

1 SALES NEEDED TO EARN TARGET INCOME

Head-First Company plans to sell 5,000 bicycle helmets at \$70 each in the coming year. Variable cost is 70 percent of the sales price; contribution margin is 30 percent of sales price. Total fixed cost equals \$29,400 (includes fixed factory overhead and fixed selling and administrative expense).

Required:

1. Calculate the sales revenue that Head-First must make to earn operating income of \$81,900.
2. Check your answer by preparing a contribution margin income statement based on the sales dollars calculated in Requirement 1.

2 MARGIN OF SAFETY

Head-First Company plans to sell 5,000 bicycle helmets at \$70 each in the coming year. Unit variable cost is \$49 (includes direct materials, direct labor, variable overhead, and variable selling expense). Total fixed cost equals \$29,400 (includes fixed factory overhead and fixed selling and administrative expense). Break-even units equal 1,400.

Required:

1. Calculate the margin of safety in terms of the number of units.
2. Calculate the margin of safety in terms of sales revenue.

3 DEGREE OF OPERATING LEVERAGE

Head-First Company plans to sell 5,000 bicycle helmets at \$70 each in the coming year. Unit variable cost is \$49 (includes direct materials, direct labor, variable overhead, and variable selling expense). Total fixed cost equals \$29,400 (includes fixed factory overhead and fixed selling and administrative expense). Operating income at 5,000 units sold is \$75,600.

Required:

Calculate the degree of operating leverage. (Round your answer to the nearest tenth.)

4 IMPACT OF INCREASED SALES ON OPERATING INCOME USING THE DEGREE OF OPERATING LEVERAGE

Head-First Company had planned to sell 5,000 bicycle helmets at \$70 each in the coming year. Unit variable cost is \$49 (includes direct materials, direct labor, variable overhead, and variable selling expense). Total fixed cost equals \$29,400 (includes fixed factory overhead and fixed selling and administrative expense). Operating income at 5,000 units sold is \$75,600. The degree of operating leverage is 1.4. Now Head-First expects to increase sales by 15 percent next year.

Required:

1. Calculate the percent change in operating income expected.
2. Calculate the operating income expected next year using the percent change in operating income calculated in Requirement 1.

5 CONTRIBUTION MARGIN, CONTRIBUTION MARGIN RATIO,

OBJECTIVE 1

BREAK-EVEN POINT IN UNITS, BREAK-EVEN SALES REVENUE

Next year, Jefferson Company expects to sell 140,000 units at \$7.60 each. Variable costs are 60 percent of sales price. Fixed costs total \$349,600.

Required:

1. Calculate the contribution margin per unit.
2. Calculate the break-even point in units.
3. Calculate the break-even sales revenue.
4. Prepare an income statement for Jefferson at break even.

**6 INCOME STATEMENT, BREAK-EVEN UNITS, UNITS TO EARN OBJECTIVE 2
TARGET INCOME**

Goslin Company sold 27,000 units last year at \$14 each. Variable cost was \$9.50, and fixed costs were \$126,000.

Required:

1. Prepare an income statement for Goslin Company for last year.
2. Calculate the break-even point in units.
3. Calculate the units that Goslin must sell to earn operating income of \$9,900 next year.

7 MARGIN OF SAFETY

Chase Company produces and sells strings of colorful indoor/outdoor lights for holiday display to retailers for \$6.28 per string. The variable costs per string are as follows:

Direct materials	\$1.27
Direct labor	1.58
Variable overhead	0.63
Variable selling	0.17

Fixed manufacturing costs total \$231,650 per year. Administrative costs (all fixed) total \$315,390. Chase expects to sell 380,000 strings of light next year.

Required:

1. Calculate the break-even point in units.
2. Calculate the margin of safety in units.
3. Calculate the margin of safety in dollars.

8 CONTRIBUTION MARGIN, UNIT AMOUNTS, BREAK-EVEN UNITS

Information on four independent companies follows. Calculate the correct amount each for question mark. (Round your answers to two significant digits.)

	A	B	C	D
Sales	\$15,000	\$?	\$?	\$10,60
Total variable costs	5,000	11,700	9,750	0
Total contribution margin	\$10,00	\$?	\$?	?
Total fixed costs	0	3,900	?	\$
Operating income (loss)	?	4,000	\$?
Units sold	\$ 500	?	364	4,452
Price per unit	?	\$ 1,300	12	848
Variable cost per unit	\$ 5.00	?	5\$	1,00
Contribution margin per unit	?	\$	130	0
Contribution margin ratio	?	9	?	?
Break even in units	?	\$?	?
		3	40%	?
		?	?	?
		?	?	?

