CHAPTER 6

Cost-Volume-Profit Analysis: Additional Issues

Learning Objectives

1. Apply basic CVP concepts.
2. Explain the term sales mix and its effects on break-even sales.
3. Determine sales mix when a company has limited resources.
4. Indicate how operating leverage affects profitability.

*5. Explain the differences between absorption costing and variable costing.

ANSWERS TO QUESTIONS

1. CVP or cost-volume-profit analysis is the study of the effects of changes in costs and volume on a company's profit.

LO1 BT: K Difficulty: Easy TOT: 1 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Decision Analysis

2. Managers use CVP analysis to make decisions involving break-even point, sales required to reach a target net income, margin of safety, the most profitable sales mix, allocation of limited resources, and operating leverage.

LO1 BT: C Difficulty: Easy TOT: 2 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Decision Analysis

3. Both types of income statements report the same amount of net income. But the format used to reach net income differs.

A traditional income statement's format consists of:

Sales revenue – cost of goods sold = gross profit; Gross profit – selling and administrative expenses = net income.

A CVP income statement's format consists of:

Sales revenue – variable expenses = contribution margin; Contribution margin – fixed expenses = net income.

LO1 BT: K Difficulty: Easy TOT: 5 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Decision Analysis

4. The CVP income statement isolates variable costs from fixed costs while the traditional income statement does not. The CVP format indicates contribution margin in total and frequently on a per unit basis as well. This format facilitates calculation of break-even point and target net income. It also highlights how changes in sales volume or cost structure affect net income.

LO1 BT: C Difficulty: Easy TOT: 2 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Decision Analysis

5.

WHEAT COMPANY
CVP Income Statement

Sales	$900,000
Variable costs ($500,000 x .75) + ($200,000 x .75)	525,000
Contribution margin	$375,000

LO1 BT: AP Difficulty: Easy TOT: 3min. AACSB: Analytic AICPA FC: Reporting IMA: Decision Analysis

6. If the selling price is reduced but variable and fixed costs remain unchanged, the break-even point will increase.

LO1 BT: C Difficulty: Easy TOT: 1 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Decision Analysis

7. Sales mix is the relative percentage of each product sold when a company sells more than one product. It is used to calculate the weighted-average unit contribution margin, and changes the calculation of the break-even point because the fixed costs must be divided by the weighted-average unit contribution margin.

LO2 BT: K Difficulty: Easy TOT: 2 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Decision Analysis

8. The 150,000-mile tire has a higher unit contribution margin, that is, each tire sold covers a larger amount of fixed costs. Therefore, if the sales mix shifts away from the 150,000-mile tire to the 50,000-mile tire, the company will have to sell more total tires in order to break-even.

LO2 BT: C Difficulty: Easy TOT: 2 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Decision Analysis

9. If a company has many products, the break-even point is calculated using sales information for divisions or product lines, rather than individual products. The weighted-average contribution margin ratio is computed by multiplying the sales mix percentage of each product line by the contribution margin ratio of each product line, and then summing the results. Total break-even sales in dollars is then calculated by dividing the company's total fixed costs by the weighted-

average contribution margin ratio. Finally, to determine the amount of sales generated by each product line at the break-even point, multiply the total break-even sales by the sales mix percentage of each product line.

LO2 BT: C Difficulty: Easy TOT: 5 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Decision Analysis

10. Contribution margin per unit of limited resource is determined by dividing the unit contribution margin of the product by the number of units of the limited resource required to produce the product.

LO3 BT: C Difficulty: Easy TOT: 2 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Quantitative Methods

11. The theory of constraints is a specific approach used to identify and manage constraints to achieve the company's goals. According to this theory, a company must continually identify its constraints and find ways to reduce or eliminate them, where appropriate. Examples of constraints would be production bottlenecks or poorly trained workers.

LO3 BT: K Difficulty: Easy TOT: 3 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Quantitative Methods

12. Cost structure refers to the relative proportion of fixed costs versus variable costs that a company incurs. Companies that rely heavily on fixed costs will have higher break-even points.

LO4 BT: K Difficulty: Easy TOT: 2 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Decision Analysis

13. Operating leverage refers to the extent to which a company's net income reacts to a given change in sales. A company can increase its operating leverage by increasing its reliance on fixed costs.

LO4 BT: K Difficulty: Easy TOT: 2 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Decision Analysis

14. Typically, manual labor is considered a variable cost. Depreciation on factory equipment is a fixed cost. Therefore, if a company replaces manual labor with automated factory equipment it will increase fixed costs, its operating leverage, and its break-even point.

LO4 BT: C Difficulty: Easy TOT: 2 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Decision Analysis

15. The degree of operating leverage provides a measure of a company's earnings volatility and can be used to compare companies. It is calculated by dividing the contribution margin by net income at a particular level of sales.

LO4 BT: K Difficulty: Easy TOT: 2 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Decision Analysis

16. Pine's degree of operating leverage of 8 versus Fir's measure of 4 tells us that Pine will experience twice (8 ÷ 4) the increase (or decrease) in net income for a given increase (decrease) in sales as Fir.

LO4 BT: C Difficulty: Easy TOT: 3 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Decision Analysis

***17.** Under absorption costing, both variable and fixed manufacturing costs are considered to be product costs. Under variable costing, only variable manufacturing costs are product costs and fixed manufacturing costs are expensed when incurred.

LO5 BT: C Difficulty: Easy TOT: 2 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management

***18.** (a) The rationale for variable costing centers on the purpose of fixed manufacturing costs, which is to have productive facilities available for use. Since these costs are incurred whether a company operates at zero or 100% capacity, it is argued that they should be expensed when they are incurred. Under variable costing it is easier to understand the impact of variable and fixed costs on net income.

(b) Variable costing cannot be used for financial reporting purposes because it does not follow generally accepted accounting principles which requires that fixed manufacturing overhead be accounted for as a product cost

LO5 BT: C Difficulty: Easy TOT: 5 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management

***19.** One way to compute the difference is as follows:

Ending inventory	x	Fixed manufacturing overhead cost per unit	
8,500	x	$5	= $42,500

Absorption costing will report a $42,500 higher net income than variable costing because a portion of the fixed manufacturing overhead costs are deferred in inventory under absorption costing.

LO5 BT: C Difficulty: Easy TOT: 3 min. AACSB: Analytic AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management

***20.** If production equals sales in any given period, the net income under both methods will be equal. In this case, there is no increase in the ending inventory. So fixed manufacturing overhead costs in the current period are not deferred to future periods through the ending inventory. The same total cost is expensed under both methods.

LO5 BT: C Difficulty: Easy TOT: 2 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management

***21.** If production is greater than sales, absorption costing net income will be greater than variable costing net income. Absorption costing net income is higher because some of the fixed manufacturing overhead costs will be deferred in the inventory account until the products are sold.

LO5 BT: C Difficulty: Easy TOT: 2 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management

***22.** In the long run, neither method will produce a higher net income amount. Over a long period of time, sales can never exceed production, nor production exceed sales by significant amounts. For this reason, over the lifetime of a corporation, variable costing and absorption costing will tend to yield the same cumulative net income amounts.

