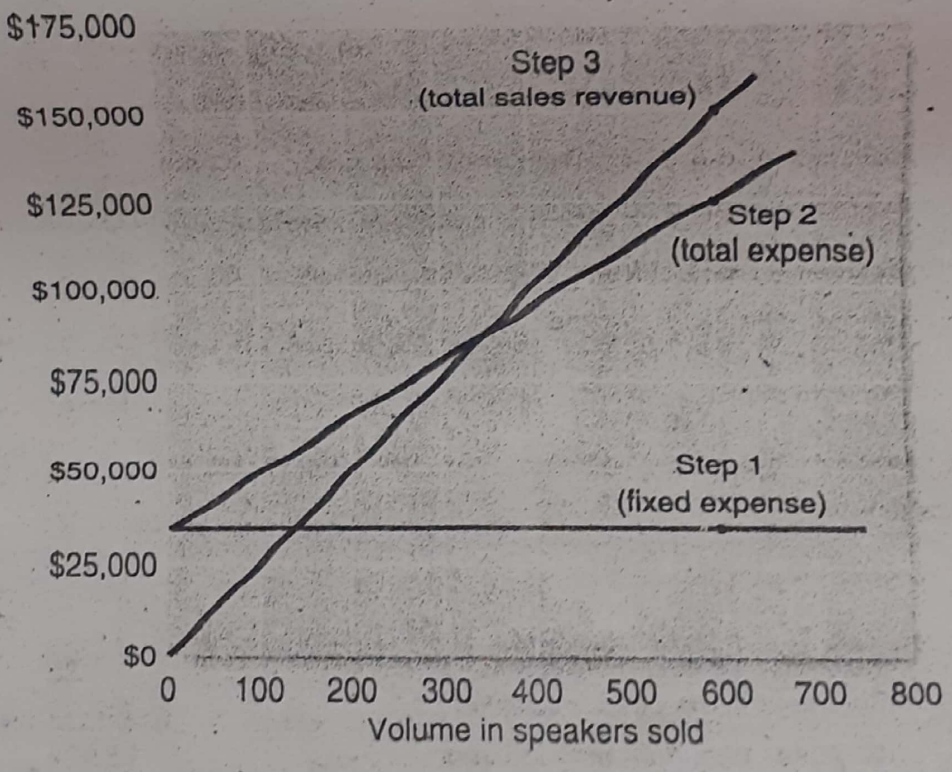
LEARNING OBJECTIVE 2
Prepare and interpret a cost-volume-profit (CVP) graph.

The relationships among revenue, cost, profit, and volume are illustrated on a **cost-volume-profit (CVP) graph.** A CVP graph highlights CVP relationships over wide ranges of activity. To help explain his analysis to Prem Narayan, Bob Luchinni decided to prepare a CVP graph for Acoustic Concepts.

Preparing the CVP Graph In a CVP graph (sometimes called a *break-even chart*), unit volume is represented on the horizontal (X) axis and dollars on the vertical (Y) axis. Preparing a CVP graph involves three steps as depicted in Exhibit 6–1:

1. Draw a line parallel to the volume axis to represent total fixed expense. For Acoustic Concepts, total fixed expenses are $35,000.

Exhibit 6–1
The CVP Graph



The contribution margin ratio is the ratio of the total contribution margin to total sales. This ratio can be used to quickly estimate what impact a change in total sales would have on net operating income. The ratio is also useful in break-even analysis.

The break-even point is the level of sales (in units or in dollars) at which the company just breaks even. The break-even point can be computed using several different techniques that are all based on the simple CVP model. With slight modifications, the same techniques can be used to compute the level of sales required to attain a target profit.

The margin of safety is the amount by which the company's current sales exceeds break-even sales.

The degree of operating leverage allows quick estimation of what impact a given percentage change in sales would have on the company's net operating income. The higher the degree of operating leverage, the greater is the impact on the company's profits. The degree of operating leverage is not constant—it depends on the company's current level of sales.