9 SALES REVENUE APPROACH, VARIABLE COST RATIO, CONTRIBUTION MARGIN RATIO

Rezler Company's controller prepared the following budgeted income statement for the coming year:

Sales	\$315,000
Less: Variable expenses	<u>141,750</u>
Contribution margin	\$173,250
Less: Fixed expenses	<u>63,000</u>
Operating income	\$110,250

Required:

1. What is Rezler's variable cost ratio? What is its contribution margin ratio?
2. Suppose Rezler's actual revenues are \$30,000 more than budgeted. By how much will operating income increase? Give the answer without preparing a new income statement.
3. How much sales revenue must Rezler earn to break even? Prepare a contribution margin income statement to verify the accuracy of your answer.
4. What is Rezler's expected margin of safety?
5. What is Rezler's margin of safety if sales revenue is \$280,000?

10 MULTIPLE-PRODUCT BREAK EVEN

Switzer Company produces and sells yoga-training products: how-to DVDs and a basic equipment set (blocks, strap, and small pillows). Last year, Switzer sold 10,000 DVDs and 5,000 equipment sets. Information on the two products is as follows:

	DVDs	Equipment Sets
Price	\$12	\$15
Variable cost per unit	4	6

Total fixed costs are \$70,000.

Required:

1. What is the sales mix of DVDs and equipment sets?
2. Compute the break-even quantity of each product.

11 MULTIPLE-PRODUCT BREAK EVEN, BREAK-EVEN SALES REVENUE

Refer to the data in **Exercise 15-32**. Suppose that in the coming year, Switzer plans to produce an extra-thick yoga mat for sale to health clubs. The company estimates that 20,000 mats can be sold at a price of \$18 and a variable cost per unit of \$13. Fixed costs must be increased by \$48,350 (making total fixed costs of \$118,350). Assume that anticipated sales of the other products, as well as their prices and variable costs, remain the same.

Required:

1. What is the sales mix of DVDs, equipment sets, and yoga mats?
2. Compute the break-even quantity of each product.
3. Prepare an income statement for Switzer for the coming year. What is the overall contribution margin ratio? The overall break-even sales revenue?
4. Compute the margin of safety for the coming year in sales dollars. (Round the contribution margin ratio to three significant digits; round the break-even sales revenue to the nearest dollar.)

12 CONTRIBUTION MARGIN RATIO, BREAK-EVEN SALES REVENUE, AND MARGIN OF SAFETY FOR MULTIPLE-PRODUCT FIRM

Sonora Company produces and sells pottery chimineas (small clay outdoor fireplaces). The chimineas come in three models: small basic, large basic, and carved (ornately shaped and carved). In the coming year, Sonora sold 30,000 small basic models, 50,000 large basic models, and 10,000 carved models. Information on the three models is as follows:

	Small	Large	Carved
Price	\$120	\$200	\$350
Variable cost per unit	70	150	275

13 BREAK-EVEN UNITS, CONTRIBUTION MARGIN RATIO, MULTIPLE-PRODUCT BREAK EVEN, MARGIN OF SAFETY, DEGREE OF OPERATING LEVERAGE

Rad-Brad, Inc.'s projected operating income (based on sales of 350,000 units) for the coming year is as follows:

	Total
Sales	\$8,400,000
Less: Variable expenses	6,720,000
Contribution margin	\$1,680,000
Less: Fixed expenses	1,512,000
Operating income	<u>\$ 168,000</u>

Required:

1. Compute:
 - a. Variable cost per unit
 - b. Contribution margin per unit
 - c. Contribution margin ratio
 - d. Break-even point in units.
 - e. Break-even point in sales dollars.
2. How many units must be sold to earn operating income of \$300,000?
3. Compute the additional operating income that Rad-Brad's would earn if sales \$50,000 more than expected.
4. For the projected level of sales, compute the margin of safety in units, and then sales dollars.
5. Compute the degree of operating leverage.
6. Compute the new operating income if sales are 10 percent higher than expected.

14 BREAK-EVEN UNITS, OPERATING INCOME, MARGIN OF SAFETY

Dory Manufacturing Company produces T-shirts screen-printed with the logos of various sports teams. Each shirt is priced at \$10 and has a unit variable cost of \$5. Total fixed costs are \$96,000.

Required:

1. Compute the break-even point in units.
2. Suppose that Dory could reduce its fixed costs by \$13,500 by reducing the amount

of setup and engineering time needed. How many units must be sold to break even in this case?

- How does the reduction in fixed costs affect the break-even point? Operating income? The margin of safety?