LO5 BT: C Difficulty: Easy TOT: 3 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management

SOLUTIONS TO EXERCISES

EXERCISE 6.3

Current selling price = $325,000 ÷ 5,000 units
Current selling price = $65

1. Increase selling price to $71.50 ($65 x 110%).
Net income = $357,500* – $210,000 – $75,000 = $72,500.

***($71.50 x 5,000)**

($325,000 ÷ 5,000 = $65); (Tot. sales $ ÷ Units sold = Current USP)
[(($65 x 110%) x 5,000) - $210,000 - $75,000 = $72,500]; [((Current USP x % incr.) x Units sold) – Tot. VC – Tot. FC = Net inc.]

2. Reduce variable costs to 58% of sales.
Net income = $325,000 – $188,500 – $75,000 = $61,500.**

****($325,000 x 58%)**

[$325,000 – ($325,000 x 58%) - $75,000 = $61,500]
[Tot sales – (Tot. sales x Reduced VC % of sales) – FC = Net inc.]

3. Reduce fixed costs to $60,000 ($75,000 – $15,000).
Net income = $325,000 – $210,000 – $60,000 = $55,000.

Alternative 1, increasing unit sales price, will produce the highest net income.
LO1 BT: AP Difficulty: Easy TOT: 8 min. AACSB: Analytic AICPA FC: Measurement Analysis and Interpretation IMA: Decision Analysis

EXERCISE 6.4

(a) 1. Contribution margin ratio is: $\frac{\$30,000}{\$48,000} = 62.5\%$

Break-even point in dollars = $\frac{\$20,250}{62.5\%} = \underline{\$32,400}$

2. Contribution margin per flight = $\frac{\$30,000}{400 \text{ flights}} = \$75$

Break-even point in flights = $\frac{\$20,250}{\$75} = \underline{270 \text{ flights}}$

($30,000 ÷ $48,000 = 62.5%); (CM ÷ Sales = CM ratio)
($20,250 ÷ 62.5% = $32,400); (FC ÷ CM ratio = BEP in $)
($30,000 ÷ 400 = $75); (CM ÷ No. of flights = CM per flight)
($20,250 ÷ $75 = 270); (FC ÷ CM per flight = BEP in flights)

(b) At the break-even point fixed costs and contribution margin are equal. Therefore, the contribution margin at the break-even point would be $20,250.

(c) Fare revenue ($108* x 500)**	**$54,000**
Variable costs ($18,000 x 125%)	**22,500**
Contribution margin	**31,500**
Fixed costs	**20,250**
Net income	**$11,250**

Yes, the fare decrease should be implemented because net income increases to $11,250 from $9,750.

***$120 – (10% x $120)**
****400 + (25% x 400)**

[$120 – ($120 x 10%) = $108]; [Current price per flight – (current price per flight x % decr.) = Proposed price per flight]
(400 + 100 = 500); (Current no. of flights + proposed incr. = Proposed no. of flights)
[($108 x 500) – ($18,000 x 125%) - $20,250 = $11,250]; [(Proposed price per flight x proposed no. of flights) – (Current VC x Proposed % incr.) – FC = Proposed net inc.]
LO1 BT: AP Difficulty: Moderate TOT: 12 min. AACSB: Analytic AICPA FC: Measurement Analysis and Interpretation IMA: Decision Analysis

EXERCISE 6.5

(a)

CAREY COMPANY
CVP Income Statement
For the Year Ended December 31, 2022

	Total	Per Unit	% of Sales
Sales (60,000 x $25)	$1,500,000	$25	100%
Variable costs (60,000 x $15)	900,000	15	60
Contribution margin (60,000 x $10)	600,000	$10	40%
Fixed costs	500,000		
Net income	$ 100,000		

(b)

CAREY COMPANY
CVP Income Statement
For the Year Ended December 31, 2022

	Total	Per Unit	% of Sales
Sales [(60,000 x 105%) x $23.50*]	$1,480,500	$23.50	100%
Variable costs (63,000 x $12.00**)	756,000	12.00	51
Contribution margin (63,000 x $11.50)	724,500	$11.50	49%
Fixed costs ($500,000 + $100,000)	600,000		
Net income	$ 124,500		

***$25.00 – ($3.00 x 50%) = $23.50**
****$15.00 – ($15.00 x 20%) = $12.00; or $15.00 - $3.00(given) = $12.00**
[((60,000 x 105%) x ($26 – ($3 x 50%))) – (63,000 x ($15 – ($15 x 20%))) – ($500,000 + $100,000) = $124,500]
[(Incr. units sold x reduced USP) – (Incr. units sold x reduced UVC) – Incr. FC = New net inc.]
LO1 BT: AP Difficulty: Easy TOT: 10 min. AACSB: Analytic AICPA FC: Measurement Analysis and Interpretation IMA: Decision Analysis

EXERCISE 6.6

	Sales Mix Percentage	Unit contribution Margin	Weighted-Average Contribution Margin
Lawnmowers	20%	$30	$ 6
Weed-trimmers	50%	$20	10
Chainsaws	30%	$40	12
			$28

Total break-even sales in units = $4,200,000 ÷ $28 = 150,000 units

EXERCISE 6.6 (Continued)

	Sales Mix Percentage		Total Break-even Sales in Units		Sales Units Needed Per Product
Lawnmowers	**20%**	**x**	**150,000**	**=**	**30,000 units**
Weed-trimmers	**50%**	**x**	**150,000**	**=**	**75,000 units**
Chainsaws	**30%**	**x**	**150,000**	**=**	**45,000 units**
Total units					**150,000 units**

LO2 BT: AP Difficulty: Easy TOT: 4 min. AACSB: Analytic AICPA FC: Measurement Analysis and Interpretation IMA: Decision Analysis

[$4,200,000 ÷ ((20% x $30) + (50% x $20) + (30% x $40)) = 150,000]; (FC ÷ Wtd.-ave. CM = Tot. BEP units) [(20% x 150,000 = 30,000) + (50% x 150,000 = 75,000) + (30% x 150,000 = 45,000) = 150,000]; [(Lawnmowers sales mix % x Tot. BEP units = Lawnmowers at BEP) + (Weed-trimmers sales mix % x Tot. BEP units = Weed-trimmers at BEP) + (Chainsaws sales mix % x Tot. BEP units = Chainsaws at BEP) = Tot. BEP units]

EXERCISE 6.8

(a)

	Sales Mix Percentage	Contribution Margin Ratio	Weighted-Average Contribution Margin Ratio
Mail pouches and small boxes	**80%**	**20%**	**0.16**
Non-standard boxes	**20%**	**70%**	**0.14**
			0.30

Total break-even sales in dollars = $12,000,000 ÷ 0.30 = $40,000,000

	Sales Mix Percentage		Total Break-even Sales in Dollars		Sales Dollars Needed Per Product
Mail pouches and small boxes	**80%**	**x**	**$40,000,000**	**=**	**$32,000,000**
Non-standard boxes	**20%**	**x**	**$40,000,000**	**=**	**8,000,000**
Total sales					**$40,000,000**

EXERCISE 6.8 (Continued)

(b)

	Sales Mix Percentage	Contribution Margin Ratio	Weighted-Average Contribution Margin Ratio
Mail pouches and small boxes	40%	20%	0.08
Non-standard boxes	60%	70%	0.42
			0.50