The profits of a multiproduct company are affected by its sales mix. Changes in the sales mix can affect the break-even point, margin of safety, and other critical factors.

Review Problem: CVP Relationships

Voltar Company manufactures and sells a specialized cordless telephone for high electromagnetic radiation environments. The company's contribution format income statement for the most recent year is given below:

	Total	Per Unit	Percent of Sales
Sales (20,000 units)	$1,200,000	$60	100%
Variable expenses	900,000	45	? %
Contribution margin	300,000	$15	? %
Fixed expenses	240,000		
Net operating income	$ 60,000		

Management is anxious to increase the company's profit and has asked for an analysis of a number of items.

Required:

1. Compute the company's CM ratio and variable expense ratio.
2. Compute the company's break-even point in both units and sales dollars. Use the equation method.
3. Assume that sales increase by $400,000 next year. If cost behavior patterns remain unchanged, by how much will the company's net operating income increase? Use the CM ratio to compute your answer.
4. Refer to the original data. Assume that next year management wants the company to earn a profit of at least $90,000. How many units will have to be sold to meet this target profit?
5. Refer to the original data. Compute the company's margin of safety in both dollar and percentage form.
6. *a.* Compute the company's degree of operating leverage at the present level of sales.
   b. Assume that through a more intense effort by the sales staff, the company's sales increase by 8% next year. By what percentage would you expect net operating income to increase? Use the degree of operating leverage to obtain your answer.
   c. Verify your answer to (*b*) by preparing a new contribution format income statement showing an 8% increase in sales.
7. In an effort to increase sales and profits, management is considering the use of a higher-quality speaker. The higher-quality speaker would increase variable costs by $3 per unit, but management could eliminate one quality inspector who is paid a salary of $30,000 per year. The sales manager estimates that the higher-quality speaker would increase annual sales by at least 20%.
   a. Assuming that changes are made as described above, prepare a projected contribution format income statement for next year. Show data on a total, per unit, and percentage basis.
   b. Compute the company's new break-even point in both units and dollars of sales. Use the contribution margin method.
   c. Would you recommend that the changes be made?

Solution to Review Problem

1.

$$\text{CM ratio} = \frac{\text{Unit contribution margin}}{\text{Selling price}} = \frac{\$15}{\$60} = 25\%$$

$$\text{Variable expense ratio} = \frac{\text{Variable expense}}{\text{Selling price}} = \frac{\$45}{\$60} = 75\%$$

2.

$$\text{Sales} = \text{Variable expenses} + \text{Fixed expenses} + \text{Profits}$$

$$\$60Q = \$45Q + \$240{,}000 + \$0$$

$$\$15Q = \$240{,}000$$

$$Q = \$240{,}000 \div \$15 \text{ per unit}$$

$$Q = 16{,}000 \text{ units; or at } \$60 \text{ per unit, } \$960{,}000$$

Alternative solution:

$$X = 0.75X + \$240{,}000 + \$0$$

$$0.25X = \$240{,}000$$

$$X = \$240{,}000 \div 0.25$$

$$X = \$960{,}000; \text{ or at } \$60 \text{ per unit, } 16{,}000 \text{ units}$$

3.

Increase in sales	$400,000
Multiply by the CM ratio	× 25%
Expected increase in contribution margin	$100,000

Since the fixed expenses are not expected to change, net operating income will increase by the entire $100,000 increase in contribution margin computed above.