15 CONTRIBUTION MARGIN, BREAK-EVEN UNITS, BREAK-EVEN SALES, MARGIN OF SAFETY, DEGREE OF OPERATING LEVERAGE

Sohrwide Company produces a variety of chemicals. One division makes reagents for laboratories. The division's projected income statement for the coming year is:

Sales (128,000 units @ \$50)	\$6,400,000
Less: Variable expenses	<u>4,480,000</u>
Contribution margin	\$1,920,000
Less: Fixed expenses	<u>1,000,000</u>
Operating income	<u>\$ 920,000</u>

Required:

- Compute the contribution margin per unit, and calculate the break-even point in units (round to the nearest unit). Calculate the contribution margin ratio and the break-even sales revenue.
- The divisional manager has decided to increase the advertising budget by \$100,000. This will increase sales revenues by \$1 million. By how much will operating income increase or decrease as a result of this action?
- Suppose sales revenues exceed the estimated amount on the income statement by \$315,000. Without preparing a new income statement, by how much are profits underestimated?
- Compute the margin of safety based on the original income statement.
- Compute the degree of operating leverage based on the original income statement. If sales revenues are 20 percent greater than expected, what is the percentage increase in operating income? Round operating leverage to two decimal places.

16 COST-VOLUME-PROFIT EQUATION, BASIC CONCEPTS, SOLVING FOR UNKNOWNNS

Nutri-Tress Company produces combination shampoos and conditioners in individual-use bottles for hotels. Each bottle sells for \$0.36. The variable costs for each bottle (materials, labor, and overhead) total \$0.27. The total fixed costs are \$58,500. During the most recent year, 830,000 bottles were sold.

Required:

- What is the break-even point in units for Nutri-Tress? What is the margin of safety in units for the most recent year?
- Prepare an income statement for Nutri-Tress's most recent year.
- How many units must be sold for Nutri-Tress to earn a profit of \$36,000?
- What is the level of sales dollars needed for Nutri-Tress to earn operating income of 20 percent of sales?

17 CONTRIBUTION MARGIN RATIO, BREAK-EVEN SALES, OPERATING LEVERAGE

Doerhing Company produces plastic mailboxes. The projected income statement for the coming year follows:

	\$560,400
Variable costs	<u>257,784</u>
Contribution margin	\$302,616
Fixed costs	<u>150,000</u>
Operating income	<u>\$152,616</u>

Required:

1. Compute the contribution margin ratio for the mailboxes.
2. How much revenue must Doerhing earn in order to break even?
3. What is the effect on the contribution margin ratio if the unit selling price and unit variable cost each increase by 10 percent?
4. Suppose that management has decided to give a 3 percent commission on all sales. The projected income statement does not reflect this commission. Recompute the contribution margin ratio, assuming that the commission will be paid. What effect does this have on the break-even point?
5. If the commission is paid as described in Requirement 4, management expects sales revenues to increase by \$80,000. How will this affect operating leverage? Is it a sound decision to implement the commission? Support your answer with appropriate computations.

18 MULTIPLE PRODUCTS, BREAK-EVEN ANALYSIS, OPERATING LEVERAGE

Carlyle Lighting Products produces two different types of lamps: a floor lamp and a desk lamp. Floor lamps sell for \$30, and desk lamps sell for \$20. The projected income statement for the coming year follows:

	\$600,000
Variable costs	<u>400,000</u>
Contribution margin	\$200,000
Fixed costs	<u>150,000</u>
Operating income	<u>\$ 50,000</u>

The owner of Carlyle estimates that 60 percent of the sales revenues will be produced by floor lamps and the remaining 40 percent by desk lamps. Floor lamps are also responsible for 60 percent of the variable expenses. Of the fixed expenses, one-third are common to both products, and one-half are directly traceable to the floor lamp product line.

Required:

1. Compute the sales revenue that must be earned for Carlyle to break even.
2. Compute the number of floor lamps and desk lamps that must be sold for Carlyle to break even.
3. Compute the degree of operating leverage for Carlyle Lighting Products. Now assume that the actual revenues will be 40 percent higher than the projected revenues. By what percentage will profits increase with this change in sales volume?

19 MULTIPLE-PRODUCT BREAK EVEN

Polaris Inc. manufactures two types of metal stampings for the automobile industry: door handles and trim kits. Fixed costs equal \$146,000. Each door handle sells for \$12 and has variable costs of \$9; each trim kit sells for \$8 and has variable costs of \$5.

Required:

1. What are the contribution margin per unit and the contribution margin ratio for door handles and for trim kits?
2. If Polaris sells 20,000 door handles and 40,000 trim kits, what is the operating income?
3. How many door handles and how many trim kits must be sold for Polaris to break even?
4. Assume that Polaris has the opportunity to rearrange its plant to produce only trim kits. If this is done, fixed costs will decrease by \$35,000, and 70,000 trim kits can be produced and sold. Is this a good idea? Explain.

