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(b) (c)

202. The following monthly data in contribution format are available for the MN Company and its only product, Product SD:

Units 300

	Total	Per Unit
Sales	$83,700	$279
Variable expenses	32,700	109
Contribution margin	51,000	$170
Fixed expenses	40,000	
Net operating income	$11,000	

(b) 250 units: 279; 109 − 18 = 91; 188 — 69,750; 22,750; 47,000; − 40,000; 7,000 — decrease 4000

(c) (450) 300 × 1.5: 279 − 22 = 257; 109; 148; 40,000 + 20,000 = 60,000 — 115,650; − 49,050; 66,600; 60,000; 6,600

The company produced and sold 300 units during the month and had no beginning or ending inventories.

Required:

a. Without resorting to calculations, what is the total contribution margin at the break-even point? CM 40000; FC = 40,000; NI 0

b. Management is contemplating the use of plastic gearing rather than metal gearing in Product SD. This change would reduce variable expenses by $18 per unit. The company's sales manager predicts that this would reduce the overall quality of the product and thus would result in a decline in sales to a level of 250 units per month. Should this change be made? No. Decrease of profit by 4000

c. Assume that MN Company is currently selling 300 units of Product SD per month. Management wants to increase sales and feels this can be done by cutting the selling price by $22 per unit and increasing the advertising budget by $20,000 per month. Management believes that these actions will increase unit sales by 50 percent. Should these changes be made? No. Decrease of profit by 4,400

d. Assume that MN Company is currently selling 300 units of Product SD. Management wants to automate a portion of the production process for Product SD. The new equipment would reduce direct labor costs by $20 per unit but would result in a monthly rental cost for the new robotic equipment of $10,000. Management believes that the new equipment will increase the reliability of Product SD thus resulting in an increase in monthly sales of 12%. Should these changes be made?

(d) 300 × 1.12 = 336

S 279
VC 109 − 20 = 89
CM 190
FC 40,000 + 10,000

63,840
50,000
13,840 − 11,000 original NI = $2,840 increase in NI

a. The total contribution margin would be $40,000 since it is equal to the fixed expenses at the break-even point.

b. The $18 decrease in variable costs will cause the contribution margin per unit to increase from $170 to $188.

250 units × $188 per unit	**$47,000**
Present total contribution margin:	
300 units × $170 per unit	**51,000**
Decrease in total contribution margin	**$(4,000)**

The less costly components should not be used in the manufacture of Product SD. Net operating income will decrease by $4,000.

c. The decrease in selling price per unit will cause the unit contribution margin to decrease from $170 to $148.

Expected total contribution margin:	
300 units × 150% × $148 per unit	**$66,600**
Present total contribution margin:	
300 units × $170 per unit	**51,000**
Incremental contribution margin	**15,600**
Change in fixed expenses:	
Less incremental advertising expense	**20,000**
Reduction in net operating income	**$(4,400)**

The changes should not be made.

d. The use of the automated process would affect both fixed and variable costs. Fixed expenses will increase by $10,000 from $40,000 to $50,000. Variable costs will decrease by $20 from $109 to $89, and the unit contribution margin will increase from $170 to $190.

Expected total contribution margin:	
300 units × 112% × $190 per unit	**$63,840**
Present total contribution margin:	
300 units × $170 per unit	**51,000**
Increase in total contribution margin	**12,840**
Change in fixed expenses:	
Less monthly equipment rental	**10,000**
Increase in net operating income	**$ 2,840**

The changes should be made.

AACSB: Analytic
AICPA BB: Critical Thinking
AICPA FN: Measurement
Bloom's: Application
Learning Objective: 05-01 Explain how changes in activity affect contribution margin and net operating income
Learning Objective: 05-04 Show the effects on net operating income of changes in variable costs; fixed costs; selling price; and volume
Learning Objective: 05-06 Determine the break-even point
Level: Hard

(e)

207. Iron Decor manufactures decorative iron railings. In preparing for next year's operations, management has developed the following estimates:

20,000 (20,000 × 1.2) = 24,000

	Total	Per Unit
Sales (20,000 units)	$1,000,000	$50.00
Direct materials	$200,000	$10.00
Direct labor (variable)	$50,000	$2.50
Manufacturing overhead:		
Variable	$70,000	$3.50
Fixed	$80,000	$4.00
Selling & administrative:		
Variable	$100,000	$5.00
Fixed	$30,000	$1.50
NI	470,000	

CM/unit = 29 × 24000 = 696,000

FC = 110,000

NI = 586,000

− 470,000 = × 29 (Δ in Sales (24,000 − 20,000)) = 116,000

[$116,000 NI increase]

Required:

Compute the following items:

a. Unit contribution margin. → $29
b. Contribution margin ratio. → 58%
c. Break-even in dollar sales.
d. Margin of safety percentage.
e. If the sales volume increases by 20% with no change in total fixed expenses, what will be the change in net operating income?
f. If the per unit variable production costs increase by 15%, and if fixed selling and administrative expenses increase by 12%, what will be the new break-even point in dollar sales?