4. Equation method:

$$\text{Sales} = \text{Variable expenses} + \text{Fixed expenses} + \text{Profits}$$

$$\$60Q = \$45Q + \$240{,}000 + \$90{,}000$$

$$\$15Q = \$330{,}000$$

$$Q = \$330{,}000 \div \$15 \text{ per unit}$$

$$Q = 22{,}000 \text{ units}$$

Contribution margin method:

$$\frac{\text{Fixed expenses} + \text{Target profit}}{\text{Contribution margin per unit}} = \frac{\$240{,}000 + \$90{,}000}{\$15 \text{ per unit}} = 22{,}000 \text{ units}$$

5.

$$\text{Margin of safety in dollars} = \text{Total sales} - \text{Break-even sales}$$

$$= \$1{,}200{,}000 - \$960{,}000 = \$240{,}000$$

$$\text{Margin of safety percentage} = \frac{\text{Margin of safety in dollars}}{\text{Total sales}} = \frac{\$240{,}000}{\$1{,}200{,}000} = 20\%$$

6. *a.*

$$\text{Degree of operating leverage} = \frac{\text{Contribution margin}}{\text{Net operating income}} = \frac{\$300{,}000}{\$60{,}000} = 5$$

b.

Expected increase in sales	8%
Degree of operating leverage	× 5
Expected increase in net operating income	40%

If sales increase by 8%, then 21,600 units (20,000 × 1.08 = 21,600) will be sold next year. The new contribution format income statement would be as follows:

	Total	Per Unit	Percent of Sales
Sales (21,600 units)	$1,296,000	$60	100%
Variable expenses	972,000	45	75%
Contribution margin	324,000	$15	25%
Fixed expenses	240,000		
Net operating income	$ 84,000		

Thus, the $84,000 expected net operating income for next year represents a 40% increase over the $60,000 net operating income earned during the current year:

$$\frac{\$84,000 - \$60,000}{\$60,000} = \frac{\$24,000}{\$60,000} = 40\% \text{ increase}$$

Note from the income statement above that the increase in sales from 20,000 to 21,600 units has increased *both* total sales and total variable expenses. It is a common error to overlook the increase in variable expenses when preparing a projected contribution format income statement.

7. *a.* A 20% increase in sales would result in 24,000 units being sold next year: 20,000 units × 1.20 = 24,000 units.

	Total	Per Unit	Percent of Sales
Sales (24,000 units)	$1,440,000	$60	100%
Variable expenses	1,152,000	48*	80%
Contribution margin	288,000	$12	20%
Fixed expenses	210,000†		
Net operating income	$ 78,000		

*$45 + $3 = $48; $48 ÷ $60 = 80%.
†$240,000 − $30,000 = $210,000.

Note that the change in per unit variable expenses results in a change in both the per unit contribution margin and the CM ratio.

b.

$$\text{Break-even point in unit sales} = \frac{\text{Fixed expenses}}{\text{Unit contribution margin}}$$

$$= \frac{\$210,000}{\$12 \text{ per unit}} = 17,500 \text{ units}$$

$$\text{Break-even point in dollar sales} = \frac{\text{Fixed expenses}}{\text{CM ratio}}$$

$$= \frac{\$210,000}{0.20} = \$1,050,000$$

c. Yes, based on these data the changes should be made. The changes increase the company's net operating income from the present $60,000 to $78,000 per year. Although the changes also result in a higher break-even point (17,500 units as compared to the present 16,000 units), the company's margin of safety actually becomes greater than before:

$$\text{Margin of safety in dollars} = \text{Total sales} - \text{Break-even sales}$$

$$= \$1,440,000 - \$1,050,000 = \$390,000$$

As shown in (5) above, the company's present margin of safety is only $240,000. Thus, several benefits will result from the proposed changes.

Break-even point The level of sales at which profit is zero. The break-even point can also be defined as the point where total sales equals total expenses or as the point where total contribution margin equals total fixed expenses. (p. 235)

Contribution margin method A method of computing the break-even point in which the fixed expenses are divided by the contribution margin per unit. (p. 244)

Contribution margin ratio (CM ratio) A ratio computed by dividing contribution margin by dollar sales. (p. 238)

Cost-volume-profit (CVP) graph A graphical representation of the relationships between an organization's revenues, costs, and profits on the one hand and its sales volume on the other hand. (p. 236)