20 USING THE BREAK-EVEN EQUATIONS TO SOLVE FOR PRICE AND VARIABLE COST PER UNIT

Solve the following independent problems.

Required:

1. Sarah Company's break-even point is 1,500 units. Variable cost per unit is \$300; total fixed costs are \$120,000 per year. What price does Sarah charge?
2. Jesper Company charges a price of \$3.50; total fixed costs are \$160,000 per year, and the break-even point is

128,000 units. What is the variable cost per unit?

21 CONTRIBUTION MARGIN, COST-VOLUME-PROFIT, MARGIN OF SAFETY

Candyland Inc. produces a particularly rich praline fudge. Each 10-ounce box sells for \$5.60. Variable unit costs are as follows:

Pecans	\$0.70
Sugar	0.35
Butter	1.85
Other ingredients	0.34
Box, packing material	0.76
Selling commission	0.20

Fixed overhead cost is \$32,300 per year. Fixed selling and administrative costs are \$12,500 per year. Candyland sold 35,000 boxes last year.

Required:

1. What is the contribution margin per unit for a box of praline fudge?
What is the contribution margin ratio?
2. How many boxes must be sold to break even? What is the break-even sales revenue?
3. What was Candyland's operating income last year?
4. What was the margin of safety?
5. Suppose that Candyland Inc. raises the price to \$6.20 per box but anticipates a sales drop to 31,500 boxes. What will be the new break-even point in units? Should Candyland raise the price? Explain.

22 CONTRIBUTION MARGIN, BREAK-EVEN SALES, MARGIN OF SAFETY

Suppose that Kicker had the following sales and cost experience (in thousands of dollars) for May of the current year and for May of the prior year:

	May, Current Year	May, Prior
Total sales	\$ 43,560	\$ 41,700
Less:		
Purchase price paid	(17,000)	(16,000)
Additional labor and supplies	(1,400)	(1,200)
Commissions	(1,250)	(1,100)
Contribution margin	\$ 23,910	\$ 23,400
Less:		
Fixed warehouse cost	(680)	(500)
Fixed administrative cost	(4,300)	(4,300)
Fixed selling cost	(5,600)	(5,000)
Research and development	(9,750)	(4,000)
Operating income	\$ 3,580	\$ 9,600

In August of the prior year, Kicker started an intensive quality program designed to enable it to build original equipment manufacture (OEM) speaker systems for a major automobile company. The program was housed in research and development. In the beginning of the current year, Kicker's accounting department exercised tighter control over sales commissions, ensuring that no dubious (e.g., double) payments were made. The increased sales in the current year required additional warehouse space that Kicker rented in town.

Required:

1. Calculate the contribution margin ratio for May of both years.
2. Calculate the break-even point in sales dollars for both years.
3. Calculate the margin of safety in sales dollars for both years.
4. Analyze the differences shown by your calculations in Requirements 1, 2, and 3.

SOLUZIONI

ESERCIZIO 1

$$\begin{aligned} 1. \text{ Sales for target income} &= \frac{(\text{Total fixed cost} + \text{Target income})}{\text{Contribution margin ratio}} \\ &= \frac{(\$29,400 + \$81,900)}{0.30} \\ &= \$371,000 \end{aligned}$$

2. Head-First Company

Contribution Margin Income Statement At 5,300 Helmets Sold

	<u>Total</u>
Sales	\$371,000
Total variable expense (\$371,000 × 0.70).....	<u>259,700</u>
Total contribution margin	\$111,300
Total fixed expense	<u>29,400</u>
Operating income	<u>\$ 81,900</u>

ESERCIZIO 2

$$\begin{aligned} 1. \text{ Margin of safety in units} &= \text{Budgeted units} - \text{Break-even units} \\ &= 5,000 - 1,400 \\ &= 3,600 \end{aligned}$$

$$\begin{aligned} 2. \text{ Margin of safety in sales revenue} &= \text{Budgeted sales} - \text{Break-even sales} \\ &= \$350,000 - \$98,000 \\ &= \$252,000 \end{aligned}$$

ESERCIZIO 3

$$\text{Degree of operating leverage} = \frac{\text{Total contribution margin}}{\text{Operating income}}$$

$$= \frac{\$105,000}{\$75,600}$$

$$= 1.4$$

ESERCIZIO 4

1. Percent change in operating income = DOL × % Change in sales
 = 1.4 × 15%
 = 21%

2. Expected operating income = Original income + (% Change × Original income)
 = \$75,600 + (0.21 × \$75,600)
 = \$91,476