	1
S	50
VC	21 [10 + 2.5 + 3.5 + 5]
CM	29
FC	80,000 + 30,000 = 110,000
NI	

29/50 = 58% CM

(c) $\frac{FC}{CM\%} = \frac{110,000}{.58} = \$189655.17$ BE Sales

(d) 1,000,000 − 189,655.17 = 810,345 / 1,000,000 = 81%

MoS

S	50	50.00
VC	(10 + 2.5 + 3.5) * 1.15	= 18.40 + 5 = 23.40
CM		26.60 ÷ 50 = 53.2%
FC	80,000 + (30,000 × 1.12) =	113,600 ÷ 53.2% = $213,534 (f)
NI		

a. Variable cost per unit:

Direct materials	**$10.00**
Direct labor	**2.50**
Variable factory overhead	**3.50**
Variable selling & administrative	**5.00**
Total variable cost per unit	**$21.00**

Selling price per unit	**$50.00**
Less: Variable cost per unit	**21.00**
Unit CM	**$29.00**

b. CM ratio = Unit CM ÷ Selling price = $29.00 per unit ÷ $50.00 per unit = 58%

c.

Fixed factory overhead	**$ 80,000**
Fixed selling & administrative	**30,000**
Total fixed expenses	**$110,000**

Dollar sales to break even = Fixed expenses ÷ CM ratio = $110,000 ÷ 0.58 = $189,655 (rounded)

d.

Current sales	**$1,000,000**
Less break-even sales	**189,655**
Margin of safety in dollars	**$ 810,345**

Margin of safety percentage = Margin of safety in dollars ÷ Current sales
= $810,345 ÷ $1,000,000 = 81.03%

e. Current net operating income:

Units sold	20,000
× Contribution margin per unit	$29
Total contribution margin	$580,000
Less: Fixed expenses	110,000
Current net operating income	$470,000

Net operating income with a 20% sales increase:

Units sold	24,000
× Contribution margin per unit	$29
Total contribution margin	$696,000
Less: Fixed expenses	110,000
Net operating income	586,000
Less: Current net operating income	470,000
Increase in net operating income	$116,000

Alternate solution:

Increase in units sold	4,000
× Contribution margin per unit	$29
Increase in net operating income	$116,000

f. Current variable products costs per unit:

Direct materials	$10.00	
Direct labor	2.50	
Variable factory overhead	3.50	
Variable production costs		$16.00
15% increase		2.40
Total new variable production cost		$18.40
Current fixed selling & admin.		$30,000
12% increase		3,600
Total new fixed selling & admin.		$33,600

New contribution margin per unit:

Selling price		$50.00
Less variable cost		
Production	$18.40	
Selling & administrative	5.00	23.40
Contribution margin		$26.60

CM ratio = $26.60 ÷ $50.00 = 53.2%

Fixed factory overhead	**$ 80,000**
Fixed selling & administrative.....	**33,600**
Total fixed expenses	**$113,600**

New break-even in dollars = $113,600 ÷ 0.532 = $213,534 (rounded)

AACSB: Analytic
AICPA BB: Critical Thinking
AICPA FN: Measurement
Bloom's: Application
Learning Objective: 05-03 Use the contribution margin ratio (cm ratio) to compute changes in contribution margin and net operating income resulting from changes in sales volume
Learning Objective: 05-04 Show the effects on net operating income of changes in variable costs; fixed costs; selling price; and volume
Learning Objective: 05-06 Determine the break-even point
Learning Objective: 05-07 Compute the margin of safety and explain its significance
Level: Medium

211. Parkins Company produces and sells a single product. The company's income statement for the most recent month is given below:

Sales (6,000 units at $40 per unit)		**$240,000**
Less manufacturing costs:		
Direct materials	**$48,000**	
Direct labor (variable)	**60,000**	
Variable factory overhead	**12,000**	
Fixed factory overhead	**30,000**	**150,000**
Gross margin		**90,000**
Less selling and other expenses:		
Variable selling and other expenses	**24,000**	
Fixed selling and other expenses	**42,000**	**66,000**
Net operating income		**$ 24,000**

(000)

	6 000	1
S	240	40
VC	144 [48, 60, 12, 24]	24 [8, 10, 2, 4]
CM	96	16
FC	72 [30, 42]	
NI	24	

There are no beginning or ending inventories.