Total break-even sales in dollars = $12,000,000 ÷ 0.50 = $24,000,000

	Sales Mix Percentage		Total Break-even Sales in Dollars		Sales Dollars Per Product
Mail pouches and small boxes	40%	x	$24,000,000	=	$ 9,600,000
Non-standardized boxes	60%	x	$24,000,000	=	14,400,000
Total sales					$24,000,000

[$12,000,000 ÷ ((40% x 20%) + (60% x 70%)) = $24,000,000]; (FC ÷ Wtd.-ave. CM ratio = Tot. BEP $)
[(40% x $24,000,000 = $9,600,000) + (60% x $24,000,000 = $14,400,000) = $24,000,000]; [(Mail pouches sales mix % x Tot. BEP $ = Mail pouches sales $ at BEP) + (Non-std. boxes sales mix % x Tot. BEP $ = Non-std. boxes sales $ at BEP) = Tot. BEP $]
LO2 BT: AN Difficulty: Easy TOT: 10 min. AACSB: Analytic AICPA FC: Measurement Analysis and Interpretation IMA: Decision Analysis

EXERCISE 6.10

(a) Sales mix percentage
Tablet division: $600,000 ÷ ($600,000 + $400,000) = 0.60
MP3 Player division:$400,000 ÷ ($600,000 + $400,000) = 0.40

Contribution margin ratio:
Tablet division: $180,000 ÷ $600,000 = 0.30
MP3 Player division:$140,000 ÷ $400,000 = 0.35

[($600,000 ÷ ($600,000 + $400,000) = .60); ($400,000 ÷ ($600,000 + $400,000) = .40)]; [(Tablet ÷ Tot. sales = Tablet sales mix %); (MP3 player sales ÷ Tot. sales = MP3 player sales mix %)]
[($180,000 ÷ $600,000 = .30); ($140,000 ÷ $400,000 = .35)]; [Tablet CM ÷ Tablet sales = Tablet CM ratio); (MP3 player CM ÷ MP3 player sales = MP3 player CM ratio)]

(b) Weighted-average contribution margin ratio = $\frac{\$320,000}{\$1,000,000}$ = 0.32 OR

Weighted-average contribution margin ratio = (0.60 x 0.30) + (0.40 x 0.35) = 0.32

(c) Break-even point in dollars = $120,000 ÷ 0.32 = $375,000

(d) Sales dollars needed at break-even point for each division
Tablet division: $375,000 x 0.60 = $225,000
MP3 Player division:$375,000 x 0.40 = $150,000

[($375,000 x .60 = $225,000); ($375,000 x .40 = $150,000)]; [(Tablet: BEP in $ x Tablet sales mix % = Tablet sales $ at BEP); (MP3 player: BEP in $ x MP3 player sales mix % = MP3 player sales $ at BEP)]
LO2 BT: AP Difficulty: Easy TOT: 8 min. AACSB: Analytic AICPA FC: Measurement Analysis and Interpretation IMA: Decision Analysis

EXERCISE 6.11

(a)

	Product		
	A	B	C
Unit contribution margin (a)	$ 6	$ 2	$ 3
Machine hours required (b)	2	1	2
Contribution margin per unit of limited resource (a) ÷ (b)	$3.00	$2.00	$1.50

[(A: $6 ÷ 2 = $3); (B: $2 ÷ 1 = $2); (C: $3 ÷ 2 = $1.50)]
[(A: UCM ÷ MH/unit = CM/MH); (B: UCM ÷ MH/unit = CM/MH); (C: UCM ÷ MH/unit = CM/MH)]

(b) Product A should be manufactured because it results in the highest contribution margin per machine hour.

(c) 1.

	Product		
	A	B	C
Machine hours (a) (3,000 ÷ 3)	1,000	1,000	1,000
Contribution margin per unit of limited resource (b)	$3.00	$ 2.00	$ 1.50
Total contribution margin [(a) x (b)]	$3,000	$2,000	$1,500

The total contribution margin = ($3,000 + $2,000 + $1,500) = $6,500.

[(A: 1,000 x $3) + (B: 1,000 x $2) + (C: 1,000 x $1.50) = $6,500]
[(A: MH x CM/MH) +(B: MH x CM/MH) + (C: MH x CM/MH) = Tot. CM]

2.

	Product A
Machine hours (a)	3,000
Contribution margin per unit of limited resource (b)	$3.00
Total contribution margin [(a) x (b)]	$9,000

(A: 3,000 x $3 = $9,000)
(A: MH x CM/MH = Tot. CM)
LO3 BT: AN Difficulty: Easy TOT: 12 min. AACSB: Analytic AICPA FC: Measurement Analysis and Interpretation IMA: Decision Analysis

EXERCISE 6.12

(a) Product D: $30 ÷ $10 = 3.0 hours per unit
Product E: $80 ÷ $10 = 8.0 hours per unit
Product F: $35 ÷ $10 = 3.5 hours per unit

[(D: $30 ÷ $10 = 3.0); (E: $80 ÷ $10 = 8.0); ($35 ÷ $10 = 3.5)]
[(D: DL cost ÷ DL hrly. rate = DLH/unit); (E: DL cost ÷ DL hrly. rate = DLH/unit); (F: DL cost ÷ DL hrly. rate = DLH/unit)]

EXERCISE 6.12 (Continued)

(b)

	Product		
	D	E	F
Selling price	$ 200	$ 300	$ 250
Variable costs	125	160	180
Contribution margin	75	140	70
Direct labor hours per unit	÷ 3.0	÷ 8.0	÷ 3.5
Contribution margin per direct labor hour	$25.00	$17.50	$20.00

[(D: ($200 - $125) ÷ 3 = $25); (E: ($300 - $160) ÷ 8 = $17.50); (F: ($250 - $180) ÷ 3.5 = $20)]
[(D: (USP – UVC) ÷ DLH/unit = CM/DLH); (E: (USP – UVC) ÷ DLH/unit = CM/DLH); (F: (USP – UVC) ÷ DLH/unit = CM/DLH)]

(c) Product D should be produced because it generates the highest contribution margin per direct labor hour.

	Product D
Total direct labor hours available	2,000
Contribution margin per direct labor hour	x $25
Total contribution margin	$50,000

LO3 BT: AN Difficulty: Easy TOT: 6 min. AACSB: Analytic AICPA FC: Measurement analysis and Interpretation IMA: Decision Analysis

EXERCISE 6.14

(a)

	Contribution Margin	÷	Net Income	=	Degree of Operating Leverage
Armstrong	**$260,000**	**÷**	**$100,000**	**=**	**2.60**
Contador	**$450,000**	**÷**	**$100,000**	**=**	**4.50**

Interpretation: Contador has a higher degree of operating leverage. Its earnings would increase (decrease) by a greater amount than Armstrong if each experienced an equal increase (decrease) in sales.
[(Armstrong: $260,000 ÷ $100,000 = 2.60); (Contador: $450,000 ÷ $100,000 = 4.50)]

EXERCISE 6.14 (Continued)

[(Armstrong: CM ÷ Net inc. = DOL); (Contador: CM ÷ Net inc. = DOL)]

(b)

	Armstrong Company	Contador Company
Sales	**$550,000***	**$550,000**
Variable costs	**264,000****	**55,000*****
Contribution margin	**286,000**	**495,000**
Fixed costs	**160,000**	**350,000**
Net income	**$126,000**	**$145,000**

***$500,000 x 1.1**
****$240,000 x 1.1**
*****$ 50,000 x 1.1**

[(Armstrong: ($500,000 x 1.1) – ($240,000 x 1.1) - $160,000 = $126,000); (Contador: $550,000 – ($50,000 x 1.1) - $350,000 = $145,000)]
[(Armstrong: Incr. sales – Incr. VC – FC = Net inc.); (Contador: Incr. sales – Incr. VC – FC = Net inc.)]