ESERCIZIO 5

1. Unit variable cost = \$7.60 × 0.60 = \$4.56
 Unit contribution margin = \$7.60 – \$4.56 = \$3.04

2. Break-even units = $\frac{\$349,600}{\$3.04} = 115,000$

3. Break-even sales revenue = \$7.60 × 115,000 = \$874,000

OR

$$\text{Break-even sales revenue} = \frac{\$349,600}{0.40} = \$874,000$$

4. Sales	\$874,000
Less: Variable costs.....	<u>524,400</u>
Contribution margin.....	\$349,600
Less: Fixed costs	<u>349,600</u>
Operating income	<u>\$ 0</u>

ESERCIZIO 6

1. Sales (\$14 × 27,000)	\$378,000
Variable cost (\$9.50 × 27,000).....	<u>256,500</u>
Total contribution margin.....	\$121,500
Less: Fixed expenses.....	<u>126,000</u>
Operating income	<u>\$ (4,500)</u>

$$2. \text{ Break-even units} = \frac{\$126,000}{(\$14 - \$9.50)} = 28,000$$

$$3. \text{ Units to earn target income} = \frac{(\$126,000 + \$9,900)}{(\$14 - \$9.50)} = 30,200$$

ESERCIZIO 7

$$1. \text{ Break-even units} = \frac{(\$231,650 + \$315,390)}{(\$6.28 - \$3.65)} = 208,000$$

2. Expected sales in units	380,000
Break-even units.....	<u>(208,000)</u>
Margin of safety (in units).....	<u>172,000</u>
3. Expected sales revenue (\$6.28 × 380,000)	\$2,386,400
Break-even sales revenue*	<u>1,306,240</u>
Margin of safety (in dollars)	<u>\$1,080,160</u>

*Break-even revenue = Price × Break-even units = \$6.28 × 208,000 units

ESERCIZIO 8

	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
Sales	\$15,000	\$15,600*	\$16,250*	\$10,600
Total variable costs	<u>5,000</u>	<u>11,700</u>	<u>9,750</u>	<u>5,300*</u>
Total contribution margin	\$10,000\$	3,900 \$	6,500* \$	5,300*
Total fixed costs	<u>9,500*</u>	<u>4,000</u>	<u>6,136*</u>	<u>4,452</u>
Operating income (loss)	<u>\$ 500</u>	<u>\$ (100)*</u>	<u>\$ 364</u>	<u>\$ 848</u>
Units sold	3,000*	1,300	125	1,000
Price per unit	\$5.00	\$12*	\$130	\$10.60*
Variable cost per unit	\$1.67*	\$9	\$78*	\$5.30*
Contribution margin per unit	\$3.33*	\$3	\$52*	\$5.30*
Contribution margin ratio	67%*	25%*	40%	50%*
Break even in units	2,853*	1,333*	118*	840*

*Designates calculated amount.

(Note: Calculated break-even units that include a fractional amount have been rounded to the nearest whole unit.)

ESERCIZIO 9

1. Variable cost ratio = $\frac{\$141,750}{\$315,000} = 0.45$, or 45%

Contribution margin ratio = $\frac{\$173,250}{\$315,000} = 0.55$, or 55%

2. Because all fixed costs are covered by break even, any revenue above break even contributes directly to operating income.

Sales × Contribution margin ratio = Increased operating income

$\$30,000 \times 0.55 = \$16,500$

Therefore, operating income will be \$16,500 higher.

3. Break-even sales revenue = $\frac{\$63,000}{0.55} = \$114,545$ (rounded to the nearest dollar)

Sales	\$114,545
Less: Variable cost (\$114,545 × 0.45)	<u>51,545</u>
Contribution margin	\$ 63,000
Less: Fixed cost.....	<u>63,000</u>
Operating income	<u>\$ 0</u>

- | | |
|-------------------------|------------------|
| 4. Expected sales | \$315,000 |
| Break-even sales..... | <u>114,545</u> |
| Margin of safety..... | <u>\$200,455</u> |

- | | |
|-----------------------|------------------|
| 5. Sales revenue..... | \$280,000 |
| Break-even sales..... | <u>114,545</u> |
| Margin of safety..... | <u>\$165,455</u> |

ESERCIZIO 10

1. Sales mix is 2:1 (twice as many DVDs are sold as equipment sets).

<u>Product</u>	<u>Price</u>	–	<u>Variable Cost</u>	=	<u>CM</u>	×	<u>Sales Mix</u>	=	<u>Total CM</u>
DVDs	\$12		\$4		\$8		2		\$16
Equipment sets	15		6		9		1		<u>9</u>
Total									<u>\$25</u>

$$\text{Break-even packages} = \frac{\$70,000}{\$25} = 2,800$$

$$\text{Break-even DVDs} = 2 \times 2,800 = 5,600$$

$$\text{Break-even equipment sets} = 1 \times 2,800 = 2,800$$

ESERCIZIO 11

1. Sales mix is 2:1:4 (twice as many DVDs will be sold as equipment sets, and four times as many yoga mats will be sold as equipment sets).

