

**Problem 7-19** (60 minutes)

1. The CM ratio is 30%.

	<i>Total</i>	<i>Per Unit</i>	<i>Percentage</i>
Sales (13,500 units).....	\$270,000	\$20	100%
Variable expenses.....	<u>189,000</u>	<u>14</u>	<u>70%</u>
Contribution margin.....	<u>\$ 81,000</u>	<u>\$ 6</u>	<u>30%</u>

The break-even point is:

Sales = Variable expenses + Fixed expenses + Profits

\$20Q = \$14Q + \$90,000 + \$0

\$ 6Q = \$90,000

Q = \$90,000 ÷ \$6 per unit

Q = 15,000 units

15,000 units × \$20 per unit = \$300,000 in sales

Alternative solution:

$$\begin{aligned}\text{Break-even point} &= \frac{\text{Fixed expenses}}{\text{Unit contribution margin}} \\ \text{in unit sales} &= \frac{\$90,000}{\$6 \text{ per unit}} = 15,000 \text{ units}\end{aligned}$$

$$\begin{aligned}\text{Break-even point} &= \frac{\text{Fixed expenses}}{\text{CM ratio}} \\ \text{in sales dollars} &= \frac{\$90,000}{0.30} = \$300,000 \text{ in sales}\end{aligned}$$

2. Incremental contribution margin:

\$70,000 increased sales × 30% CM ratio .....	\$21,000
Less increased fixed costs:	
Increased advertising cost.....	<u>8,000</u>
Increase in monthly operating income .....	<u>\$13,000</u>

Since the company presently has a loss of \$9,000 per month, if the changes are adopted, the loss will turn into a profit of \$4,000 per month.

**Problem 7-19** (continued)

3. Sales (27,000 units × \$18 per unit*) .....	\$486,000
Variable expenses	
(27,000 units × \$14 per unit) .....	<u>378,000</u>
Contribution margin.....	108,000
Fixed expenses (\$90,000 + \$35,000) .....	<u>125,000</u>
Operating loss.....	<u><u>\$(17,000)</u></u>

$$*\$20 - (\$20 \times 0.10) = \$18$$

4. Sales = Variable expenses + Fixed expenses + Profits  
 $\$20Q = \$14.60Q^* + \$90,000 + \$4,500$   
 $\$5.40Q = \$94,500$   
 $Q = \$94,500 \div \$5.40 \text{ per unit}$   
 $Q = 17,500 \text{ units}$

$$*\$14.00 + \$0.60 = \$14.60.$$

Alternative solution:

$$\begin{aligned} \text{Unit sales to attain} &= \frac{\text{Fixed expenses} + \text{Target profit}}{\text{CM per unit}} \\ \text{target profit} &= \frac{\$90,000 + \$4,500}{\$5.40 \text{ per unit}^{**}} \\ &= 17,500 \text{ units} \end{aligned}$$

$$**\$6.00 - \$0.60 = \$5.40.$$

5. a. The new CM ratio would be:

	<i>Per Unit</i>	<i>Percentage</i>
Sales.....	\$20	100%
Variable expenses.....	<u>7</u>	<u>35%</u>
Contribution margin .....	<u>\$13</u>	<u>65%</u>

**Problem 7-19** (continued)

The new break-even point would be:

$$\begin{aligned}\text{Break-even point in unit sales} &= \frac{\text{Fixed expenses}}{\text{Unit contribution margin}} \\ &= \frac{\$208,000}{\$13 \text{ per unit}} = 16,000 \text{ units}\end{aligned}$$

$$\begin{aligned}\text{Break-even point in sales dollars} &= \frac{\text{Fixed expenses}}{\text{CM ratio}} \\ &= \frac{\$208,000}{0.65} = \$320,000 \text{ in sales}\end{aligned}$$

b. Comparative income statements follow:

	<i>Not Automated</i>			<i>Automated</i>		
	<i>Total</i>	<i>Per Unit</i>	<i>%</i>	<i>Total</i>	<i>Per Unit</i>	<i>%</i>
Sales (20,000 units)....	\$400,000	\$20	100	\$400,000	\$20	100
Variable expenses.....	<u>280,000</u>	<u>14</u>	<u>70</u>	<u>140,000</u>	<u>7</u>	<u>35</u>
Contribution margin ....	120,000	<u>\$ 6</u>	<u>30</u>	260,000	<u>\$13</u>	<u>65</u>
Fixed expenses.....	<u>90,000</u>			<u>208,000</u>		
Operating income .....	<u>\$ 30,000</u>			<u>\$ 52,000</u>		

### Problem 7-19 (continued)

- c. Whether or not one would recommend that the company automate its operations depends on how much risk he or she is willing to take, and depends heavily on prospects for future sales. The proposed changes would increase the company's fixed costs and its break-even point. However, the changes would also increase the company's CM ratio (from 30% to 65%). The higher CM ratio means that once the break-even point is reached, profits will increase more rapidly than at present. If 20,000 units are sold next month, for example, the higher CM ratio will generate \$22,000 more in profits than if no changes are made.