(c) Each company experienced a $50,000 increase in sales. However, because of Contador's higher operating leverage, it experienced a $45,000 ($145,000 – $100,000) increase in net income while Armstrong experienced only a $26,000 ($126,000 – $100,000) increase. This is what we would have expected, since Contador's degree of operating leverage exceeds that of Armstrong.

LO4 BT: AN Difficulty: Easy TOT: 8 min. AACSB: Analytic AICPA FC: Measurement analysis and Interpretation IMA: Decision Analysis

EXERCISE 6.15

(a)

	Contribution Margin	÷	Net Income	=	Degree of Operating Leverage
Manual system	**$300,000**	**÷**	**$200,000**	**=**	**1.50**
Computerized system	**$900,000**	**÷**	**$200,000**	**=**	**4.50**

(b) The computerized system would produce profits that are 3.0 times (4.50 ÷ 1.50) as much as the manual system. With a $150,000 increase in sales, net income would increase $30,000 ($230,000 – $200,000) under the manual system and $90,000 ($290,000 – $200,000) under the computerized system.

EXERCISE 6.15 (Continued)

	Manual System	Computerized System
Sales	**$1,650,000**	**$1,650,000**
Variable costs	**1,320,000***	**660,000****
Contribution margin	**330,000**	**990,000**
Fixed costs	**100,000**	**700,000**
Net income	**$ 230,000**	**$ 290,000**

***($1,200,000 ÷ $1,500,000) x $1,650,000**
****($600,000 ÷ $1,500,000) x $1,650,000**

[(Manual: ($1,500,000 + $150,000) – (($1,200,000 ÷ $1,500,000) x $1,650,000) - $100,000 = $230,000); (Computerized: ($1,500,000 + $150,000) – (($600,000 ÷ $1,500,000) x $1,650,000) - $700,000 = $290,000)]
[(Manual: Incr. sales – Incr. VC – FC = Net inc.); (Computerized: Incr. sales – Incr. VC – FC = Net inc.)]

(c)

	(Actual Sales	–	Break-even Sales)	÷	Actual Sales	=	Margin of Safety Ratio
Manual system	**($1,500,000**	**–**	**$500,000*)**	**÷**	**$1,500,000**	**=**	**.67**
Computerized system	**($1,500,000**	**–**	**$1,166,667**)**	**÷**	**$1,500,000**	**=**	**.22**

***$100,000 ÷ ($300,000 ÷ $1,500,000)**
****$700,000 ÷ ($900,000 ÷ $1,500,000)**

The manual system could weather the greater decline in sales before reaching the break-even point. Under the manual system sales could drop 67% before suffering a loss, while sales under the computerized system could only decline by 22% before suffering a loss.

[(Manual: ($1,500,000 - ($100,000 ÷ ($300,000 ÷ $1,500,000)) ÷ $1,500,000 = .67); (Computerized: ($1,500,000 – ($700,000 ÷ ($900,000 ÷ $1,500,000)) ÷ $1,500,000 = .22)]
[(Manual: (Act. sales $ - BEP $) ÷ Act. sales $ = MOS ratio); (Computerized: (Act. sales $ - BEP $) ÷ Act. sales $ = MOS ratio)]
LO4 BT: AN Difficulty: Easy TOT: 12 min. AACSB: Analytic AICPA FC: Measurement analysis and Interpretation IMA: Decision Analysis

*EXERCISE 6.17

(a)

Unit Cost	
Direct materials	**$ 7.50**
Direct labor	**3.45**
Variable manufacturing overhead	**5.80**
Manufacturing cost per unit	**$16.75**

***EXERCISE 6.17 (Continued)**

(b)

SIREN COMPANY
Income Statement
For the Year Ended December 31, 2022
Variable Costing

Sales (80,000 lures x $25)		$2,000,000
Variable cost of goods sold (80,000 lures x $16.75)	$1,340,000	
Variable selling and administrative expenses (80,000 lures x $3.90)	312,000	1,652,000
Contribution margin		348,000
Fixed manufacturing overhead	225,000	
Fixed selling and administrative expenses	210,100	435,100
Net Income (loss)		$ (87,100)

[(80,000 x $25) – ((80,000 x $16.75) + (80,000 x $3.90)) – ($225,000 + $210,100) = ($87,100)]
[(Units sold x USP) – ((Units sold x Unit VCGS) + (Units sold x Unit VS&A)) – (FMOH + FS&A) = Net loss]

(c)

Unit Cost	
Direct materials	$ 7.50
Direct labor	3.45
Variable manufacturing overhead	5.80
Fixed manufacturing overhead ($225,000 ÷ 90,000)	2.50
Manufacturing cost per unit	$19.25

(d)

SIREN COMPANY
Income Statement
For the Year Ended December 31, 2022
Absorption Costing

Sales (80,000 lures x $25)		$2,000,000
Cost of goods sold (80,000 lures x $19.25)		1,540,000
Gross profit		460,000
Variable selling and administrative expenses (80,000 lures x $3.90)	$312,000	
Fixed selling and administrative expenses	210,100	522,100
Net Income (loss)		$ (62,100)

[(80,000 x $25) – (80,000 x $19.25) – ((80,000 x $3.90) + $210,100) = ($62,100)]
[(Units sold x USP) – (Units sold x Mfg. cost/unit) – ((Units sold x Unit VS&A) + FS&A) = Net loss]

*EXERCISE 6.17 (Continued)

LO5 BT: AP Difficulty: Moderate TOT: 15 min. AACSB: Analytic AICPA FC: Measurement analysis and Interpretation, Reporting IMA: Cost Management, Reporting

*EXERCISE 6.18

(a)

Direct materials used	**$ 79,000**
Direct labor incurred	**30,000**
Variable manufacturing overhead	**21,500**
Variable manufacturing costs	**$130,500**

Variable manufacturing cost per unit = $130,500 ÷ 9,000 = $14.50 per unit

Finished goods inventory cost = (9,000 – 8,200 units) x $14.50
= $11,600

[(($79,000 + $30,000 + $21,500) ÷ 9,000 = $14.50); ((9,000 – 8,200) x $14.50 = $11,600)]
[((DM used + DL incurred + Var. MOH) ÷ Units produced = Var. mfg. cost/unit); ((Units produced – Units sold) x Var. mfg. cost/unit = Fin. gds. inv. cost)]

(b) Absorption costing would show a higher net income because a portion of the fixed costs are deferred to future periods. The following computation indicates that finished goods inventory will be $4,000 higher under absorption costing which will cause its net income to be $4,000 higher.

