# CHAPTER

**9**

**BREAK-EVEN POINT AND COST-VOLUME-PROFIT ANALYSIS**

**Learning Objectives**

After reading and studying Chapter 9, you should be able to answer the following questions:

1. What is the break-even point (BEP) and why is it important?
2. How is the BEP determined and what methods are used to identify BEP?
3. What is cost-volume-profit (CVP) analysis and how do companies use CVP information in decision making?
4. How do break-even and CVP analysis differ for single-product and multiproduct firms?
5. How are margin of safety and operating leverage concepts used in business?
6. What are the underlying assumptions of CVP analysis?

**Terminology**

**Break-even chart:** a graph that depicts the relationships among revenue, volume, variable costs, fixed costs, and profits (or losses)

**Break-even point** **(BEP):** the level of activity, in units or dollars, at which total revenues equal total costs

**Contribution margin ratio (CM%):** the proportion of each revenue dollar remaining after variable costs have been covered; or the proportion of each revenue dollar that can be used to cover fixed cost and provide profit; computed as contribution margin divided by revenue

**Cost-volume-profit** **(CVP)** **analysis:** a procedure that examines changes in costs and volume levels and the resulting effects on profits

**Degree of operating leverage (DOL):** a factor that indicates how a percentage change in sales from the current level will affect company profits; it is calculated as contribution margin divided by net income or (1 ÷ margin of safety percentage)

**Incremental analysis:** a process of evaluating alternatives that focuses only on the factors that change from one course of action or decision to another

**Margin of safety (MS):** the excess of the budgeted or actual sales of a company over break-even sales; it can be calculated in units or dollars or as a percentage; it is equal to (1 ÷ degree of operating leverage)

**Operating leverage:** the proportionate relationship between a company’s variable and fixed costs

**Profit-volume (PV)** **graph:** a visual representation of the amount of profit or loss associated with each level of sales

**Variable cost ratio (VC%):** the proportion of each revenue dollar needed to cover variable costs; computed as variable costs divided by sales or as (1 – contribution margin ratio)

**Lecture Outline**

**LO.1: What is the break-even point (BEP) and why is it important?**

1. Introduction
	1. Much of the information managers use to plan and control reflects relationships among product cost, selling prices, and sales volumes.
		1. Changing one of these essential components in the mix will cause changes in other components.
	2. This chapter focuses on understanding how costs, volumes, and profits interact.
		1. Understanding these relationships helps in predicting future conditions (planning) as well as explaining, evaluating, and acting on past results (controlling).
		2. The chapter also presents the concepts of margin of safety and degree of operating leverage.
2. Break-even Point
	1. Variable costing is commonly used for internal purposes because it makes cost behavior more transparent.
		1. The variable costing presentation of separating variable from fixed costs facilitates the use of break-even point, cost-volume-­profit, margin of safety, and degree of operating leverage models.
		2. A variable costing income statement for Calispell Company is presented in text **Exhibit 9.1 (p. 354)**. This example is used for illustration purposes in the text narrative.
	2. The **break-even point (BEP)** is the level of activity, in units or dollars, at which total revenues equal total costs.
		1. Knowing the BEP, managers are better able to set sales goals that should result in profits from operations rather than losses.
	3. Several simplifying assumptions must be made concerning revenue and cost functions (These are discussed in more detail at the end of the chapter):
		1. *Relevant range:* The company is assumed to be operating within the relevant range of activity specified in determining the revenue and cost information used in the BEP model;
		2. *Revenue:* Total revenue fluctuates in direct proportion to the level of activity or volume while revenue per unit is assumed to remain constant, and fluctuations in per unit revenue for factors such as quantity discounts are ignored;
		3. *Variable costs:* Total variable costs fluctuate in direct proportion to the level of activity or volume. Variable costs per unit are assumed to remain constant within the relevant range. Variable production costs include direct material, direct labor, and variable overhead; variable selling costs include charges for items such as commissions and shipping; variable administrative costs may exist in areas such as purchasing but in the example administrative costs are assumed to be fixed;
		4. *Fixed costs:* Total fixed costs are assumed to remain constant within the relevant range. Fixed cost per unit decreases as volume increases, and increases as volume decreases. Fixed costs include both fixed manufacturing overhead and fixed selling and administrative expenses; and
		5. *Mixed costs:* Mixed costs must be separated into their variable and fixed elements before they can be used in CVP analysis. Any method (such as regression analysis or the high-low method) that validly separates these costs in relation to one or more predictors may be used.
	4. Contribution margin (CM)is the difference between revenue and variable cost. CM may be defined on a total basis, unit basis, or percentage basis.
		1. CM indicates the amount of revenue that remains after all variable costs have been covered and goes toward the coverage of fixed costs and the generation of profits.
		2. CM fluctuates in direct proportion to sales volume. Since unit revenue and unit variable cost are constant, the contribution margin per unit is also constant.

