**Hilton chapter 7**

**Answers to Assigned End of Chapter Exercises, Problems, Cases**

# Answers to Review Questions

# 

7-1 a. In the contribution-margin approach, the break-even point in units is calculated using the following formula:



1. In the equation approach, the following profit equation is used:

|  |  |  |
| --- | --- | --- |
|  | fixed expenses |  |

This equation is solved for the sales volume in units.

c. In the graphical approach, sales revenue and total expenses are graphed. The break-even point occurs at the intersection of the total revenue and total expense lines.

7-2 The term *unit contribution margin* refers to the contribution that each unit of sales makes toward covering fixed expenses and earning a profit. The unit contribution margin is defined as the sales price minus the unit variable expense.

7-3 In addition to the break-even point, a CVP graph shows the impact on total expenses, total revenue, and profit when sales volume changes. The graph shows the sales volume required to earn a particular target net profit. The firm's profit and loss areas are also indicated on a CVP graph.

7-4 The safety margin is the amount by which budgeted sales revenue exceeds break-even sales revenue.

7-5 An increase in the fixed expenses of any enterprise will increase its break-even point. In a travel agency, more clients must be served before the fixed expenses are covered by the agency's service fees.

7-6 A decrease in the variable expense per pound of oysters results in an increase in the contribution margin per pound. This will reduce the company's break-even sales volume.

7-7 The president is correct. A price increase results in a higher unit contribution margin. An increase in the unit contribution margin causes the break-even point to decline.

The financial vice president's reasoning is flawed. Even though the break-even point will be lower, the price increase will not necessarily reduce the likelihood of a loss. Customers will probably be less likely to buy the product at a higher price. Thus, the firm may be less likely to meet the lower break-even point (at a high price) than the higher break-even point (at a low price).

7-8 When the sales price and unit variable cost increase by the same amount, the unit contribution margin remains unchanged. Therefore, the firm's break-even point remains the same.

7-9 The fixed annual donation will offset some of the museum's fixed expenses. The reduction in net fixed expenses will reduce the museum's break-even point.

7-10 A profit-volume graph shows the profit to be earned at each level of sales volume.

7-11 The most important assumptions of a cost-volume-profit analysis are as follows:

(a) The behavior of total revenue is linear (straight line) over the relevant range. This behavior implies that the price of the product or service will not change as sales volume varies within the relevant range.

(b) The behavior of total expenses is linear (straight line) over the relevant range. This behavior implies the following more specific assumptions:

(1) Expenses can be categorized as fixed, variable, or semivariable.

(2) Efficiency and productivity are constant.

(c) In multiproduct organizations, the sales mix remains constant over the relevant range.

(d) In manufacturing firms, the inventory levels at the beginning and end of the period are the same.

7-12 Operating managers frequently prefer the contribution income statement because it separates fixed and variable costs. This format makes cost-volume-profit relationships more readily discernible.

7-13 The *gross margin* is defined as sales revenue minus all variable and fixed manufacturing expenses. The total *contribution margin* is defined as sales revenue minus all variable expenses, including manufacturing, selling, and administrative expenses.

7-14 East Company, which is highly automated, will have a cost structure dominated by fixed costs. West Company's cost structure will include a larger proportion of variable costs than East Company's cost structure.

A firm's operating leverage factor, at a particular sales volume, is defined as its total contribution margin divided by its net income. Since East Company has proportionately higher fixed costs, it will have a proportionately higher total contribution margin. Therefore, East Company's operating leverage factor will be higher.

7-15 When sales volume increases, Company X will have a higher percentage increase in profit than Company Y. Company X's higher proportion of fixed costs gives the firm a higher operating leverage factor. The company's percentage increase in profit can be found by multiplying the percentage increase in sales volume by the firm's operating leverage factor.

7-16 The sales mix of a multiproduct organization is the relative proportion of sales of its products.

The weighted-average unit contribution margin is the average of the unit contribution margins for a firm's several products, with each product's contribution margin weighted by the relative proportion of that product's sales.

7-17 The car rental agency's sales mix is the relative proportion of its rental business associated with each of the three types of automobiles: subcompact, compact, and full-size. In a multi-product CVP analysis, the sales mix is assumed to be constant over the relevant range of activity.

7-18 Cost-volume-profit analysis shows the effect on profit of changes in expenses, sales prices, and sales mix. A change in the hotel's room rate (price) will change the hotel's unit contribution margin. This contribution-margin change will alter the relationship between volume and profit.

7-19 Budgeting begins with a sales forecast. Cost-volume-profit analysis can be used to determine the profit that will be achieved at the budgeted sales volume. A CVP analysis also shows how profit will change if the sales volume deviates from budgeted sales.

Cost-volume-profit analysis can be used to show the effect on profit when variable or fixed expenses change. The effect on profit of changes in variable or fixed advertising expenses is one factor that management would consider in making a decision about advertising.

7-20 The low-price company must have a larger sales volume than the high-price company. By spreading its fixed expense across a larger sales volume, the low-price firm can afford to charge a lower price and still earn the same profit as the high-price company. Suppose, for example, that companies A and B have the following expenses, sales prices, sales volumes, and profits.

|  |  |  |
| --- | --- | --- |
|  | Company A | Company B |
| Sales revenue:  350 units at $10   100 units at $20  Variable expenses:  350 units at $6   100 units at $6  Contribution margin  Fixed expenses  Profit | $3,500    2,100    $1,400  1,000  $ 400 | $2,000    600  $1,400  1,000  $ 400 |

7-21 The statement makes three assertions, but only two of them are true. Thus, the statement is *false*. A company with an advanced manufacturing environment typically will have a larger proportion of fixed costs in its cost structure. This will result in a higher break-even point and greater operating leverage. However, the firm's higher break-even point will result in a *reduced* safety margin.