Degree of operating leverage A measure, at a given level of sales, of how a percentage change in sales will affect profits. The degree of operating leverage is computed by dividing contribution margin by net operating income. (p. 249)

Equation method A method of computing the break-even point that relies on the equation Sales = Variable expenses + Fixed expenses + Profits. (p. 243)

Incremental analysis An analytical approach that focuses only on those costs and revenues that change as a result of a decision. (p. 240)

Margin of safety The excess of budgeted (or actual) dollar sales over the break-even dollar sales. (p. 246)

Operating leverage A measure of how sensitive net operating income is to a given percentage change in dollar sales. (p. 249)

Sales mix The relative proportions in which a company's products are sold. Sales mix is computed by expressing the sales of each product as a percentage of total sales. (p. 251)

Variable expense ratio A ratio computed by dividing variable expenses by dollar sales (p. 244)

6-1 What is meant by a product's contribution margin ratio? How is this ratio useful in planning business operations?

6-2 Often the most direct route to a business decision is an incremental analysis. What is meant by an *incremental analysis?*

6-3 Company A's costs are mostly variable, whereas Company B's costs are mostly fixed. When sales increase, which company will tend to realize the greatest increase in profits? Explain.

6-4 What is meant by the term *operating leverage?*

6-5 What is meant by the term *break-even point?*

6-6 Name three approaches to break-even analysis. Briefly explain how each approach works.

6-7 In response to a request from your immediate supervisor, you have prepared a CVP graph portraying the cost and revenue characteristics of your company's product and operations. Explain how the lines on the graph and the break-even point would change if (*a*) the selling price per unit decreased, (*b*) fixed cost increased throughout the entire range of activity portrayed on the graph, and (*c*) variable cost per unit increased.

6-8 What is meant by the margin of safety?

6-9 What is meant by the term *sales mix?* What assumption is usually made concerning sales mix in CVP analysis?

6-10 Explain how a shift in the sales mix could result in both a higher break-even point and a lower net income.

1. Using the equation method, solve for the unit sales that are required to earn a target profit of $10,000.
2. Using the contribution margin approach, solve for the dollar sales that are required to earn a target profit of $15,000.

EXERCISE 6-7 Compute the Margin of Safety [LO7]

Molander Corporation is a distributor of a sun umbrella used at resort hotels. Data concerning the next month's budget appear below:

Selling price	$30 per unit
Variable expense	$20 per unit
Fixed expense	$7,500 per month
Unit sales	1,000 units per month

Required:

1. Compute the company's margin of safety.
2. Compute the company's margin of safety as a percentage of its sales.

EXERCISE 6-8 Compute and Use the Degree of Operating Leverage [LO8]

Engberg Company installs lawn sod in home yards. The company's most recent monthly contribution format income statement follows:

	Amount	Percent of Sales
Sales	$80,000	100%
Variable expenses	32,000	40%
Contribution margin	48,000	60%
Fixed expenses	38,000	
Net operating income	$10,000	

Required:

1. Compute the company's degree of operating leverage.
2. Using the degree of operating leverage, estimate the impact on net income of a 5% increase in sales.
3. Verify your estimate from part (2) above by constructing a new contribution format income statement for the company assuming a 5% increase in sales.

EXERCISE 6-9 Compute the Break-Even Point for a Multiproduct Company [LO9]

Lucido Products markets two computer games: Claimjumper and Makeover. A contribution format income statement for a recent month for the two games appears below:

	Claimjumper	Makeover	Total
Sales	$30,000	$70,000	$100,000
Less variable expenses	20,000	50,000	70,000
Contribution margin	$10,000	$20,000	30,000
Less fixed expenses			24,000
Net operating income			$ 6,000

Required:

1. Compute the overall contribution margin (CM) ratio for the company.
2. Compute the overall break-even point for the company in sales dollars.
3. Verify the overall break-even point for the company by constructing a contribution format income statement showing the appropriate levels of sales for the two products.