**LO.2: How is the BEP determined and what methods are used to identify BEP?**

1. Identifying the Break-even Point
	1. Formula Approach to Breakeven
		1. The formula approach uses an algebraic equation to calculate the exact break-even point.
		2. Sales activity, rather than production, is the focus for the relevant range.
		3. Algebraic break-even computations use an equation that represents the variable costing income statement and shows the relationships among revenue, fixed cost, variable cost, volume, and profit as follows:

 R(X) – VC(X) – FC = P

 where R = revenue (selling price) per unit

 X = number of units sold or to be sold

 R(X) = total revenue

 VC = variable cost per unit

 VC(X) = total variable cost

 FC = total fixed cost

 P = profit

* + - 1. The equation represents an income statement, so P can be set equal to zero for the formula to indicate a break-even situation.
			2. The break-even point in units can be found by solving the equation for X:

			X = FC ÷ (R – VC)
			3. *Break-even point volume* is equal to total fixed cost divided by the unit contribution margin (revenue per unit minus the variable cost per unit): X = FC ÷ CM where CM = contribution margin per unit
		1. The break-even point can be expressed in either units or dollars of revenue.
			1. The break-even point in sales dollars can be found by multiplying the break-even point in units by the selling price per unit.
		2. The break-even point in sales dollars can also be computed.
			1. **Contribution margin (CM) ratio** is the proportion of each revenue dollar remaining after variable costs have been covered; it is computed as contribution margin divided by sales on a total or per unit basis.
			2. The **variable cost (VC) ratio** represents the variable cost proportion of each revenue dollar and is computed as variable costs divided by sales or as (1 – contribution margin ratio).
			3. The BEP in dollars is found by dividing total fixed costs by the contribution margin ratio.

 Sales = FC ÷ (1 – VC%)

 or

 Sales = FC ÷ CM%

 where VC% = the percentage relationship of variable cost to sales

 CM% = the percentage relationship of contribution margin to sales

* 1. Graphing Approach to Breakeven
		1. Sometimes BEP information may be more effectively conveyed to managers in a visual format.
			1. Text **Exhibit 9.2 (p. 357)** provides a visual representation of Calispell Company’s revenue, cost and contribution margin behaviors.
		2. Traditional Approach
			1. Step 1: As shown in text **Exhibit 9.3 (p. 358)**, label each axis and graph the total cost and fixed cost lines.
				+ The fixed cost line is drawn parallel to the x-axis.
				+ The variable cost line begins where the fixed cost line intersects the y-axis. The slope of the variable cost line is the per-unit variable cost. The resulting line represents total cost.
			2. Step 2: Graph the total revenue line.
				+ The revenue line begins at the origin and has a slope equal to the per-unit selling price.
			3. The BEP is located at the intersection of the total revenue line and the total cost line.
				+ The vertical distance to the right of the BEP and between the revenue and total cost lines represents profit (to the left of BEP, loss).
			4. Text **Exhibit 9.4 (p. 358)** presents a traditional CVP graph for Calispell Company.
		3. Profit-Volume Graph
			1. The **profit-volume graph** is a visual representation of the amount of profit or loss associated with each level of sales (See text **Exhibit 9.5 p. 359**).
			2. The horizontal axis on the PV graph represents unit sales volume and the vertical axis represents dollars.
			3. Amounts shown above the horizontal axis are positive and represent profits, while amounts below the horizontal axis are negative and represent losses.
		4. Income Statement Approach
			1. The income statement approach to CVP analysis allows the preparation of pro forma (budgeted) statements from available information.
			2. Income statements can be used to prove the accuracy of computations made with the CVP formula, or the statements can be prepared simply to determine the impact of various sales levels on profit after taxes (net income).
	2. The *break-even point* provides a starting point for planning future operations.
		1. Managers want to earn profits, not just cover costs, so the break-even point formula can be used by substituting an amount other than zero for the profit (P) term.
		2. This substitution converts break-even analysis to *cost-volume-profit analysis.*