<u>Product</u>	<u>Price</u>	–	<u>Variable Cost</u>	=	<u>CM</u>	×	<u>Sales Mix</u>	=	<u>Total CM</u>
DVDs	\$12		\$ 4		\$8		2		\$16
Equipment sets	15		6		9		1		9
Yoga mats	18		13		5		4		<u>20</u>
Total									<u>\$45</u>

$$\text{Break-even packages} = \frac{\$118,350}{\$45} = 2,630$$

$$\text{Break-even DVDs} = 2 \times 2,630 = 5,260$$

$$\text{Break-even equipment sets} = 1 \times 2,630 = 2,630$$

$$\text{Break-even yoga mats} = 4 \times 2,630 = 10,520$$

3. Switzer Company

Income Statement For the Coming Year

Sales	\$555,000
Less: Total variable costs	<u>330,000</u>
Contribution margin	\$225,000
Less: Total fixed costs	<u>118,350</u>
Operating income	<u>\$106,650</u>

$$\text{Contribution margin ratio} = \frac{\$225,000}{\$555,000} = 0.405, \text{ or } 40.5\%$$

$$\text{Break-even revenue} = \frac{\$118,350}{0.405} = \$292,222$$

4. Margin of safety = \$555,000 – \$292,222 = \$262,778

ESERCIZIO 12

1. Sales mix is 3:5:1 (three times as many small basics will be sold as carved models, and five times as many large basics will be sold as carved models).

2.

<u>Product</u>	<u>Price</u>	–	<u>Variable Cost</u>	=	<u>CM</u>	×	<u>Sales Mix</u>	=	<u>Total CM</u>
Small basic	\$120		\$ 70		\$50		3		\$150
Large basic	200		150		50		5		250
Carved model	350		275		75		1		<u>75</u>
Total									<u>\$475</u>

Break-even packages = $\frac{\$446,500}{\$475} = 940$

Break-even small basic models = 3 × 940 = 2,820

Break-even large basic models = 5 × 940 = 4,700

Break-even carved models = 1 × 940 = 940

3. Sonora Company

Income Statement
For the Coming Year

Sales	\$17,100,000
Less: Total variable costs	<u>12,350,000</u>
Contribution margin	\$ 4,750,000
Less: Total fixed costs	<u>446,500</u>
Operating income	<u>\$ 4,303,500</u>

Contribution margin ratio = $\frac{\$4,750,000}{\$17,100,000} = 0.2778$, or 27.78%

Break-even revenue = $\frac{\$446,500}{0.2778} = \$1,607,271$

3. Margin of safety = \$17,100,000 – \$1,607,271 = \$15,492,729

ESERCIZIO 13

1. a. Variable cost per unit = $\frac{\$6,720,000}{350,000} = \19.20

b. Contribution margin per unit = $\frac{\$1,680,000}{350,000} = \4.80

c. Contribution margin ratio = $\frac{\$4.80}{\$24.00} = 0.20$, or 20%

d. Break-even units = $\frac{\$1,512,000}{\$4.80} = 315,000$

e. Break-even sales dollars = $\frac{\$1,512,000}{0.20} = \$7,560,000$

OR

Break-even sales dollars = $315,000 \times \$24 = \$7,560,000$

2. Units for target income = $\frac{(\$1,512,000 + \$300,000)}{\$4.80} = 377,500$

3. Additional operating income = $\$50,000 \times 0.20 = \$10,000$

4. Margin of safety in units = $350,000 - 315,000 = 35,000$ units

Margin of safety in sales dollars = $\$8,400,000 - \$7,560,000 = \$840,000$

5. Degree of operating leverage = $\frac{\$1,680,000}{\$168,000} = 10.0$

6. New operating income = $\$168,000 + [(10 \times 0.10) (\$168,000)] = \$336,000$

ESERCIZIO 14

1. Break-even units = $\frac{\text{Fixed cost}}{(\text{Price} - \text{Unit variable cost})}$

= $\frac{\$96,000}{(\$10 - \$5)}$

= 19,200 units

2. Break-even units = $\frac{(\$96,000 - \$13,500)}{(\$10 - \$5)}$

= 16,500 units

4. The reduction in fixed costs reduces the break-even point because less contribution margin is needed to cover the new, lower fixed costs. Operating income goes up, and the margin of safety also goes up.