The greatest risk of automating is that future sales may drop back down to present levels (only 13,500 units per month), and as a result, losses will be even larger than at present due to the company's greater fixed costs. (Note the problem states that sales are erratic from month to month.) In summary, the proposed changes will help the company if sales continue to trend upward in future months; the changes will hurt the company if sales drop back down to or near present levels.

Note to the Instructor: Although it is not asked for in the problem, if time permits you may want to compute the point of indifference between the two alternatives in terms of units sold; i.e., the point where profits will be the same under either alternative. At this point, total revenue will be the same; hence, we include only costs in our equation:

$$\begin{aligned}\text{Let } Q &= \text{Point of indifference in units sold} \\ \$14Q + \$90,000 &= \$7Q + \$208,000 \\ \$7Q &= \$118,000 \\ Q &= \$118,000 \div \$7 \text{ per unit} \\ Q &= 16,857 \text{ units (rounded)}\end{aligned}$$

If more than 16,857 units are sold, the proposed plan will yield the greater profit; if less than 16,857 units are sold, the present plan will yield the greater profit (or the lesser loss).

An alternative solution that is more consistent with the text would use operating profit as follows:

$$\$6Q - \$90,000 = \$13Q - 208,000$$

$$\begin{aligned} \$7Q &= \$118,000 \\ Q &= 16,857 \text{ units} \end{aligned}$$

**Problem 7-26** (60 minutes)

1. April's Income Statement:

	<i>Standard</i>		<i>Deluxe</i>		<i>Pro</i>		<i>Total</i>	
	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>
Sales .....	\$80,000	100	\$60,000	100	\$450,000	100	\$590,000	100
Variable expenses:								
Production .....	44,000	55	27,000	45	157,500	35	228,500	38.7
Selling .....	<u>4,000</u>	<u>5</u>	<u>3,000</u>	<u>5</u>	<u>22,500</u>	<u>5</u>	<u>29,500</u>	<u>5.0</u>
Total variable expenses.	<u>48,000</u>	<u>60</u>	<u>30,000</u>	<u>50</u>	<u>180,000</u>	<u>40</u>	<u>258,000</u>	<u>43.7</u>
Contribution margin .....	<u>\$32,000</u>	<u>40</u>	<u>\$30,000</u>	<u>50</u>	<u>\$270,000</u>	<u>60</u>	<u>332,000</u>	<u>56.3</u>
Fixed expenses:								
Production .....							120,000	
Advertising .....							100,000	
Administrative .....							<u>50,000</u>	
Total fixed expenses .....							<u>270,000</u>	
Operating income .....							<u>\$ 62,000</u>	

**Problem 7-26** (continued)

May's Income Statement:

	<i>Standard</i>		<i>Deluxe</i>		<i>Pro</i>		<i>Total</i>	
	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>	<i>Amount</i>	<i>%</i>
Sales.....	\$320,000	100	\$60,000	100	\$270,000	100	\$650,000	100
Variable expenses:								
Production.....	176,000	55	27,000	45	94,500	35	297,500	45.8
Selling.....	<u>16,000</u>	<u>5</u>	<u>3,000</u>	<u>5</u>	<u>13,500</u>	<u>5</u>	<u>32,500</u>	<u>5.0</u>
Total variable expenses.	<u>192,000</u>	<u>60</u>	<u>30,000</u>	<u>50</u>	<u>108,000</u>	<u>40</u>	<u>330,000</u>	<u>50.8</u>
Contribution margin .....	<u>\$128,000</u>	<u>40</u>	<u>\$30,000</u>	<u>50</u>	<u>\$162,000</u>	<u>60</u>	<u>320,000</u>	<u>49.2</u>
Fixed expenses:								
Production.....							120,000	
Advertising .....							100,000	
Administrative.....							<u>50,000</u>	
Total fixed expenses .....							<u>270,000</u>	
Operating income .....							<u>\$ 50,000</u>	



**Problem 7-26** (continued)

2. The sales mix has shifted over the last month from a greater concentration of Pro rackets to a greater concentration of Standard rackets. This shift has caused a decrease in the company's overall CM ratio from 56.3% in April to only 49.2% in May. For this reason, even though total sales (both in units and in dollars) is greater, operating income is lower than last month in the division.

3. The break-even in dollar sales can be computed as follows:

$$\frac{\text{Fixed expenses}}{\text{CM ratio}} = \frac{\$270,000}{0.563} = \$479,574 \text{ (rounded)}$$

4. May's break-even point has gone up. The reason is that the division's overall CM ratio has declined for May as stated in (2) above. Unchanged fixed expenses divided by a lower overall CM ratio would yield a higher break-even point in sales dollars.