**LO.3: What is cost-volume-profit (CVP) analysis and how do companies use CVP information in decision making?**

1. CVP Analysis
	1. General
		1. **Cost-volume-profit analysis** is a procedure that examines changes in costs and volume levels and the resulting effects on profits.
			1. CVP analysis can be used to calculate the sales volume necessary to achieve a desired target profit on a before or after-tax basis.
		2. Managers use CVP to plan and control more effectively since the technique allows them to concentrate on the relationships between revenues, costs, volume changes, taxes, and profits.
			1. The CVP model can be expressed through a formula or as a graph.
			2. All costs—regardless of whether they are product, period, variable, or fixed, are considered in the CVP model.
			3. The same basic CVP model and calculations can be applied to a single product or multiproduct business.
		3. CVP analysis requires the substitution of known amounts in the formula to determine an unknown amount. In the typical CVP model, “profits” refer to operating profits before extraordinary and other non-operating, nonrecurring items.
		4. A significant application of CVP analysis is the setting of a desired target profit and focusing on the relationships between it and specified income statement amounts to find an unknown.
			1. Volume is a common unknown in such applications since managers want to achieve a particular amount of profit and need to know what quantity of sales must be generated to accomplish this objective.
			2. Selling price is not as common an unknown as volume since the selling price is usually market-related rather than being set solely by company management.
		5. Profits may be stated as either a fixed or variable amount and on either a before-tax or after-tax basis.
	2. Fixed Amount of Profit
		1. Each dollar of contribution margin is a dollar of profit after the break-even point is reached.
			1. Before Tax
				* The formula to compute target profit before tax is as follows:

 R(X) – VC(X) – FC = PBT or R(X) – VC(X) = FC + PBT or

 CM(X) = FC + PBT or X = (FC + PBT) ÷ CM

 where PBT = fixed amount of profit before taxes

* + - 1. After Tax
				* The formula to compute target profit after taxes is as follows:

 PBT – [(TR) (PBT)] = PAT

 and

 R(X) – VC(X) – FC – [(TR) (PBT)] = PAT

 where PBT = fixed amount of profit before tax

 PAT = fixed amount of profit after tax

 TR = tax rate

* + - * + PBT is further defined as:

PBT – (1 – TR) = PAT or
PBT = PAT ÷ (1 – TR)

Substituting into the formula:

R(X) – VC(X) – FC = PBT or
R(X) – VC(X) = FC + PBT or
(R – VC)(X) = FC + [PAT ÷ (1 – TR)] or
CM(X) = FC + [PAT ÷ (1 – TR)]

* 1. Specific Amount of Profit Per Unit
		1. Managers may desire a specific amount of profit per unit, in which case, profit must be treated similarly to a variable cost.
			1. A set amount of profit can be stated on either a before tax or after tax basis or as either a percentage of revenues or as a per unit amount.
		2. Before Tax
			1. Text **Exhibit 9.8 (p. 363)** provides an analysis of a set amount of profit per unit before tax.
			2. The adjusted CVP formula for computing the necessary unit sales volume to earn a specified amount of profit before tax per unit is as follows:

 R(X) - VC(X) - FC = PuBT(X) or
 R(X) - VC(X) - PuBT(X) = FC or
 CM(X) - PuBT(X) = FC or
 X = FC ÷ (CM – PuBT)

* + 1. After Tax
			1. Text **Exhibit 9.9 (p. 364)** provides an analysis of a set amount of profit per unit after tax
			2. The adjusted CVP formula for computing the necessary unit sales volume to earn a specified amount of profit after tax per unit is as follows:

 R(X) - VC(X) - FC – {(TR) [PuBT(X)]} = PuAT(X)
 where PuAT = profit per unit after tax or
 X = FC ÷ (CM – PuBT)
 where PuBT = variable amount profit per unit before taxes

* 1. Incremental Analysis for Short-Run Changes
		1. **Incremental analysis** is a process of evaluating changes that focuses only on the factors that differ from one course of action or decision to another.
		2. The break-even point may increase or decrease, depending on the particular changes that occur in the revenue and cost factors.
			1. The break-even point will increase if there is an increase in total fixed cost or a decrease in unit (or percentage) contribution margin.
			2. A decrease in contribution margin could arise due to a reduction in selling price, an increase in variable unit cost, or a combination of the two.
			3. The break-even point will decrease if there is a decrease in total fixed cost or an increase in unit (or percentage) contribution margin.
		3. Any factor that causes a change in the break-even point will also cause a shift in total profits or losses at any activity level.
		4. The text presents four examples (cases) of changes in the CVP variables that could occur and the incremental computations that can be used to determine the effects of those changes on the BEP or on profit.
			1. In most situations, incremental analysis is sufficient to determine the feasibility of contemplated changes, and a complete income statement need not be prepared.