EXERCISE 6-10 Break-Even Analysis; Target Profit; Margin of Safety; CM Ratio [LO1, LO3, LO5, LO6, LO7]

Menlo Company manufactures and sells a single product. The company's sales and expenses for last quarter follow:

	Total	Per Unit
Sales	$450,000	$30
Less variable expenses	180,000	12
Contribution margin	270,000	$18
Less fixed expenses	216,000	
Net operating income	$ 54,000	

Required:

1. What is the quarterly break-even point in units sold and in sales dollars?
2. Without resorting to computations, what is the total contribution margin at the break-even point?
3. How many units would have to be sold each quarter to earn a target profit of $90,000? Use the contribution margin method. Verify your answer by preparing a contribution format income statement at the target sales level.
4. Refer to the original data. Compute the company's margin of safety in both dollar and percentage terms.
5. What is the company's CM ratio? If sales increase by $50,000 per quarter and there is no change in fixed expenses, by how much would you expect quarterly net operating income to increase?

EXERCISE 6-11 Break-Even Analysis and CVP Graphing [LO2, LO4, LO5]

The Hartford Symphony Guild is planning its annual dinner-dance. The dinner-dance committee has assembled the following expected costs for the event:

Dinner (per person)	$18
Favors and program (per person)	$2
Band	$2,800
Rental of ballroom	$900
Professional entertainment during intermission	$1,000
Tickets and advertising	$1,300

The committee members would like to charge $35 per person for the evening's activities.

Required:

1. Compute the break-even point for the dinner-dance (in terms of the number of persons who must attend).
2. Assume that last year only 300 persons attended the dinner-dance. If the same number attend this year, what price per ticket must be charged in order to break even?
3. Refer to the original data ($35 ticket price per person). Prepare a CVP graph for the dinner-dance from a zero level of activity up to 600 tickets sold. Number of persons should be placed on the horizontal (*X*) axis, and dollars should be placed on the vertical (*Y*) axis.

EXERCISE 6-12 Using a Contribution Format Income Statement [LO1, LO4]

Miller Company's most recent contribution format income statement is shown below:

	Total	Per Unit
Sales (20,000 units)	$300,000	$15.00
Variable expenses	180,000	9.00
Contribution margin	120,000	$6.00
Fixed expenses	70,000	
Net operating income	$ 50,000	

Required:

Prepare a new contribution format income statement under each of the following conditions (consider each case independently):

1. The sales volume increases by 15%.
2. The selling price decreases by $1.50 per unit, and the sales volume increases by 25%.

volume decreases by 10%.

EXERCISE 6-13 Missing Data; Basic CVP Concepts [LO1, LO3]
Fill in the missing amounts in each of the eight case situations below. Each case is independent of the others. (Hint: One way to find the missing amounts would be to prepare a contribution income statement for each case, enter the known data, and then compute the missing items.)

a. Assume that only one product is being sold in each of the four following case situations:

Case	Units Sold	Sales	Variable Expenses	Contribution Margin per Unit	Fixed Expenses	Net Operating Income (Loss)
1	15,000	$180,000	$120,000	?	$50,000	?
2	?	$100,000	?	$10	$32,000	$8,000
3	10,000	?	$70,000	$13	?	$12,000
4	6,000	$300,000	?	?	$100,000	$(10,000)

b. Assume that more than one product is being sold in each of the four following case situations:

Case	Sales	Variable Expenses	Average Contribution Margin (Percent)	Fixed Expenses	Net Operating Income (Loss)
1	$500,000	?	20%	?	$7,000
2	$400,000	$260,000	?	$100,000	?
3	?	?	60%	$130,000	$20,000
4	$600,000	$420,000	?	?	$(5,000)

EXERCISE 6-14 Break-Even and Target Profit Analysis [LO3, LO4, LO5, LO6]
Lindon Company is the exclusive distributor for an automotive product that sells for $40 per unit. Lindon Company has a CM ratio of 30%. The company's fixed expenses are $180,000 per year.