5.	<i>Standard</i>	<i>Pro</i>
Increase in sales .....	\$20,000	\$20,000
Multiply by the CM ratio .....	<u>× 40%</u>	<u>× 60%</u>
Increase in operating income* .....	<u>\$ 8,000</u>	<u>\$12,000</u>

\*Assuming that fixed costs do not change.

# **Problem 7-30** (60 minutes)

1. The income statements would be:

	<i>Present</i>			<i>Proposed</i>		
	<i>Amount</i>	<i>Per Unit</i>	<i>%</i>	<i>Amount</i>	<i>Per Unit</i>	<i>%</i>
Sales .....	\$800,000	\$20	100	\$800,000	\$20	100
Variable expenses.....	<u>560,000</u>	<u>14</u>	<u>70</u>	<u>320,000</u>	<u>8</u> *	<u>40</u>
Contribution margin..	240,000	<u>\$6</u>	<u>30</u>	480,000	<u>\$12</u>	<u>60</u>
Fixed expenses.....	<u>192,000</u>			<u>432,000</u>		
Operating income.....	<u>\$ 48,000</u>			<u>\$ 48,000</u>		

$$*\$14 - \$6 = \$8$$

2. a.
- |                                   | <i>Present</i>                   | <i>Proposed</i>                   |
|-----------------------------------|----------------------------------|-----------------------------------|
| Degree of operating leverage..... | $\frac{\$240,000}{\$48,000} = 5$ | $\frac{\$480,000}{\$48,000} = 10$ |
- b.
- |                                  |                                      |                                      |
|----------------------------------|--------------------------------------|--------------------------------------|
| Break-even point in dollars..... | $\frac{\$192,000}{0.30} = \$640,000$ | $\frac{\$432,000}{0.60} = \$720,000$ |
|----------------------------------|--------------------------------------|--------------------------------------|
- c.
- Margin of safety =
- Total sales –
- Break-even sales:
- |                         |           |          |
|-------------------------|-----------|----------|
| \$800,000 – \$640,000 . | \$160,000 |          |
| \$800,000 – \$720,000 . |           | \$80,000 |
- Margin of safety percentage =
- Margin of safety ÷
- Total sales:
- |                         |     |     |
|-------------------------|-----|-----|
| \$160,000 ÷ \$800,000 . | 20% |     |
| \$80,000 ÷ \$800,000 .. |     | 10% |

### Problem 7-30 (continued)

3. The major factor would be the sensitivity of the company's operations to cyclical movements in the economy. In years of strong economic activity, the company will be better off with the new equipment. The new equipment will increase the CM ratio and, as a consequence, profits would rise more rapidly in years with strong sales. However, the company will be worse off with the new equipment in years in which sales drop. The greater fixed costs of the new equipment will result in losses being incurred more quickly and they will be deeper. Thus, management must decide whether the potential greater profits in good years is worth the risk of deeper losses in bad years.
4. No information is given in the problem concerning the new variable expenses or the new contribution margin ratio. Both of these items must be determined before the new break-even point can be computed. The computations are:

New variable expenses:

$$\begin{aligned}\text{Sales} &= \text{Variable expenses} + \text{Fixed expenses} + \text{Profits} \\ \$1,200,000^* &= \text{Variable expenses} + \$240,000 + \$60,000^{**} \\ \$900,000 &= \text{Variable expenses}\end{aligned}$$

$$* \text{ New level of sales: } \$800,000 \times 1.5 = \$1,200,000$$

$$** \text{ New level of operating income: } \$48,000 \times 1.25 = \$60,000$$

New CM ratio:

Sales .....	\$1,200,000	100%
Variable expenses.....	<u>900,000</u>	<u>75%</u>
Contribution margin.....	<u>\$ 300,000</u>	<u>25%</u>

With the above data, the new break-even point can be computed:

$$\begin{aligned}\text{Break-even point} &= \frac{\text{Fixed expenses}}{\text{CM ratio}} = \frac{\$240,000}{0.25} = \$960,000 \\ \text{in dollar sales}\end{aligned}$$

### Problem 7-30 (continued)

The greatest risk is that the marketing manager's estimates of increases in sales and operating income will not materialize and that sales will remain at their present level. Note that the present level of sales is \$800,000, which is well below the break-even level of sales under the new marketing method.

It would be a good idea to compare the new marketing strategy to the current situation more directly. What level of sales would be needed under the new method to generate at least the \$48,000 in profits the company is currently earning each month? The computations are:

$$\begin{aligned}\text{Dollar sales to attain} &= \frac{\text{Fixed expenses} + \text{Target profit}}{\text{CM ratio}} \\ \text{target profit} &= \frac{\$240,000 + \$48,000}{0.25} \\ &= \$1,152,000 \text{ in sales each month}\end{aligned}$$

Thus, sales would have to increase by at least 44% (\$1,152,000 is 44% higher than \$800,000) in order to make the company better off with the new marketing strategy than with the current situation. This appears to be extremely risky.