**LO.4: How do break-even and CVP analysis differ for single-product and multiproduct firms?**

1. CVP Analysis in a Multiproduct Environment
	1. A constant product sales mix or, alternatively, an average contribution margin ratio must be assumed in order to perform CVP analysis in a multiproduct company.
	2. The constant sales mix assumption can be referred to as the “bag” (or “basket”) assumption, with sales mix representing a bag of products that are sold together.
	3. The computation of a weighted average contribution margin ratio for the bag of products being sold is necessary under the constant sales mix assumption.
		1. In other words, the CM% is weighted by the quantities of each product included in the “bag.”
		2. Text **Exhibit 9.11 (p. 368)** illustrates the computation of the weighted average contribution margin.
			1. Note that it is the sum of all of the products’ individual product CM multiplied by its weight or mix proportion.
	4. Any shift in the sales mix proportion of products will change the weighted average contribution margin and the break-even point.
		1. Text **Exhibit 9.12 (p. 369)** illustrates the impact on profit when the sales mix changes.
		2. A shift toward higher dollar contribution margin products without a corresponding decrease in revenues will cause a lower BEP and increase profits and vice versa.

**LO.5: How are margin of safety and operating leverage concepts used in business?**

1. Managing Risk of CVP Relationships
	1. Margin of Safety
		1. The **margin of safety** is the excess of the budgeted or actual sales of a company over its break-even sales; it can be calculated in units or dollars or as a percentage; it is equal to (1 ÷ degree of operating leverage).
		2. The margin of safety (See text **Exhibit 9.13 p. 369**) is the amount that sales can fall before reaching the break-even point and, thus, provides a certain amount of “cushion” from losses.
		3. The following formulas are applicable:
			1. Margin of safety in units = Actual units – Break-even units
			2. Margin of safety in $ = Actual sales $ – Break-even sales $
			3. Margin of safety % = Margin of safety in units ÷ Actual unit sales
			4. Margin of safety % = Margin of safety in $ ÷ Actual sales $
		4. The margin of safety calculation allows management to determine how close to a danger level the company is operating, and thus provides an indication of risk.
	2. Operating Leverage (See text **Exhibits 9.14 p. 370** and **9.15 p. 371**)
		1. **Operating leverage** is the proportionate relationship between a company’s variable and fixed costs.
		2. Low operating leverage and a relatively low break-even point are found in companies that are highly labor-intensive, experience high variable costs, and have low fixed costs.
			1. Companies with low operating leverage can experience wide swings in volume levels and still show a profit.
				* An exception is a sports team, which is highly labor-intensive, but whose labor costs are fixed.
		3. High operating leverage and a relatively high break-even point are found in companies that have low variable costs and high fixed costs.
			1. Companies will face this type of cost structure and become more dependent on volume to add profits as they become more automated.
			2. A company’s cost structure strongly influences the degree to which its profits respond to changes in volume.
			3. Companies with high operating leverage also have high contribution margin ratios.
		4. The **degree of operating leverage** is a factor that indicates how a *percentage* change in sales, from the existing or current level, will affect company profits; it is calculated as contribution margin divided by net income; it is equal to (1 ÷ margin of safety percentage). The calculation providing the degree of operating leverage factor is:

 Degree of operating leverage = Contribution margin ÷ Profit before tax

* + - 1. The calculation assumes that fixed costs do not increase when sales increase.
			2. The degree of operating leverage *decreases* as sales move upward from the BEP.
			3. When the margin of safety is small, the degree of operating leverage is large:

			MS% = 1 ÷ DOL and DOL = 1 ÷ MS%

**LO.6: What are the underlying assumptions of CVP analysis?**

1. Underlying Assumptions of CVP Analysis
	1. CVP analysis is a short-run model that focuses on relationships among selling price, variable costs, fixed costs, volume, and profits.
	2. CVP is useful as a planning tool that can provide information about the impact on profits when changes are made in the cost structure or in sales levels.
		1. The CVP model, like other human-made models, is an abstraction of reality and, as such, does not reveal all the forces at work. It reflects reality but does not duplicate it.
		2. CVP is a tool that focuses on the short run partially because of the assumptions that underlie the calculations.
		3. The assumptions are necessary, but they limit the accuracy of the results.
	3. The underlying assumptions are as follows:
		1. the revenue and cost behavior patterns are constant per unit and linear within the relevant range;
		2. total contribution margin is linear within the relevant range and increases proportionally with output;
		3. total fixed cost is a constant amount within the relevant range;
		4. mixed costs can be accurately separated into their fixed and variable elements;
		5. sales and production are equal; thus, there is no material fluctuation in inventory levels. This assumption is necessary because of the allocation of fixed costs to inventory at potentially different rates each year;
		6. in a multiproduct firm, the sales mix will remain constant. If this assumption were not made, no useful weighted average contribution margin could be calculated for the company; and
		7. labor productivity, production technology, and market conditions will not change. Any such changes would change costs correspondingly, and possibly selling prices would change, invalidating the first three assumptions.
	4. Accountants have generally assumed that cost behavior, once classified, remains constant as long as operations remain within the relevant range.
		1. It is more appropriate, however, to regard fixed costs as long-term variable costs.
			1. Part of the traditional “misclassification” of fixed costs has been caused by improperly specifying drivers of costs.
			2. As production and sales volumes are less often viewed as cost drivers, companies will begin to recognize that a “fixed cost” exists only in a short-term perspective and therefore cost drivers for long-term variable costs must be specified in break-even and CVP analyses.
			3. The CVP model will need to be expanded to include these additional drivers, and more information and a longer time frame will be needed to make the calculations. These adjustments will force managers to take a long-run view of product opportunities.

**Multiple Choice Questions**

1. (LO.1) Which income statement format better facilitates the determination of a company’s break-even point?
	1. Absorption costing income statement
	2. Full costing income statement
	3. Variable costing income statement
	4. None of the above
2. (LO.1) Select the *incorrect* equation for computing the breakeven point.
	1. Total Fixed Costs = Total Contribution Margin
	2. Total Revenue = Total Costs
	3. Total Profit = $0
	4. Total Variable Costs = Total Fixed Costs
3. (LO.2) A Company sells a product for $7.50 whose variable cost is $2.25 per unit. The company needed to sell 20,000 shirts to break even. What was the company’s total fixed costs?
	1. $105,000
	2. $150,000
	3. $45,000
	4. $3,810
4. (LO.2) B Company sells a product for $7.50 whose variable cost is $2.25 per unit. The company needed to sell 20,000 shirts to break even and its net income was $5,040 before tax. How many units did the company sell?
	1. 2,240
	2. 20,000
	3. 20,672
	4. 20,960
5. (LO.2) W Company manufactures a product that sells for $800 per unit. The unit variable costs are $600 and total fixed costs are $6,600,000. The annual sales volume required for W Company to break even is:
	1. $26,400,000.
	2. $8,800,000.
	3. $6,600,000.
	4. None of the above.
6. (LO.3) F Company manufactures and sells T-shirts. Last year, the shirts sold for $7.50 each, and the variable cost to manufacture them was $2.25 per unit. The company needed to sell 20,000 shirts to break even. The net income last year was $5,040. F Company’s expectation for the coming year include the following:
* The selling price of the T-shirts will be $9.00
* Variable cost to manufacture will increase by one-third
* Fixed costs will increase by 10%
* The income tax rate of 40% will be unchanged

The number of T-shirts that must be sold to break even in the coming year is:

a. 22,000.

b. 20,000.

c. 19,250.

d. 17,500.