Direct materials used	**$ 79,000**
Direct labor incurred	**30,000**
Variable manufacturing overhead	**21,500**
Fixed manufacturing overhead	**45,000**
Total manufacturing costs	**$175,500**

Total manufacturing costs per unit = $175,500 ÷ 9,000 = $19.50 per unit

Finished goods inventory cost = (9,000 – 8,200 units) x $19.50 = $15,600

Inventory (absorption costing)	**$15,600**
Inventory (variable costing)	**11,600**
	$ 4,000

[(($79,000 + $30,000 + $21,500 + $45,000) ÷ 9,000 = $19.50); ((9,000 – 8,200) x $19.50 = $15,600)]
[((DM used + DL incurred + Var. MOH + Fix. MOH) ÷ Units produced = Tot. mfg. cost/unit); ((Units produced – Units sold) x Tot. mfg. cost/unit = Fin. gds. inv. cost)]
LO5 BT: AN Difficulty: Moderate TOT: 10 min. AACSB: Analytic AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management

*EXERCISE 6.19

(a)

Utility Expense

Months in a year	x	Kilowatt hours	x	Hourly Charge	=	Variable Utilities
12	x	500	x	$0.50	=	$3,000

Months in a year	x	Monthly Fee	=	Fixed Utilities
12	x	$1,500	=	$18,000

Variable Costing	
Labor:	
Crate builders	$43,000
Material:	
Wood	54,000
Variable Overhead:	
Utilities	3,000
Nails	350
Total manufacturing costs	$100,350

[$43,000 + $54,000 + (12 x 500 x $0.50) + $350 = $100,350]
[DL + DM + Var. util. + Nails = Tot. var. mfg. costs]

(b)

Absorption Costing	
Labor:	
Crate builders	$ 43,000
Material:	
Wood	54,000
Variable overhead:	
Utilities	3,000
Nails	350
Fixed overhead:	
Utilities	18,000
Rent	21,400
Total manufacturing costs	$139,750

($43,000 + $54,000 + $3,000 + $350 + $18,000 + $21,400 = $139,750)
(DL + DM + Var. util. + Nails + Fix. util. + Rent = Tot. mfg. costs)

EXERCISE 6.19 (Continued)

(c) The entire difference in costs between the two methods is due to the fact that fixed overhead is included as part of manufacturing costs only under the absorption costing method. This difference amounts to $39,400 ($18,000 + $21,400).

LO5 BT: AN Difficulty: Moderate TOT: 10 min. AACSB: Analytic AICPA FC: Measurement Analysis and Interpretation IMA: Cost Management

SOLUTIONS TO PROBLEMS

PROBLEM 6.1

(a) Sales were $2,000,000 and variable expenses were $1,200,000, which means contribution margin was $800,000 and the CM ratio was 0.40. Fixed expenses were $1,035,000. Therefore, the break-even point in dollars is:

$$\frac{\$1,035,000}{.40} = \$2,587,500$$

[(($2,000,000 - $1,200,000) ÷ $2,000,000 = .40); ($1,035,000 ÷ .40 = $2,587,500)]
[((Sales – VC) ÷ Sales = CM ratio); (FC ÷ CM ratio = BEP in $)]

(b) 1. The effect of this alternative is to increase the selling price per unit to $31.25 ($25 x 125%). Total sales become $2,500,000 (80,000 x $31.25). Thus, contribution margin ratio changes to 52% [($2,500,000 – $1,200,000) ÷ $2,500,000]. The new break-even point is:

$$\frac{\$1,035,000}{0.52} = \$1,990,385 \text{ (rounded)}$$

[(((80,000 x ($25 x 125%)) - $1,200,000) ÷ $2,500,000 = .52); ($1,035,000 ÷ .52 = $1,990,385 (rounded))]
[(((Units sold x Incr. USP) – VC) ÷ Incr. sales = CM ratio); (FC ÷ CM ratio = New BEP in $)]

2. The effects of this alternative are: (1) fixed costs decrease by $160,000, (2) variable costs increase by $100,000 ($2,000,000 x 5%), (3) total fixed costs become $875,000 ($1,035,000 – $160,000), and the contribution margin ratio becomes 0.35 [($2,000,000 – $1,200,000 – $100,000) ÷ $2,000,000]. The new break-even point is:

$$\frac{\$875,000}{0.35} = \$2,500,000$$

3. The effects of this alternative are: (1) variable and fixed cost of goods sold become $784,000 (($1,050,000 + $518,000) ÷ 2) each, (2) total variable costs become $934,000 ($784,000 + $92,000 + $58,000), (3) total fixed costs are $1,301,000 ($784,000 + $425,000 + $92,000) and the contribution margin ratio becomes 0.533 [($2,000,000 – $934,000) ÷ $2,000,000]. The new break-even point is:

$$\frac{\$1,301,000}{0.533} = \$2,440,901 \text{ (rounded)}$$

[(($1,568,000 x .50) + $92,000 + $58,000 = $934,000); (($1,568,000 x .50) + $425,000 + $92,000 = $1,301,000); (($2,000,000 - $934,000) ÷ $2,000,000 = .533); ($1,301,000 ÷ .533 = $2,440,901 (rounded))]
[(Var. CGS + Var. sell. exp. + Var. admin. sell. = Tot. VC); (Fix. CGS + Fix. sell. exp. + Fix. admin. exp. = Tot. FC); ((Sales – Tot. VC) ÷ Sales = CM ratio); (Tot. FC ÷ CM ratio = New BEP in $)]

PROBLEM 6.1 (Continued)

Alternative 1 is the recommended course of action using break-even analysis because it has the lowest break-even point.

LO1 BT: AN Difficulty: Moderate TOT: 25 min. AACSB: Analytic AICPA FC: Measurement Analysis and Interpretation IMA: Decision Analysis

PROBLEM 6.2

(a) (1)

	Current Year
Sales	**$1,500,000**
Variable costs	
Direct materials	**511,000**
Direct labor	**290,000**
Manufacturing overhead ($350,000 x 0.70)	**245,000**
Selling expenses ($250,000 x 0.40)	**100,000**
Administrative expenses ($270,000 x 0.20)	**54,000**
Total variable costs	**1,200,000**
Contribution margin	**$ 300,000**

	Current Year		Projected Year
Sales	**$1,500,000**	**x 1.1**	**$1,650,000**
Variable costs			
Direct materials	**511,000**	**x 1.1**	**562,100**
Direct labor	**290,000**	**x 1.1**	**319,000**
Manufacturing overhead	**245,000**	**x 1.1**	**269,500**
Selling expenses	**100,000**	**x 1.1**	**110,000**
Administrative expenses	**54,000**	**x 1.1**	**59,400**
Total variable costs	**1,200,000**	**x 1.1**	**1,320,000**
Contribution margin	**$ 300,000**	**x 1.1**	**$ 330,000**

[(Current yr.: $1,500,000 – ($511,000 + $290,000 + ($350,000 x .70) + ($250,000 x .40) + ($270,000 x .20)) = $300,000); (Projected yr.: $300,000 x 1.1 = $330,000)
[(Current yr.: Sales – (DM + DL + Var. MOH + Var. sell. exp. + Var. admin. exp.) = CM); (Projected yr.: Current yr. CM x Projected incr. = CM)]