ESERCIZIO 15

1. Unit contribution margin = $\frac{\$1,920,000}{128,000} = \15

Break-even point = $\frac{\$1,000,000}{\$15} = 66,667$ units

Contribution margin ratio = $\frac{\$15}{\$50} = 0.3$

Break-even sales = $\frac{\$1,000,000}{0.3} = \$3,333,333$

OR

= $\$50 \times 66,667 = \$3,333,350$ (rounded)

Note: Difference in break-even sales due to rounding.

2. Increased contribution margin ($\$1,000,000 \times 0.3$).....	\$300,000
Less: Increased advertising expense	<u>100,000</u>
Increased profit.....	<u>\$200,000</u>

3. $\$315,000 \times 0.3 = \$94,500$

4. Margin of safety = $\$6,400,000 - \$3,333,333 = \$3,066,667$

Or

= $\$6,400,000 - \$3,333,350 = \$3,066,650$ (rounded)

Note: Difference in margin of safety due to rounding in break-even sales.

5. $\frac{\$1,920,000}{\$920,000} = 2.09$ (operating leverage)

$20\% \times 2.09 = 41.8\%$ (profit increase)

ESERCIZIO 16

1. Break-even units = $\frac{\$58,500}{(\$0.36 - \$0.27)} = 650,000$

Margin of safety in units = $830,000 - 650,000 = 180,000$

2. Sales revenue ($\$0.36 \times 830,000$).....	\$298,800
Total variable cost ($\$0.27 \times 830,000$)	<u>224,100</u>
Total contribution margin.....	\$ 74,700
Total fixed expense	<u>58,500</u>
Operating income	<u>\$ 16,200</u>

3. Units for target profit $= \frac{(\$58,500 + \$36,000)}{(\$0.36 - \$0.27)}$
 $= 1,050,000$
4. Operating income = Sales – (Variable cost ratio × Sales) – Fixed cost
- 0.20 Sales = Sales – (0.75 × Sales) – \$58,500
- 0.20 Sales = 0.25 Sales – \$58,500
- \$58,500 = (0.25 Sales – 0.20 Sales)
- \$58,500 = 0.05 Sales
- Sales = \$1,170,000

ESERCIZIO 17

1. Contribution margin ratio = $\frac{\$302,616}{\$560,400} = 0.54$, or 54%

2. Revenue = $\frac{\$150,000}{0.54} = \$277,778$

3. \$560,400 × 110% = \$616,440

\$257,784 × 110% = 283,562

\$332,878

Contribution Margin Ratio = $\frac{\$332,878}{\$616,440} = 0.54$

The contribution margin ratio remains at 0.54.

4. Additional variable expense: \$560,400 × 0.03 = \$16,812
- New contribution margin = \$302,616 – \$16,812 = \$285,804

New contribution margin ratio = $\frac{\$285,804}{\$560,400} = 0.51$

Break-even point = $\frac{\$150,000}{0.51} = \$294,118$

The effect is to increase the break-even point.

5. Present contribution margin \$302,616

Projected contribution margin* 326,604

Increase in contribution margin/profit \$ 23,988

$$*(\$560,400 + \$80,000) \times 0.51 = \$326,604$$

Operating leverage will decrease because the increase in variable costs (the sales commission) causes a decrease in the contribution margin.

Doerhing should pay the commission because profit would increase by \$23,988.

ESERCIZIO 18

$$\begin{aligned}
 1. \text{ Revenue} &= \frac{\text{Fixed cost}}{(1 - \text{Variable rate})} \\
 &= \frac{\$150,000}{(1/3)} \\
 &= \$450,000
 \end{aligned}$$

2. Of total sales revenue, 60 percent is produced by floor lamps and 40 percent by desk lamps.

$$\frac{\$360,000}{\$30} = 12,000 \text{ units}$$

$$\frac{\$240,000}{\$20} = 12,000 \text{ units}$$

Thus, the sales mix is 1:1.

Product	Price	-	Cost	=	Margin	×	Mix	=	CM
Floor lamps	\$30		\$20.00		\$10.00		1		\$10.00
Desk lamps	20		13.33		6.67		1		<u>6.67</u>
Package									<u>\$16.67</u>

$$\begin{aligned}
 \text{Number of packages} &= \frac{\text{Fixed cost}}{(\text{Price} - \text{Variable cost})} \\
 &= \frac{\$150,000}{\$16.67} \\
 &= 8,998 \text{ packages}
 \end{aligned}$$

$$\text{Floor lamps: } 1 \times 8,998 = 8,998$$

$$\text{Desk lamps: } 1 \times 8,998 = 8,998$$

$$3. \text{ Operating leverage} = \frac{\text{Contribution margin}}{\text{Operating income}}$$

$$= \frac{\$200,000}{\$50,000}$$

$$= 4.0$$

Percentage change in profits = $4.0 \times 40\% = 160\%$

ESERCIZIO 19

1.	<u>Door Handles</u>	<u>Trim Kits</u>
CM	$\$12 - \$9 = \$3$	$\$8 - \$5 = \$3$
CM ratio	$\$3/\$12 = 0.25$	$\$3/\$8 = 0.375$