1. (LO.3) A calculation used in a CVP analysis determines the break-even point. Once the break-even point has been reached, operating income will increase by the:
	1. contribution margin per unit for each additional unit sold.
	2. gross margin per unit for each additional unit sold.
	3. fixed costs per unit for each additional unit sold.
	4. variable costs per unit for each additional unit sold.
2. (LO.3) A company sells a product for $9.00 which has a variable manufacturing cost of $3.00 per unit. Last year, the company needed to sell 20,000 shirts to break even. Assuming the company is subject to a 40% tax rate and wishes to earn $22,500 profit after tax for the coming year, what sales will be required?
	1. $257,625
	2. $236,250
	3. $213,750
	4. $180,000
3. (LO.3) X Company sold a product last year that had a $5.00 unit contribution margin. A significant change in the company’s production technology has caused a 10% increase in annual fixed costs but a 20% decrease in unit variable costs. Assuming there was no change in the product’s $10.00 selling price what is the company’s new contribution margin ratio?
	1. 60%
	2. 50%
	3. 40%
	4. Can’t be determined from the information provided
4. (LO.3) A significant change in Y Company’s production technology caused its total fixed costs of $6,708,716 to increase by 9%. However, the change caused a 20% unit cost decrease in direct labor and a 25% decrease in the unit material cost leading to $25 increase in its $300 unit contribution margin. After incorporating these changes, what is Y Company’s new break-even point?
	1. 22,500 units
	2. 20,643 units
	3. 24,375 units
	4. 22,363 units
5. (LO.4) One Company sells two products, A and B. A has a unit contribution margin of $40 while B has a unit contribution margin of $25. Last year the company sold 40,000 units of Product A and 60,000 units of Product B. What is the company’s weighted average contribution margin?
	1. ($40 + $25) / 2
	2. ($40 x 40,000) + ($25 x 60,000)
	3. ($40 x 0.4) + ($25 x 0.6)
	4. None of the above
6. (LO.5) For a profitable company, the amount by which sales can decline before losses occur is known as the:
	1. sales volume variance.
	2. hurdle rate.
	3. marginal income rate.
	4. margin of safety.
7. (LO.5) V Company sold 10,000 units of its product for $100 per unit. It’s unit variable costs are $20 and its total fixed costs are $600,000. Assuming the company has a 40% tax rate, what is its degree of operating leverage?
	1. 4.00
	2. 0.25
	3. 6.67
	4. 0.15
8. (LO.6) Which of the following is *not* an assumption of CVP analysis?
	1. All revenues and variable cost are linear.
	2. Mixed costs can be accurately separated into their fixed and variable components.
	3. Sales exceed production.
	4. Labor productivity and market conditions will not change.
9. (LO.6) Select the *incorrect* statement from the following.
	1. If changes occur in selling price or cost, new computations must be made for break-even and CVP analysis.
	2. In the long-term, fixed costs should be regarded as a long-term variable cost.
	3. Fixed costs exist only in a short-term perspective.
	4. In the future, the only nonmonetary variable included in the break-even model will be sales volume.

**Multiple Choice Solutions**

1. c
2. d
3. a

TFC / ($7.50 - $2.25) = 20,000; 20,000 x $5.25 = **$105,000**

1. d

$7.50(x) - $105,000 (see #3) - $2.25(x) = $5,050; $5.25(x) = $110,040; X = **20,960** units

1. a (CMA Adapted)

$6,600,000 / ($200 / $800) = **$26,400,000**

1. c (CMA Adapted)
 Coming Year

 Units sold  **19,250**

 Unit   Breakeven

 100.00% Sales $ 9.00 $ 173,250

 33.33% Variable costs (3.00) (57,750)

 67.67% Contribution margin $ 6.00 $ 115,500

 Fixed costs (115,500)

 Operating income $ -0-

 Income tax expense -0-

 Net income $ -0-

1. a (CMA Adapted)
2. b (CMA Adapted)
 Coming Year

 Units sold 26,250

 Unit   Projected

 100.00% Sales $ 9.00 **$ 236,250**

 33.33% Variable costs (3.00) (78,750)

 66.67% Contribution margin $ 6.00 $ 157,500

 Fixed costs (120,000)

 Operating income $ 37,500

 Income tax expense (15,000)
 Net income $ 22,500

1. a

VC = $10 - $5 = $5; $5 x .8 = $4; New CM = $10 - $4 = $6; New CM% = $6/$10 = **60%**

1. a

TFC = $6,708,716 x 1.09 = $7,312,500; New CM = $300 + $25 = $325.
New BEP = $7,312,500 / $325 = **22,500** units

1. c
2. d (CMA Adapted)
3. a

10,000 x ($100 - $20) / (10,000 x ($100 - $20) - $600,000 = **4.0**

1. c
2. d