

PART III: TEST BANK AND SOLUTIONS

1-1: Accounting and Control

The controller of a small private college is complaining about the amount of work she is required to do at the beginning of each month. The president of the university requires the controller to submit a monthly report by the fifth day of the following month. The monthly report contains pages of financial data from operations. The controller was heard saying, "Why does the president need all this information? He probably doesn't read half of the report. He's an old English professor and probably doesn't know the difference between a cost and a revenue."

Required:

- a. What is the probable role of the monthly report?
- b. What is the controller's responsibility with respect to a president who doesn't know much accounting?

2-1: Fixed, Variable, and Average Costs

Midstate University is trying to decide whether to allow 100 more students into the university. Tuition is \$5000 per year. The controller has determined the following schedule of costs to educate students:

<u>Number of Students</u>	<u>Total Costs</u>
4000	\$30,000,000
4100	30,300,000
4200	30,600,000
4300	30,900,000

The current enrollment is 4200 students. The president of the university has calculated the cost per student in the following manner: $\$30,600,000 / 4200 \text{ students} = \7286 per student. The president was wondering why the university should accept more students if the tuition is only \$5000.

Required:

- a. What is wrong with the president's calculation?
- b. What are the fixed and variable costs of operating the university?

2-2: Opportunity Costs

The First Church has been asked to operate a homeless shelter in part of the church. To operate a homeless shelter the church would have to hire a full time employee for \$1,200/month to manage the shelter. In addition, the church would have to purchase \$400 of supplies/month for the people using the shelter. The space that would be used by the shelter is rented for wedding parties. The church averages about 5 wedding parties a month that pay rent of \$200 per party. Utilities are normally \$1,000 per month. With the homeless shelter, the utilities will increase to \$1,300 per month.

What is the opportunity cost to the church of operating a homeless shelter in the church?

2-3: Fixed and Variable Costs

The university athletic department has been asked to host a professional basketball game at the campus sports center. The athletic director must estimate the opportunity cost of holding the event at the sports center. The only other event scheduled for the sports center that evening is a fencing match that would not have generated any additional costs or revenues. The fencing match can be held at the local high school, but the rental cost of the high school gym would be \$200. The athletic director estimates that the professional basketball game will require 20 hours of labor to prepare the building. Clean-up depends on the number of spectators. The athletic director estimates the time of clean-up to be equal to 2 minutes per spectator. The labor would be hired especially for the basketball game and would cost \$8 per hour. Utilities will be \$500 greater if the basketball game is held at the sports center. All other costs would be covered by the professional basketball team.

Required:

- a. What is the variable cost of having one more spectator?
- b. What is the opportunity cost of allowing the professional basketball team to use the sports center if 10,000 spectators are expected?
- c. What is the opportunity cost of allowing the professional basketball team to use the sports center if 12,000 spectators are expected?

2-4: Opportunity Cost of Attracting Industry

The Itagi Computer Company From Japan is looking to build a factory for making CD-ROM's in the United States. The company is concerned about the safety and well-being of its employees and wants to locate in a community with good schools. The company also wants the factory to be profitable and is looking for subsidies from potential communities. Encouraging new business to create jobs for citizens is important for communities, especially communities with high unemployment.

Wellville has not been very well since the shoe factory left town. The city officials have been working on a deal with Itagi to get the company to locate in Wellville. Itagi officials have identified a 20 acre undeveloped site. The city has tentatively agreed to buy the site for \$50,000 for Itagi and not require any payment of property taxes on the factory by Itagi for the first five years of operation. The property tax deal will save Itagi \$3,000,000 in taxes over the five years. This deal was leaked to the local newspaper. The headlines the next day were: "Wellville Gives Away \$3,000,000+ to Japanese Company".

Required:

- a. Do the headlines accurately describe the deal with Itagi?
- b. What are the relevant costs and benefits to the citizens of Wellville of making this deal?

2-5: Cost, Volume, Profit Analysis

With the possibility of the US Congress relaxing restrictions on cutting old growth, a local lumber company is considering an expansion of its facilities. The company believes it can sell lumber for \$0.18/board foot. A board foot is a measure of lumber. The tax rate for the company is 30 percent. The company has the following two opportunities:

- Build Factory A with annual fixed costs of \$20 million and variable costs of \$0.10/board foot. This factory has an annual capacity of 500 million board feet.
- Build Factory B with annual fixed costs of \$10 million and variable costs of \$0.12/board foot. This factory has an annual capacity of 300 million board feet.