Required:

1. What are the variable expenses per unit?
2. Using the equation method:
   a. What is the break-even point in units and sales dollars?
   b. What sales level in units and in sales dollars is required to earn an annual profit of
   c. Assume that by using a more efficient shipper, the company is able to reduce it expenses by $4 per unit. What is the company's new break-even point in units dollars?
3. Repeat (2) above using the contribution margin method.

EXERCISE 6-15 Operating Leverage [LO4, LO8]
Magic Realm, Inc., has developed a new fantasy board game. The company sold 15,00 year at a selling price of $20 per game. Fixed costs associated with the game total $182 and variable costs are $6 per game. Production of the game is entrusted to a printing co able costs consist mostly of payments to this contractor.

Required:

1. Prepare a contribution format income statement for the game last year and compu operating leverage.
2. Management is confident that the company can sell 18,000 games next year (an i games, or 20%, over last year). Compute:
   a. The expected percentage increase in net operating income for next year.
   b. The expected total dollar net operating income for next year. (Do not pr statement; use the degree of operating leverage to compute your answer.)

EXERCISE 6-17 Multiproduct Break-Even Analysis [LO9]

Olongapo Sports Corporation is the distributor in the Philippines of two premium golf balls—the Flight Dynamic and the Sure Shot. Monthly sales and the contribution margin ratios for the two products follow:

	Product		
	Flight Dynamic	Sure Shot	Total
Sales	P150,000	P250,000	P400,000
CM ratio	80%	36%	?

Fixed expenses total P183,750 per month. (The currency in the Philippines is the peso, which is denoted by P.)

Required:

1. Prepare a contribution format income statement for the company as a whole. Carry computations to one decimal place.
2. Compute the break-even point for the company based on the current sales mix.
3. If sales increase by P100,000 a month, by how much would you expect net operating income to increase? What are your assumptions?

PROBLEM 6-18 Basic CVP Analysis [LO1, LO3, LO4, LO5, LO8]

Feather Friends, Inc., distributes a high-quality wooden birdhouse that sells for $20 per unit. Variable costs are $8 per unit, and fixed costs total $180,000 per year.

Required:

Answer the following independent questions:

1. What is the product's CM ratio?
2. Use the CM ratio to determine the break-even point in sales dollars.
3. Due to an increase in demand, the company estimates that sales will increase by $75,000 during the next year. By how much should net operating income increase (or net loss decrease) assuming that fixed costs do not change?
4. Assume that the operating results for last year were:

Sales	$400,000
Variable expenses	160,000
Contribution margin	240,000
Fixed expenses	180,000
Net operating income	$60,000

a. Compute the degree of operating leverage at the current level of sales.

b. The president expects sales to increase by 20% next year. By what percentage should net operating income increase?

degree of operating leverage to compute your expected percentage

PROBLEM 6-24 Break-Even and Target Profit Analysis [LO5, LO6]

The Shirt Works sells a large variety of tee shirts and sweatshirts. Steve Hooper, the owner, is thinking of expanding his sales by hiring local high school students, on a commission basis, to sell sweatshirts bearing the name and mascot of the local high school.

These sweatshirts would have to be ordered from the manufacturer six weeks in advance, and they could not be returned because of the unique printing required. The sweatshirts would cost Mr. Hooper $8 each with a minimum order of 75 sweatshirts. Any additional sweatshirts would have to be ordered in increments of 75.

Since Mr. Hooper's plan would not require any additional facilities, the only costs associated with the project would be the costs of the sweatshirts and the costs of the sales commissions. The selling price of the sweatshirts would be $13.50 each. Mr. Hooper would pay the students a commission of $1.50 for each shirt sold.