(2)

Fixed Costs	Current Year	Projected year
Manufacturing overhead ($350,000 x 0.30)	**$105,000**	**$105,000**
Selling expenses ($250,000 x 0.60)	**150,000**	**150,000**
Administrative expenses ($270,000 x 0.80)	**216,000**	**216,000**
Total fixed costs	**$471,000**	**$471,000**

[Current & projected yr.: ($350,000 x .30) + ($250,000 x .60) + ($270,000 x .80) = $471,000]
[Current & projected yr.: Fix. MOH + Fix. sell. exp. + Fix. admin. exp. = Tot. FC]

PROBLEM 6.2 (Continued)

(b) Unit selling price = $1,500,000 ÷ 100,000 = $15
Unit variable cost = $1,200,000 ÷ 100,000 = $12
Unit contribution margin = $15 – $12 = $3
Contribution margin ratio = $3 ÷ $15 = 0.20

Break-even point in units	=	Fixed costs	÷	Unit contribution margin
157,000 units	=	$471,000	÷	$3.00

Break-even point in dollars	=	Fixed costs	÷	Contribution margin ratio
$2,355,000	=	$471,000	÷	0.20

[(($1,500,000 ÷ 100,000) – ($1,200,000 ÷ 100,000) = $3); ($3 ÷ $15 = .20)]; [(USP – UVC = UCM); (UCM ÷ USP = CM ratio)]
[($471,000 ÷ $3 = 157,000); ($471,000 ÷ .20 = $2,355,000)]; (FC ÷ UCM = BEP in units); (FC ÷ CM ratio = BEP in $)]

(c) Sales dollars required for target net income = (Fixed costs + Target net income) ÷ Contribution margin ratio

$3,355,000 = ($471,000 + $200,000) ÷ 0.20

(d) Margin of safety ratio = (Expected sales – Break-even sales) ÷ Expected sales

29.8% = ($3,355,000 – $2,355,000) ÷ $3,355,000

(e) (1)

	Current Year
Sales	**$1,500,000**
Variable costs	
Direct materials	**511,000**
Direct labor ($290,000 – $104,000)	**186,000**
Manufacturing overhead ($350,000 x 0.30)	**105,000**
Selling expenses ($250,000 x 0.90)	**225,000**
Administrative expenses ($270,000 x 0.20)	**54,000**
Total variable costs	**1,081,000**
Contribution margin	**$ 419,000**

PROBLEM 6.2 (Continued)

Fixed cost	
Manufacturing overhead ($350,000 x 0.70)	$245,000
Selling expenses ($250,000 x 0.10)	25,000
Administrative expenses ($270,000 x 0.80)	216,000
Total fixed costs	$486,000

(2) Contribution margin ratio = $419,000 ÷ $1,500,000 = 0.28 (rounded)

(3) Break-even point in dollars = $486,000 ÷ 0.28 = $1,735,714 (rounded)

The break-even point in dollars declined from $2,355,000 to $1,735,714. This means that overall the company's risk has declined because it doesn't have to generate as much in sales. The two changes actually had opposing effects on the break-even point. By changing to a more commission-based approach to compensate its sales staff the company reduced its fixed costs, and therefore reduced its break-even point. In contrast, the purchase of the new equipment increased the company's fixed costs (by increasing its equipment depreciation) which would increase the break-even point.

LO1 BT: AN Difficulty: Moderate TOT: 30 min. AACSB: Analytic AICPA FC: Measurement Analysis and Interpretation IMA: Decision Analysis

PROBLEM 6.3

(a)

	Sales Mix Percentage	x	Contribution Margin Ratio	=	Weighted-Average Contribution Margin Ratio
Appetizers	15%	x	50%	=	0.075
Main entrees	50%	x	25%	=	0.125
Desserts	10%	x	50%	=	0.050
Beverages	25%	x	80%	=	0.200
					0.450

Total sales required to achieve target net income = ($1,053,000 + $117,000) ÷ 0.45 = $2,600,000

	Sales Mix Percentage	x	Total Sales Needed	=	Sales from Each Product
Appetizers	15%	x	$2,600,000	=	$ 390,000
Main entrees	50%	x	$2,600,000	=	1,300,000
Desserts	10%	x	$2,600,000	=	260,000
Beverages	25%	x	$2,600,000	=	650,000
					$2,600,000

[(Appet.: 15% x 50%) + (Main ent.: 50% x 25%) + (Desserts: 10% x 50%) + (Bev.: 25% x 80%) = .450]; [(Appet.: Sales mix % x CM ratio) + (Main ent.: Sales mix % x CM ratio) + (Desserts: Sales mix % x CM ratio) + (Bev.: Sales mix % x CM ratio) = Wtd.-ave. CM ratio]
[($1,053,000 + $117,000) ÷ .45 = $2,600,000]; [(FC + Target net inc.) ÷ Wtd.-ave. CM ratio = Tot. sales $ req.]
[(Appet.: 15% x $2,600,000) + (Main ent.: 50% x $2,600,000) + (Desserts: 10% x $2,600,000) + (Bev.: 25% x $2,600,000) = $2,600,000]; [(Appet.: Sales mix % x Tot. sales $ req.) + (Main ent.: 50% x Tot. sales $ req.) + (Desserts: Sales mix % x Tot. sales $ req.) + (Bev.: Sales mix % x Tot. sales $ req.) = Tot. sales $ req.]

(b)

	Sales Mix Percentage	x	Contribution Margin Ratio	=	Weighted-Average Contribution Margin Ratio
Appetizers	25%	x	50%	=	0.125
Main entrees	25%	x	10%	=	0.025
Desserts	10%	x	50%	=	0.050
Beverages	40%	x	80%	=	0.320
					0.520

Total sales required to achieve target net income = ($1,638,000* + $117,000) ÷ 0.52 = $ 3,375,000

***$1,053,000 + $585,000**

PROBLEM 6.3 (Continued)

Thus, sales would have to increase by $775,000 ($3,375,000 – $2,600,000) to achieve the target net income. This increase in sales is driven by the increase in fixed costs. The sales of each product line would be:

	Sales Mix Percentage	x	Total Sales Needed	=	Sales from Each Product
Appetizers	25%	x	$3,375,000	=	$ 843,750
Main entrees	25%	x	$3,375,000	=	843,750
Desserts	10%	x	$3,375,000	=	337,500
Beverages	40%	x	$3,375,000	=	1,350,000
					$3,375,000

(c)

	Sales Mix Percentage	x	Contribution Margin Ratio	=	Weighted-Average Contribution Margin Ratio
Appetizers	15%	x	50%	=	0.075
Main entrees	50%	x	10%	=	0.050
Desserts	10%	x	50%	=	0.050
Beverages	25%	x	80%	=	0.200
					0.375

The weighted-average contribution margin ratio computed in part (a) was 45%. With the contribution margin ratio on entrees falling to 10%, that average will now be 37.5% as shown previously. Applying this to the new fixed costs of $1,638,000 and target net income of $117,000 we get:

Total sales required to achieve target net income = ($1,638,000 + $117,000) ÷ 0.375 = $ 4,680,000

	Sales Mix Percentage	x	Total Sales Needed	=	Sales from Each Product
Appetizers	15%	x	$4,680,000	=	$ 702,000
Main entrees	50%	x	$4,680,000	=	2,340,000
Desserts	10%	x	$4,680,000	=	468,000
Beverages	25%	x	$4,680,000	=	1,170,000
					$4,680,000

Relative to parts (a) and (b), the total required sales for (c) would increase. It appears that the least risky approach would have been for Paul to switch to the new sales mix, but not to incur the additional fixed costs of expanding operations. If the switch in sales mix appears to be successful, then it may be appropriate for him to incur the additional fixed costs necessary for expansion of operations.

