Problem 6-19 (60 minutes)

1. The CM ratio is 30%.

	Total	*Per Unit*	*Percent of Sales*
Sales (19,500 units)	$585,000	$30.00	100%
Variable expenses	409,500	21.00	70
Contribution margin	$175,500	$ 9.00	30%

The break-even point is:

$$\begin{aligned} \text{Sales} &= \text{Variable expenses} + \text{Fixed expenses} + \text{Profits} \\ \$30.00Q &= \$21.00Q + \$180{,}000 + \$0 \\ \$9.00Q &= \$180{,}000 \\ Q &= \$180{,}000 \div \$9.00 \text{ per unit} \\ Q &= 20{,}000 \text{ units} \end{aligned}$$

20,000 units × $30.00 per unit = $600,000 in sales.

Alternative solution:

$$\text{Break-even point in unit sales} = \frac{\text{Fixed expenses}}{\text{Unit contribution margin}}$$

$$= \frac{\$180{,}000}{\$9.00 \text{ per unit}} = 20{,}000 \text{ units}$$

$$\text{Break-even point in sales dollars} = \frac{\text{Fixed expenses}}{\text{CM ratio}}$$

$$= \frac{\$180{,}000}{0.30} = \$600{,}000 \text{ in sales}$$

2. Incremental contribution margin:

$80,000 increased sales × 0.30 CM ratio	$24,000
Less increased advertising cost	16,000
Increase in monthly net operating income	$ 8,000

Since the company is now showing a loss of $4,500 per month, if the changes are adopted, the loss will turn into a profit of $3,500 each month ($8,000 less $4,500 = $3,500).

Problem 6-19 (continued)

3. Sales (39,000 units @ $27.00 per unit*) $1,053,000
   Variable expenses
   (39,000 units @ $21.00 per unit)..... 819,000
   Contribution margin..... 234,000
   Fixed expenses ($180,000 + $60,000)..... 240,000
   Net operating loss..... $ (6,000)

   *$30.00 – ($30.00 × 0.10) = $27.00

4. Sales = Variable expenses + Fixed expenses + Profits
   $30.00Q = $21.75Q* + $180,000 + $9,750
   $8.25Q = $189,750
   Q = $189,750 ÷ $8.25 per unit
   Q = 23,000 units

   *$21.00 + $0.75 = $21.75

   Alternative solution:

$$\text{Unit sales to attain target profit} = \frac{\text{Fixed expenses + Target profit}}{\text{CM per unit}}$$

$$= \frac{\$180{,}000 + \$9{,}750}{\$8.25 \text{ per unit}^{**}} = 23{,}000 \text{ units}$$

   **$30.00 – $21.75 = $8.25

5. a. The new CM ratio would be:

	Per Unit	*Percent of Sales*
Sales.....	$30.00	100%
Variable expenses	18.00	60
Contribution margin.....	$12.00	40%

Problem 6-19 (continued)

The new break-even point would be:

$$\text{Break-even point in unit sales} = \frac{\text{Fixed expenses}}{\text{Unit contribution margin}}$$

$$= \frac{\$180{,}000 + \$72{,}000}{\$12.00 \text{ per unit}} = 21{,}000 \text{ units}$$

$$\text{Break-even point in sales dollars} = \frac{\text{Fixed expenses}}{\text{CM ratio}}$$

$$= \frac{\$180{,}000 + \$72{,}000}{0.40} = \$630{,}000$$

b. Comparative income statements follow:

	Not Automated			*Automated*		
	Total	*Per Unit*	*%*	*Total*	*Per Unit*	*%*
Sales (26,000 units)	$780,000	$30.00	100%	$780,000	$30.00	100%
Variable expenses	546,000	21.00	70	468,000	18.00	60
Contribution margin	234,000	$ 9.00	30%	312,000	$12.00	40%
Fixed expenses	180,000			252,000		
Net operating income	$ 54,000			$ 60,000		

c. Whether or not the company should automate its operations depends on how much risk the company is willing to take and 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 0.30 to 0.40). The higher CM ratio means that once the break-even point is reached, profits will increase more rapidly than at present. If 26,000 units are sold next month, for example, the higher CM ratio will generate $6,000 more in profits than if no changes are made.

Problem 6-19 (continued)

The greatest risk of automating is that future sales may drop back down to present levels (only 19,500 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 sum, 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:

$$\begin{aligned} \text{Let } Q &= \text{Point of indifference in units sold} \\ \$21.00Q + \$180{,}000 &= \$18.00Q + \$252{,}000 \\ \$3.00Q &= \$72{,}000 \\ Q &= \$72{,}000 \div \$3.00 \text{ per unit} \\ Q &= 24{,}000 \text{ units} \end{aligned}$$

If more than 24,000 units are sold in a month, the proposed plan will yield the greater profits; if less than 24,000 units are sold in a month, the present plan will yield the greater profits (or the least loss).