Required:

a. Compute the company's monthly break-even point in units of product. $\frac{72,000}{16} = 4500$ units BE

b. What would the company's monthly net operating income be if sales increased by 25% and there is no change in total fixed expenses? $OL = \frac{96}{24} = 4.0$; $4.0 \times 25\% = 100\%$ increase in NI

$24,000 \times 2 = \$48,000$

c. What dollar sales must the company achieve in order to earn a net operating income of $50,000 per month? $\frac{\text{Fc + Target}}{\text{CM \%}} = \frac{72,000 + 50000}{16/40} = \$305,000$

d. The company has decided to automate a portion of its operations. The change will reduce direct labor costs per unit by 40 percent, but it will double the costs for fixed factory overhead. Compute the new break-even point in units.

S 40

VC $8 + [10 \times .6] + 2 + 4 = 20$

CM 20

FC $[30,000 \times 2] + 42,000 = 102,000$

$\frac{FC}{CM/unit} = \frac{102,000}{20} = 5,100$ units

a. The company's income statement in contribution format would be:

Sales		**$240,000**
Variable expenses:		
Direct materials	**$48,000**	
Direct labor	**60,000**	
Variable factory overhead	**12,000**	
Variable selling and other expenses	**24,000**	**144,000**
Contribution margin		**96,000**
Fixed expenses:		
Fixed factory overhead	**30,000**	
Fixed selling and other expense	**42,000**	**72,000**
Net operating income		**$ 24,000**

The break-even point in units would be: $72,000 ÷ $16 per unit = 4,500 units (a)

b. 6,000 units × 125% = 7,500 units

Sales (7,500 units × $40 per unit)	**$300,000**
Variable expenses (7,500 units × $24 per unit)	**180,000**
Contribution margin	**120,000**
Fixed expenses	**72,000**
Net operating income	**$ 48,000** (b)

c. ($72,000 + $50,000) ÷ 0.40 = $305,000 (c)

d. Direct labor costs are presently $10 per unit ($60,000 ÷ 6,000 units) and will decrease by $4 per unit ($10 × 40%). Therefore, the company's new cost structure will be:

Selling price	**$40**	**100%**
Variable expenses ($24 – $4)	**20**	**50%**
Contribution margin	**$20**	**50%**

((2 × $30,000) + $42,000) ÷ $20 per unit = 5,100 units (d)

AACSB: Analytic
AICPA BB: Critical Thinking
AICPA FN: Measurement
Bloom's: Application
Learning Objective: 05-04 Show the effects on net operating income of changes in variable costs; fixed costs; selling price; and volume
Learning Objective: 05-05 Determine the level of sales needed to achieve a desired target profit
Learning Objective: 05-06 Determine the break-even point
Level: Medium

212. Almo company manufactures and sells adjustable canopies that attach to motor homes and trailers. Almo developed its budget for the current year assuming that the canopies would sell at a price of $400 each. The variable expenses for each canopy were forecasted to be $200 and the annual fixed expenses were forecasted to be $100,000. Almo had targeted a profit of $400,000.

While Almo's sales usually rise during the second quarter, the May financial statements reported that sales were not meeting expectations. For the first five months of the year, only 350 units had been sold at the established price, with variable expense as planned, and it was clear that the target profit for the year would not be reached unless some actions were taken. Almo's president assigned a management committee to analyze the situation and develop several alternative courses of action. The following three alternatives were presented to the president, only one of which can be selected.

1. Reduce the selling price by $40. The marketing department forecasts that with the lower price, 2,700 units could be sold during the remainder of the year.

2. Lower variable expenses per unit by $25 through the use of less expensive materials. Because of the difference in materials, the selling price would have to be lowered by $30 and sales of 2,200 units for the remainder of the year are forecast.

3. Cut fixed expenses by $10,000 and lower the selling price by 5 percent. Sales of 2,000 units would be expected for the remainder of the year.