PROBLEM 6.3 (Continued)

[(Appet.: 15% x 50%) + (Main ent.: 50% x 10%) + (Desserts: 10% x 50%) + (Bev.: 25% x 80%) = .375]; [(Appet.: Sales mix % x CM ratio) + (Main ent.: Sales mix % x CM ratio) + (Desserts: Sales mix % x CM ratio) + (Bev.: Sales mix % x CM ratio) = Wtd.-ave. CM ratio]
[($1,638,000 + $117,000) ÷ .375 = $4,680,000]; [(FC + Target net inc.) ÷ Wtd.-ave. CM ratio = Tot. sales $ req.]
[(Appet.: 15% x $4,680,000) + (Main ent.: 50% x $4,680,000) + (Desserts: 10% x $4,680,000) + (Bev.: 25% x $4,680,000) = $4,680,000]; [(Appet.: Sales mix % x Tot. sales $ req.) + (Main ent.: 50% x Tot. sales $ req.) + (Desserts: Sales mix % x Tot. sales $ req.) + (Bev.: Sales mix % x Tot. sale $s req.) = Tot. sales $ req.]
LO2 BT: AN Difficulty: Moderate TOT: 30 min. AACSB: Analytic AICPA FC: Measurement Analysis and Interpretation IMA: Decision Analysis

PROBLEM 6.4

(a)

	Product		
	Economy	Standard	Deluxe
Selling price	$30	$50	$100
Less: Variable costs	16	20	46
Unit contribution margin	$14	$30	$ 54

Ignoring the machine time constraint, the Deluxe product should be produced because it has the highest unit contribution margin.

(b)

	Product		
	Economy	Standard	Deluxe
Unit contribution margin (a)	$ 14	$ 30	$ 54
Machine hours required (b)	0.5	0.8	1.6
Contribution margin per limited resource (a)/(b)	$28.00	$37.50	$33.75

[(Econ.: ($30 - $16) ÷ .5 = $28); (Std.: ($50 - $20) ÷ .8 = $37.50); (Deluxe: ($100 - $46) ÷ 1.6 = $33.75)]
[(Econ.: UCM ÷ MH/unit = CM/MH); (Std.: UCM ÷ MH/unit = CM/MH); (Deluxe: UCM ÷ MH/unit = CM/MH)]

(c) If additional machine hours become available, the additional time should be used to produce the Standard product since it has the highest contribution margin per machine hour.

LO3 BT: AN Difficulty: Easy TOT: 12 min. AACSB: Analytic AICPA FC: Measurement Analysis and Interpretation IMA: Decision Analysis

PROBLEM 6.5

(a) To determine the break-even point in dollars we must first calculate the contribution margin ratio for each company.

	Contribution Margin	÷	Sales	=	Contribution Margin Ratio
Blanc Company	$220,000	÷	$500,000	=	0.44
Noir Company	$320,000	÷	$500,000	=	0.64

	Fixed Costs	÷	Contribution Margin Ratio	=	Break-even Point in Dollars
Blanc Company	$170,000	÷	0.44	=	$386,364
Noir Company	$270,000	÷	0.64	=	$421,875

	(Actual Sales	–	Break-even Sales)	÷	Actual Sales	=	Margin of Safety Ratio
Blanc Company	($500,000	–	$386,364)	÷	$500,000	=	0.227
Noir Company	($500,000	–	$421,875)	÷	$500,000	=	0.156

[(Blanc: $220,000 ÷ $500,000 = .44); (Noir: $320,000 ÷ $500,000 = .64)]; [Blanc: CM ÷ Sales = CM ratio); (Noir: CM ÷ Sales = CM ratio)]
[(Blanc: $170,000 ÷ .44 = $386,364); (Noir: $270,000 ÷ .64 = $421,875)]; [(Blanc: FC ÷ CM ratio = BEP in $); (Noir: FC ÷ CM ratio = BEP in $)]
[(Blanc: ($500,000 - $386,364) ÷ $500,000 = .227); (Noir: ($500,000 - $421,875) ÷ $500,000 = .156)]; [(Blanc: (Act. sales $ - BEP in $) ÷ Act. sales $ = MOS ratio); (Noir: (Act. sales $ - BEP in $) ÷ Act. sales $ = MOS ratio)]

(b)

	Contribution Margin	÷	Net Income	=	Degree of Operating Leverage
Blanc Company	$220,000	÷	$50,000	=	4.4
Noir Company	$320,000	÷	$50,000	=	6.4

Because Noir Company relies more heavily on fixed costs, it has a higher degree of operating leverage. This means that its net income will be more sensitive to changes in sales. For a given change in sales, the change in net income will be 1.45 (6.4 ÷ 4.4) times higher or lower for Noir Company than for Blanc Company.

(c)

	Blanc Company	Noir Company
Sales	$600,000*	$600,000
Variable costs	336,000**	216,000***
Contribution margin	264,000	384,000
Fixed costs	170,000	270,000
Net income	$ 94,000	$114,000

*$500,000 x 1.2
**$280,000 x 1.2
***$180,000 x 1.2

PROBLEM 6.5 (Continued)

(d)

	Blanc Company	Noir Company
Sales	$400,000*	$400,000
Variable costs	224,000**	144,000***
Contribution margin	176,000	256,000
Fixed costs	170,000	270,000
Net income (Loss)	$ 6,000	($ 14,000)

*$500,000 x 0.80
**$280,000 x 0.80
***$180,000 x 0.80

[(Blanc: ($500,000 x .80) – ($280,000 x .80) - $170,000 = $6,000); (Noir: ($500,000 x .80) – ($180,000 x .80) - $270,000 = ($14,000))]
[(Blanc: Decr. sales – Decr. VC – FC = Net inc.); (Noir: Decr. sales – Decr. VC – FC = Net loss)]

(e) In part (b) the degree of operating leverage of Noir Company was higher than that of Blanc Company, telling us that the net income of Noir Company was more sensitive to changes in sales than that of Blanc Company. In part (c) we see that a 20% increase in sales increased the net income of Noir Company by $64,000 ($114,000 – $50,000), while the net income of Blanc Company increased by only $44,000 ($94,000 – $50,000). However, in part (d) we see that a 20% decrease in sales resulted in a $64,000 ($50,000 + $14,000) decline in net income for Noir Company, while Blanc Company's net income only declined by $44,000 ($50,000 – $6,000). The increased risk caused by higher operating leverage is also seen in part (a). Noir Company has a higher break-even point, and a lower margin of safety ratio than Blanc Company. Thus, while operating leverage can be very beneficial for a company that expects its sales to increase, it can also significantly increase a company's risk.