Required:

- a. What is the break-even point in board feet for Factory A?
- b. If the company wants to generate an after tax profit of \$2 million with Factory B, how many board feet would the company have to process and sell?
- c. If demand for lumber is uncertain, which factory is riskier?
- d. At what level of board feet would the after-tax profit of the two factories be the same?

2-6: Cost, Volume, Profit Analysis

Leslie Mittelberg is considering the wholesaling of a leather handbag from Kenya. She must travel to Kenya to check on quality and transportation. The trip will cost \$3000. The cost of the handbag is \$10 and shipping to the United States can occur through the postal system for \$2 per handbag or through a freight company which will ship a container that can hold up to a 1000 handbags at a cost of \$1000. The freight company will charge \$1000 even if less than 1000 handbags are shipped. Leslie will try to sell the handbags to retailers for \$20. Assume there are no other costs and benefits.

Required:

- What is the break-even point if shipping is through the postal system?
- How many units must be sold if Leslie uses the freight company and she wants to have a profit of \$1000?
- At what output level would the two shipping methods yield the same profit?
- Suppose a large discount store asks to buy an additional 1000 handbags beyond normal sales. Which shipping method should be used and what is the minimum sales price Leslie should consider in selling those 1000 handbags?

2-7: Cost, Volume, Profit Analysis

Kalifo Company manufactures a line of electric garden tools that are sold in general hardware stores. The company's controller, Sylvia Harlow, has just received the sales forecast for the coming year for Kalifo's three products: weeders, hedge clippers, and leaf blowers. Kalifo has experienced considerable variations in sales volumes and variable costs over the past two years, and Harlow believes the forecast should be carefully evaluated from a cost-volume-profit viewpoint. The preliminary budget information for 1996 is presented below.

	Weeders	Hedge Clippers	Leaf Blowers
Unit sales	50,000	50,000	100,000
Unit selling price	\$28.00	\$36.00	\$48.00
Variable manufacturing cost per unit	13.00	12.00	25.00
Variable selling cost per unit	5.00	4.00	6.00

For 1996, Kalifo's fixed factory overhead is budgeted at \$2 million, and the company's fixed selling and administrative expenses are forecast to be \$600,000. Kalifo has a tax rate of 40 percent.

Required:

- a. Determine Kalifo Co.'s budgeted net income for 1996.
- b. Assuming that the sales mix remains as budgeted, determine how many units of each product Kalifo must sell in order to break even in 1996.
- c. Determine the total dollar sales Kalifo must sell in 1996 in order to earn an after-tax net income of \$450,000.
- d. After preparing the original estimates, Kalifo determines that its variable manufacturing cost of leaf blowers will increase 20 percent and the variable selling cost of hedge clippers can be expected to increase \$1 per unit. However, Kalifo has decided not to change the selling price of either product. In addition, Kalifo learns that its leaf blower is perceived as the best value on the market, and it can expect to sell three times as many leaf blowers as any other product. Under these circumstances, determine how many units of each product Kalifo will have to sell to break even in 1996.
- e. Explain the limitations of cost-volume-profit analysis that Sylvia Harlow should consider when evaluating Kalifo's 1996 budget.

Source: CMA adapted.

2-8: Breakeven and Cost-Volume-Profit with Taxes

DisKing Company is a retailer for video disks. The projected after-tax net income for the current year is \$120,000 based on a sales volume of 200,000 video disks. DisKing has been selling the disks at \$16 each. The variable costs consist of the \$10 unit purchase price of the disks and a handling cost of \$2 per disk. DisKing's annual fixed costs are \$600,000 and DisKing is subject to a 40 percent income tax rate.

Management is planning for the coming year, when it expects that the unit purchase price of the video disks will increase 30 percent.

Required:

- a. Calculate DisKing Company's break-even point for the current year in number of video disks.
- b. Calculate the increased after-tax income for the current year from an increase of 10 percent in projected unit sales volume.
- c. If the unit selling price remains at \$16, calculate the volume of sales in dollars that DisKing Company must achieve in the coming year to maintain the same after-tax net income as projected for the current year.