Required:

1. To make the project worthwhile, Mr. Hooper would require a $1,200 profit for the first three months of the venture. What level of sales in units and in dollars would be required to reach this target net operating income? Show all computations.
2. Assume that the venture is undertaken and an order is placed for 75 sweatshirts. What would be Mr. Hooper's break-even point in units and in sales dollars? Show computations and explain the reasoning behind your answer.

PROBLEM 6-25 Sales Mix; Break-Even Analysis; Margin of Safety [LO7, LO9]

Island Novelties, Inc., of Palau makes two products, Hawaiian Fantasy and Tahitian Joy. Present revenue, cost, and sales data for the two products follow:

	Hawaiian Fantasy	Tahitian Joy
Selling price per unit	$15	$100
Variable expenses per unit	$9	$20
Number of units sold ~~monthly~~ annually	20,000	5,000

Fixed expenses total $475,800 per year. The Republic of Palau uses the U.S. dollar as its currency.

Required:

1. Assuming the sales mix given above, do the following:
   a. Prepare a contribution format income statement showing both dollar and percent columns for each product and for the company as a whole.
   b. Compute the break-even point in dollars for the company as a whole and the margin of safety in both dollars and percent.
2. The company has developed a new product to be called Samoan Delight. Assume that the company could sell 10,000 units at $45 each. The variable expenses would be $36 each. The company's fixed expenses would not change.
   a. Prepare another contribution format income statement, including sales of the Samoan Delight (sales of the other two products would not change).
   b. Compute the company's new break-even point in dollars and the new margin of safety in both dollars and percent.
3. The president of the company examines your figures and says, "There's something strange here. Our fixed costs haven't changed and you show greater total contribution margin if we add the new product, but you also show our break-even point going up. With greater contribution margin, the break-even point should go down, not up. You've made a mistake somewhere." Explain to the president what has happened.

Required:

1. Prepare a contribution format income statement for the month based on actual sales data. Present the income statement in the format shown above.
2. Compute the break-even point in sales dollars for the month based on your actual data.
3. Considering the fact that the company met its B750,000 sales budget for the month, the president is shocked at the results shown on your income statement in (1) above. Prepare a brief memo for the president explaining why both the operating results and the break-even point in sales dollars are different from what was budgeted.

PROBLEM 6-21 Basic CVP Analysis; Graphing [LO1, LO2, LO4, LO5]

The Fashion Shoe Company operates a chain of women's shoe shops around the country. The shops carry many styles of shoes that are all sold at the same price. Sales personnel in the shops are paid a substantial commission on each pair of shoes sold (in addition to a small basic salary) in order to encourage them to be aggressive in their sales efforts.

The following worksheet contains cost and revenue data for Shop 48 and is typical of the company's many outlets:

	A	B	C
1		Per Pair of Shoes	
2	Selling price	$ 30.00	
3			
4	Variable expenses:		
5	Invoice cost	$ 13.50	
6	Sales commission	4.50	
7	Total variable expenses	$ 18.00	
8			
9		Annual	
10	Fixed expenses:		
11	Advertising	$ 30,000	
12	Rent	20,000	
13	Salaries	100,000	
14	Total fixed expenses	$150,000	
15			

Sheet1 / Sheet2 / Sheet3

Required:

1. Calculate the annual break-even point in dollar sales and in unit sales for Shop 48.
2. Prepare a CVP graph showing cost and revenue data for Shop 48 from a zero level of activity up to 17,000 pairs of shoes sold each year. Clearly indicate the break-even point on the graph.
3. If 12,000 pairs of shoes are sold in a year, what would be Shop 48's net operating income or loss?
4. The company is considering paying the store manager of Shop 48 an incentive commission of 75 cents per pair of shoes (in addition to the salesperson's commission). If this change is made, what will be the new break-even point in dollar sales and in unit sales?
5. Refer to the original data. As an alternative to (4) above, the company is considering paying the store manager 50 cents commission on each pair of shoes sold in excess of the break-even point. If this change is made, what will be the shop's net operating income or loss if 15,000 pairs of shoes are sold?