Required:

a. If no changes are made to the selling ~~price~~ or cost structure, estimate the number of units that must be sold during the year to break even. $\frac{100,000}{200/\text{unit}} = 500$ units

b. If no changes are made to the selling price or cost structure, estimate the number of units that must be sold during the year to attain the target profit of $400,000. $\frac{100,000 + 400,000}{200/\text{unit}} = 2500$ units

c. Determine which of the alternatives Almo's president should select to maximize profit.

see next page for solution

	1
S	$400
VC	200
50% CM	200
FC	100,000
NI	
Target	400,000

a. Unit sales to break even = Fixed expenses ÷ Unit CM
= $100,000 ÷ ($400 per unit - $200 per unit) = $100,000 ÷ $200 per unit = 500 units

b. Unit sales to attain target profit = (Target profit + Fixed expenses) ÷ Unit CM
= ($400,000 + $100,000) ÷ $200 per unit = 2,500 units

c. Which alternative should be selected?
Profit = Sales - Variable expenses - Fixed expenses
Alternative 1:
Sales = ($400 per unit × 350 units) + ($360 per unit × 2,700 units) = $1,112,000
Variable expenses = ($200 per unit × 350 units) + ($200 per unit × 2,700 units) = $610,000
Fixed expenses = $100,000
Profit = Sales - Variable expenses - Fixed expenses = $1,112,000 - $610,000 - $100,000
= $402,000

Alternative 2:
Sales = ($400 per unit × 350 units) + ($370 per unit × 2,200 units) = $954,000
Variable expenses = ($200 per unit × 350 units) + ($175 per unit × 2,200 units) = $455,000
Fixed expenses = $100,000
Profit = Sales - Variable expenses - Fixed expenses = $954,000 - $455,000 - $100,000
= $399,000

Alternative 3:
Sales = ($400 per unit × 350 units) + ($380 per unit × 2,000 units) = $900,000
Variable expenses = ($200 per unit × 350 units) + ($200 per unit × 2,200 units) = $510,000
Fixed expenses = $90,000
Profit = Sales - Variable expenses - Fixed expenses = $900,000 - $510,000 - $90,000
= $300,000

Alternative 1 would yield the highest profit.

AACSB: Analytic
AICPA BB: Critical Thinking
AICPA FN: Measurement
Bloom's: Application
Learning Objective: 05-04 Show the effects on net operating income of changes in variable costs; fixed costs; selling price; and volume
Learning Objective: 05-05 Determine the level of sales needed to achieve a desired target profit
Learning Objective: 05-06 Determine the break-even point
Level: Hard

227. Penury Company offers two products. At present, the following represents the usual results of a month's operations:

	Product K		Product L		
		Per Unit		Per Unit	Combined
Sales revenue	$120,000	$1.20	$80,000	$0.80	$200,000
Variable expenses	60,000	0.60	60,000	0.60	120,000
Contribution margin	$ 60,000	$0.60	$20,000	$0.20	80,000
Fixed expenses					50,000
Net operating income					$ 30,000

Required:

a. Find the break-even point in dollars.

b. Find the margin of safety in dollars.

c. The company is considering decreasing product K's unit sales to 80,000 and increasing product L's unit sales to 180,000, leaving unchanged the selling price per unit, variable expense per unit, and total fixed expenses. Would you advise adopting this plan?

d. Refer to (c) above. Under the new plan, find the break-even point in dollars.

e. Under the new plan in (c) above, find the margin of safety in dollars.

a. CM ratio = Contribution margin ÷ Sales revenue = $80,000 ÷ $200,000 = 40%

Dollar sales to break even = Fixed expenses ÷ CM ratio = $50,000 ÷ 0.40 = $125,000

b. Margin of safety = Sales revenue - Sales at break-even = $200,000 - $125,000 = $75,000

c.

	Product K	Product L	Total
Units	80,000	180,000	
Sales revenue	$96,000	$144,000	$240,000
Variable expenses	48,000	108,000	156,000
Contribution margin	$48,000	$ 36,000	84,000
Fixed expenses			50,000
Net operating income			$ 34,000

Yes, the new arrangement is more profitable.

d. CM ratio = Contribution margin ÷ Sales revenue = $84,000 ÷ $240,000 = 35%
Dollar sales to break even = Fixed expense ÷ CM ratio = $50,000 ÷ 0.35 = $142,857

e. Margin of safety = Sales revenue - Sales at break-even = $240,000 - $142,857 = $97,143

AACSB: Analytic
AICPA BB: Critical Thinking
AICPA FN: Measurement
Bloom's: Application
Learning Objective: 05-06 Determine the break-even point
Learning Objective: 05-07 Compute the margin of safety and explain its significance
Learning Objective: 05-09 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
Level: Medium