Source: CMA adapted

2-9: Cost-volume-profit of a Make/buy Decision

Elly Industries is a multiproduct company that currently manufactures 30,000 units of Part MR24 each month for use in production. The facilities now being used to produce Part MR24 have affixed monthly cost of \$150,000 and a capacity to produce 84,000 units per month. If Elly were to buy Part MR24 from an outside supplier, the facilities would be idle, but its fixed costs would continue at 40 percent of its present amount. The variable production costs of Part MR24 are \$11 per unit.

Required:

- a. If Elly Industries continues to use 30,000 units of Part MR24 each month, it would realize a net benefit by purchasing Part MR24 from an outside supplier only if the supplier's unit price is less than how much?
- b. If Elly Industries can obtain Part MR24 from an outside supplier at a unit purchase price of \$12.875, what is the monthly usage at which it will be indifferent between purchasing and making Part MR24?

Source: CMA adapted

2-10: Opportunity Cost of Purchase Discounts and Lost Sales

Winter Company is a medium-size manufacturer of disk drives that are sold to computer manufacturers. At the beginning of 2010, Winter began shipping a much-improved disk drive, Model W899. The W899 was an immediate success and accounted for \$5 million in revenues for Winter in 2010.

While the W899 was in the development stage, Winter planned to price it at \$130. In preliminary discussions with customers about the W899 design, no resistance was detected to suggestions that the price might be \$130. The \$130 price was considerably higher than the estimated variable cost of \$70 per unit to produce the W899, and it would provide Winter with ample profits.

Shortly before setting the price of the W899, Winter discovered that a competitor was reading a product very similar to the W899 and was no more than 60 days behind Winter's own schedule. No information could be obtained on the competitor's planned price, although it had a reputation for aggressive pricing. Worried about the competitor, and unsure of the market size, Winter lowered the price of the W899 to \$100. It maintained the price although, to Winter's surprise, the competitor announced a price of \$130 for its product.

After reviewing the 2010 sales of the W899, Winter's management concluded that unit sales would have been the same if the product had been marketed at the original price of \$130 each. Management has predicted that 2011 sales of the W899 would be either 85,000 units at \$100 each or 60,000 units at \$130 each. Winter has decided to raise the price of the disk drive to \$130 effective immediately.

Having supported the higher price from the beginning, Sharon Daley, Winter's marketing director, believes that the opportunity cost of selling the W899 for \$100 during 2010 should be reflected in the company's internal records and reports. In support of her recommendation, Daley explained that the company has booked these types of costs on other occasions when purchase discounts not taken for early payment have been recorded.

Required:

- a. Define *opportunity cost* and explain why opportunity costs are not usually recorded.
- b. Winter Company's management is considering Sharon Daley's recommendation to book the opportunity costs and have them reflected in its internal records and reports. If one were to record a nonzero opportunity cost, calculate the dollar amount of the opportunity cost that would be recorded by Winter Company for 2010 and explain how this cost might be reflected on its internal reports.
- c. Explain the impact of Winter Company's selection of the \$130 selling price for the W899 on 2011 operating income. Support your answer with appropriate calculations.

Source: CMA adapted

2-11: Make/Buy and the Opportunity Cost of Freed Capacity

Leland Manufacturing uses 10 units of part KJ37 each month in the production of radar equipment. The cost to manufacture one unit of KJ37 is presented in the accompanying table.

Direct materials	\$ 1,000
Materials handling (20% of direct material cost)	200
Direct labor	8,000
Manufacturing overhead	<u>12,000</u>
Total manufacturing cost	<u>\$21,200</u>

Materials handling represents the direct variable costs of the receiving department and is applied to direct materials and purchased components on the basis of their cost. This is a separate charge in addition to manufacturing overhead. Leland's annual manufacturing overhead budget is one-third variable and two-third fixed. Scott Supply, one of Leland's reliable vendors, has offered to supply part KJ37 at a unit price of \$15,000. The fixed cost of producing KJ37 is the cost of a special piece of testing equipment that ensures the quality of each part manufactured. This testing equipment is under a long-term, noncancelable lease. If Leland were to purchase part KJ37, materials handling costs would not be incurred.