7-22 Activity-based costing (ABC) results in a richer description of an organization's cost behavior and CVP relationships. Costs that are fixed with respect to sales volume may not be fixed with respect to other important cost drivers. An ABC system recognizes these nonvolume cost drivers, whereas a traditional costing system does not.

# SOLUTIONS to ASSIGNED EXERCISES

## Exercise 7-27

1. Break-even point (in units) = 

= = 4,000 components

*p* denotes Argentina’s peso.

2. New break-even point (in units) = 

== 4,200 components

3. Sales revenue (7,000 × 1,500*p*) 10,500,000*p*

Variable costs (7,000 × 1,000*p*) 7,000,000*p*

Contribution margin 3,500,000*p*

Fixed costs   2,000,000*p*

Net income 1,500,000*p*

1. New break-even point (in units) = 

= 5,000 components

5. Analysis of price change decision:

|  |  |  |
| --- | --- | --- |
|  | Price | |
|  | 1,500*p* | 1,400*p* |
| Sales revenue: (7,000 × 1,500*p*)   (8,000 × 1,400*p*)  Variable costs: (7,000 × 1,000*p*)  (8,000 × 1,000*p*)  Contribution margin  Fixed expenses  Net income (loss) | 10,500,000*p*   7,000,000*p*  3,500,000*p*  2,000,000*p*  1,500,000*p* | 11,200,000*p*  8,000,000*p*  3,200,000*p*  2,000,000*p*  1,200,000*p* |

The price cut should not be made, since projected net income will decline by 300,000*p*.

## Exercise 7-30

1.

|  |  |  |  |
| --- | --- | --- | --- |
| Bicycle Type | Sales Price | Unit  Variable Cost | Unit  Contribution Margin |
| High-quality | $1,000 | $600 ($550 + $50) | $400 |
| Medium-quality | 600 | 300 ($270 + $30) | 300 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 2. | Sales mix: | | | | | |  |
|  |  | | | | | |  |
|  | High-quality bicycles | | | | | | 30% |
|  | Medium-quality bicycles | | | | | | 70% |
|  |  |  | | | | |  |
| 3. | Weighted-average unit  contribution margin | = ($400 × 30%) + ($300 × 70%) | | | | |  |
|  |  | = $330 | | | | |  |
| 4. |  | | | | | |  |
|  | | |  |  |  | |
| Bicycle Type | | | Break-Even Sales Volume | Sales Price | Sales Revenue | |
| High-quality bicycles | | | 135 (450 × .30) | $1,000 | $135,000 | |
| Medium-quality bicycles | | | 315 (450 × .70) | 600 | 189,000 | |
| Total | |  | |  | $324,000 | |

5. Target net income:



This means that the shop will need to sell the following volume of each type of bicycle to earn the target net income:

High-quality 225 (750 × .30)

Medium-quality 525 (750 × .70)

# SOLUTIONS to ASSIGNED PROBLEMS

**PROBLEM 7-37**

1. **Unit contribution margin:**

|  |  |  |
| --- | --- | --- |
| **Sales price…………………………………** |  | **$32.00** |
| **Less variable costs:** |  |  |
| **Sales commissions ($32 x 5%)……** | **$ 1.60** |  |
| **System variable costs………………** | **8.00** | **9.60** |
| **Unit contribution margin………………..** |  | **$22.40** |

**Break-even point = fixed costs ÷ unit contribution margin**

**= $1,971,200 ÷ $22.40**

**= 88,000 units**

1. **Model B is more profitable when sales and production average 184,000 units.**

|  |  |  |
| --- | --- | --- |
|  | **Model A** | **Model B** |
|  |  |  |
| **Sales revenue (184,000 units x $32.00)……...** | **$5,888,000** | **$5,888,000** |
| **Less variable costs:** |  |  |
| **Sales commissions ($5,888,000 x 5%)…** | **$ 294,400** | **$ 294,400** |
| **System variable costs:……………………** |  |  |
| **184,000 units x $8.00………………….** | **1,472,000** |  |
| **184,000 units x $6.40………………….** |  | **1,177,600** |
| **Total variable costs………………………..** | **$1,766,400** | **$1,472,000** |
| **Contribution margin…………………………...** | **$4,121,600** | **$4,416,000** |
| **Less: Annual fixed costs……………………..** | **1,971,200** | **2,227,200** |
| **Net income………………………………………** | **$2,150,400** | **$2,188,800** |

1. **Annual fixed costs will increase by $180,000 ($900,000 ÷ 5 years) because of straight-line depreciation associated with the new equipment, to $2,407,200 ($2,227,200 + $180,000). The unit contribution margin is $24 ($4,416,000 ÷ 184,000 units). Thus:**

**Required sales = (fixed costs + target net profit) ÷ unit contribution margin**

**= ($2,407,200 + $1,912,800) ÷ $24**

**= 180,000 units**

1. **Let X = volume level at which annual total costs are equal**

**$8.00X + $1,971,200 = $6.40X + $2,227,200**

**$1.60X = $256,000**

**X = 160,000 units**