LO4 BT: AN Difficulty: Moderate TOT: 30 min. AACSB: Analytic AICPA FC: Measurement analysis and Interpretation IMA: Decision Analysis

CT 6.5 COMMUNICATION ACTIVITY

MEMO

To: Bjorn Borg—CEO

From: Student

Re: Best use of limited resources

I share your concern, that, since we are operating at full capacity, we need to ensure that our product mix maximizes our profitability. The decision of how to best utilize our limited productive resources is one of the most important decisions we face. We currently make two different anchors, a traditional fishing anchor, and a high-end yacht anchor. The unit contribution margin of the yacht anchor is three times that of the fishing anchor, thus one might logically assume that we should shift our production toward producing the yacht anchor. However, this assumption ignores an element that is critical to the decision. In order to make a proper decision, we would need to know the contribution margin per unit of limited resource that each product produces. While the yacht anchor has a very high contribution margin, it also may consume considerably more productive resources. I propose that a study be done to determine exactly how much of the limited productive resource is consumed by one unit of each of the two anchor types.

In addition, at the same time that this study is being undertaken, I propose that the marketing department undertake a study of the demand for each anchor type. This is important so that we don't produce anchors that we can't sell.

Finally, a shift in our product mix would maximize our profitability at our current level of productive capacity. However, we should also consider a more long-term solution to our production constraints. Since we have been operating at, or near full capacity for two years, it would seem appropriate to undertake a study of whether an acquisition of additional plant equipment would be appropriate.

LO3 BT: C Difficulty: Easy TOT: 15 min. AACSB: None AICPA FC: Measurement Analysis and Interpretation Reporting IMA: Decision Analysis, Reporting

*CT 6.6 ETHICS CASE

(a) The division's net income increased by $225,000 ($525,000 – $300,000). This represents a 75% increase over the previous year ($225,000 ÷ $300,000). Thus Brett's bonus would be 75 x $5,000 = $375,000.

(b) In 2021 the number of units produced and sold were equal. When this occurs variable costing and absorption costing provide the same results. Thus, in 2021, net income under variable costing would have been the same at $300,000. In 2022, units produced exceeded units sold by 5,000 units. However, net income under variable costing is not impacted by the number of units produced. Since the number of units sold did not change from 2021 to 2022, and the selling price, variable cost per unit, and total fixed costs didn't change, the division's net income in 2022 would equal its 2021 income of $300,000.

(c) In part (b) it was determined that the division's net income would have been $300,000 in 2022 under variable costing. Since this is the same as 2021 net income, Brett would not receive a bonus.

(d) If Brett intentionally overproduced inventory in order to increase his bonus, then his actions were unethical. Overproduction of inventory increases the company's costs related to inventory, such as storage, handling, waste and theft. Based on the information provided we can't actually determine Brett's motives. He may have believed that just-in-time inventory was causing the company to lose sales due to "stock-outs." If that was the case, there would be options available to the company other than totally giving up on just-in-time practices. In order to eliminate any potential conflicts of interest between Brett and the company, and to ensure that his actions are in the best interest of the company, the company could begin preparing variable costing income statements to supplement its absorption costing statements for the purpose of calculating bonuses. This would eliminate any incentive Brett might have to over-produce, as well as providing useful information for other internal management decision making.

LO5 BT: E Difficulty: Moderate TOT: 20 min. AACSB: Analytic, Ethics AICPA PC: Communication, Ethical Conduct IMA: Business Applications, Reporting

CT 6.7 ALL ABOUT YOU

(a) Using a common equation for CVP analysis, Sales = Variable Costs + Fixed Costs + Net Income, and substituting the information provided, and knowing that at break-even, net income = $0,

($26 x 300) = Variable Costs + ($4,000 + $1,460) + $0
$7,800 = Variable Costs + $5,460 + $0
$2,340 = Variable Costs (in total)
or $7.80 (variable costs/member/month) = $2,340 ÷ 300

[At BEP: ($26 x 300) – VC – ($4,000 + $1,460) = $0; VC = $2,340; $2,340 ÷ 300 = $7.80]
[At BEP: Sales – VC – FC = Net inc.; VC = Tot. VC; Tot. VC ÷ No. members = UVC]

(b) To find the sales required to reach a target net income, contribution margin must be calculated.

Contribution Margin = Sales – Variable Costs
Contribution Margin = $7,800 – $2,340
Contribution Margin = $5,460
Unit Contribution Margin = $5,460/300 memberships = $18.20
Contribution Margin Ratio = $5,460/$7,800 = 70%

To compute the sales required to reach a target net income of $3,640.

Required Sales in Units = (Fixed Costs + Target Net Income) /Unit Contribution Margin

Required Sales in Units = ($5,460 + $3,640)/$18.20
Required Sales in Units = 500 memberships

Required Sales in Dollars = 500 memberships X $26
= $13,000

OR

Using the contribution margin ratio,

Required Sales in Dollars = (Fixed Costs + Target Net Income) /Contribution Margin Ratio

Required Sales in Dollars = ($5,460 + $3,640)/70%
Required Sales in Dollars = $13,000

[($7,800 - $2,340 = $5,460); ($5,460 ÷ 300 = $18.20); ($5,460 ÷ $7,800 = 70%); (($5,460 + $3,640) ÷ $18.20 = 500); (500 x $26 = $13,000)]
[(Sales – VC = CM); (CM ÷ No. members = UCM); (CM ÷ Sales = CM ratio); ((FC + Target net inc.) ÷ UCM = BEP in members); (BEP in members x USP = BEP in $)]

CT 6.7 (Continued)

(c) Answers will vary. Suggested examples include franchise fees, employee wages, utilities, supplies, and maintenance.

(d) Answers will vary.

LO1 BT: S Difficulty: Easy TOT: 20 min. AACSB: Analytic AICPA FC: Measurement Analysis and Interpretation IMA: Decision Analysis

CT 6.8 CONSIDERING PEOPLE, PLANET, AND PROFIT

Discussion Guide: If reduction of greenhouse gas emissions is a goal, then one step toward attainment of that goal is to assign a cost to greenhouse-gas emissions. One approach that is currently being used is the buying and selling of carbon-emission rights. As companies buy and sell emission rights, the price of polluting becomes a tangible factor in the formulations that will be used to make future energy-source decisions. This approach has been effective in addressing similar issues, such as the reduction of sulfur emissions. However, as suggested in the "No" response, many believe that, to be effective and fair, an enforceable international agreement on such an approach would be necessary. In the United States, companies currently participate on a voluntary basis; in some other countries, participation is required. Another factor to consider in these decisions is the timing of conversion to new technology. A gradual conversion to new technologies as existing power plants reach the end of their productive lives would be far less costly than a rapid conversion to new technologies that required scrapping existing plants before they are fully depreciated. Decisions about which plants to replace and when to replace them will require careful cost-benefit analyses.

LO N/A BT: E Difficulty: Moderate TOT: 20 min. AACSB: Reflective Thinking, Communication IMA: Business Economics