2. Contribution margin:

$(\$3 \times 20,000) + (\$3 \times 40,000)$	\$180,000
Less: Fixed costs	<u>146,000</u>
Operating income	<u>\$ 34,000</u>

3. Sales mix (from Requirement 2): 1 door handle to 2 trim kits

	<u>Price</u>	-	<u>V</u>	=	<u>CM</u>	×	<u>Sales Mix</u>	=	<u>Total CM</u>
Door handle	\$12		\$9		\$3		1		\$3.00
Trim kit	8		5		3		2		<u>6.00</u>
Package									<u>\$9.00</u>

$$\text{Break-even packages} = \frac{\$146,000}{\$9} = 16,222$$

$$\text{Door handles} = 1 \times 16,222 = 16,222$$

$$\text{Trim kits} = 2 \times 16,222 = 32,444$$

4. Revenue (70,000 × \$8).....	\$560,000
Variable cost (70,000 × \$5).....	<u>350,000</u>
Contribution margin	\$210,000
Fixed cost	<u>111,000</u>
Operating income	<u>\$ 99,000</u>

Yes, operating income is \$65,000 higher than when both door handles and trim kits are sold.

ESERCIZIO 20

1. Income = Revenue - Variable cost - Fixed cost

$$\$0 = 1,500P - \$300(1,500) - \$120,000$$

$$\$0 = 1,500P - \$450,000 - \$120,000$$

$$\$570,000 = 1,500P$$

$$P = \$380$$

$$2. \frac{\$160,000}{(\$3.50 - \text{Unit variable cost})} = 128,000$$

Unit variable cost = \$2.25

ESERCIZIO 21

$$1. \text{ Contribution margin per unit} = \$5.60 - \$4.20^* = \$1.40$$

*Variable costs per unit:

$$\$0.70 + \$0.35 + \$1.85 + \$0.34 + \$0.76 + \$0.20 = \$4.20$$

$$\text{Contribution margin ratio} = \frac{\$1.40}{\$5.60} = 0.25$$

$$2. \text{ Break-even in units} = \frac{(\$32,300 + \$12,500)}{\$1.40} = 32,000 \text{ boxes}$$

$$\text{Break-even in sales} = 32,000 \times \$5.60 = \$179,200$$

OR

$$= \frac{(\$32,300 + \$12,500)}{0.25} = \$179,200$$

$$3. \text{ Sales } (\$5.60 \times 35,000) \quad \$196,000$$

Variable cost (\$4.20 × 35,000).....	147,000
Contribution margin	\$ 49,000
Fixed cost	44,800
Operating income	\$ 4,200

$$4. \text{ Margin of safety} = \$196,000 - \$179,200 = \$16,800$$

$$5. \text{ Break-even in units} = \frac{\$44,800}{(\$6.20 - \$4.20)} = 22,400 \text{ boxes}$$

$$\begin{aligned} \text{New operating income} &= \$6.20(31,500) - \$4.20(31,500) - \$44,800 \\ &= \$195,300 - \$132,300 - \$44,800 = \$18,200 \end{aligned}$$

Yes, operating income will increase by \$14,000 (\$18,200 – \$4,200).

ESERCIZIO 22

1. Contribution margin ratios:

$$\text{May of current year} = \frac{\$23,910}{\$43,560} = 0.549, \text{ or } 54.9\%$$

$$\text{May of prior year} = \frac{\$23,400}{\$41,700} = 0.561, \text{ or } 56.1\%$$

2. Break-even point in sales dollars:

$$\text{May of current year} = \frac{\$20,330}{0.549} = \$37,031$$

$$\text{May of prior year} = \frac{\$13,800}{0.561} = \$24,599$$

3. Margin of safety:

$$\text{May of current year} = \$43,560 - \$37,031 = \$6,529$$

$$\text{May of prior year} = \$41,700 - \$24,599 = \$17,101$$

4. Clearly, the sharp rise in fixed costs from the prior year to the current year has had a strong impact on the break-even point and the margin of safety. Kicker will need to ensure that tight cost control is exercised since the margin of safety is much slimmer. Still, the decision to go with the OEM investment program could pay large dividends in the future. Note that the margin of safety and break-even point give the company important information on the potential risk of the venture but do not tell it the upside potential.