Required:

- If Leland purchases the KJ37 units from Scott, the capacity Leland was using to manufacture these parts would be idle. Should Leland purchase the parts from Scott? Make explicit any key assumptions.
- Assume Leland Manufacturing is able to rent all idle capacity for \$25,000 per month. Should Leland purchase from Scott Supply? Make explicit any key assumptions.
- Assume that Leland Manufacturing does not wish to commit to a rental agreement but could use idle capacity to manufacture another product that would contribute \$52,000 per month. Should Leland manufacture KJ37? Make explicit any key assumptions.

Source: CMA adapted

2-12: Analyzing the Results from a Cost Regression Model

An industrial engineer has been studying the cost behavior of the automated oil cooling system in the numerically controlled cutting machine department. The oil cooling system circulates oil across the cutting tools as the machines make parts. Besides cooling the tools, the oil washes away cuttings. The oil system circulates the oil and separates out the cuttings, adds new oil as needed, and recycles the old oil. The system serves 10 machines.

Oil consumption has varied widely over the last few months, and management worries that the system is out of control. The industrial engineer has collected from the accounting reports monthly cost data on the oil used in the system over the last five years. The oil cost data represent monthly oil purchases. These cost data, combined with the number of machine cutting

hours in the month (total number of machine hours spent cutting parts in the month), led to the following regression results (both series were entered as positive numbers):

$$\left(\begin{array}{c} \text{Oil cost} \\ \text{in month } t \end{array} \right) = -12,675 - 16.54 \times \left(\begin{array}{c} \text{Number of machine} \\ \text{cutting hours in month } t \end{array} \right)$$

Based on the results of estimating this regression, the engineer concludes that the oil cooling system is out of control and a major engineering study of the system is warranted.

Interpret the regression results. Based on your interpretation, is an engineering study of the oil system warranted?

SOLUTIONS

1-1: Solution to Accounting and Control (15 minutes)

- a. There are two possible roles for the monthly report: facilitating planning decisions and control. Monthly reports provide more timely information than annual reports. With monthly reports the president can identify problem areas more quickly and make corrective actions. The president may also use the monthly reports to evaluate the work of his managers. The monthly reports provide information about how managers are performing.
- b. If the president of the university is unfamiliar with accounting numbers, the controller must adapt the monthly report to make it more comprehensible. The controller may even want to highlight areas in the report that might need attention.

2-1: Solution to Fixed, Variable, and Average Costs (15 minutes)

- a. The president of the university has calculated the average cost of each student. If the decision is to add more students, the president should be looking at the marginal cost of another student. The marginal cost can be approximated by the variable cost as long as the university is below capacity.
- b. The cost of adding 100 students is \$300,000. Therefore, the variable cost per unit is $\$300,000/100$, or $\$3,000/\text{student}$. The total variable cost of 4,000 students is $(4,000 \text{ students})(\$3,000/\text{student})$ or $\$12,000,000$. The remaining cost at 4,000 students is $\$30,000,000 - \$12,000,000$ or $\$18,000,000$, which is equal to the fixed costs.

2-2: Solution to Opportunity Costs (10 minutes)

The monthly opportunity cost of operating a homeless shelter is:

Full-time employee	\$1,200
Supplies	400
Use of space (forgone revenue: (5 parties)(\\$200/party)	1,000
Increase in utilities $\$1,300 - \$1,000$	<u>300</u>
Total	<u>\$2,900</u>

2-3: Solution to Fixed and Variable Costs (15 minutes)

- a. The variable cost of one more spectator is the cost of clean-up:

$$(2 \text{ minutes}/60 \text{ minutes/hour})(\$8/\text{hour}) = \$0.2667$$

- b. The opportunity cost with 10,000 spectators is:

Cost of relocating the fencing match	\$ 200
Cost of labor for preparation (20 hours)(\\$8/hour)	160
Cost of additional utilities	500
Cost of clean-up (10,000)(\\$0.2667)	<u>2,667</u>
Total	<u>\$3,527</u>

- c. The opportunity cost with 12,000 spectators is:

Cost of relocating the fencing match	\$ 200
Cost of labor for preparation (20 hours)(\\$8/hour)	160
Cost of additional utilities	500
Cost of clean-up (12,000)(\\$0.2667)	<u>3,200</u>
Total	<u>\$4,060</u>

2-4: Solution to Opportunity Cost of Attracting Industry (15 minutes)

- a. The headlines are not an accurate portrayal of the deal with Itagi. The analysis should consider the alternative of not having Itagi come to town. Compared to the alternative, Wellville is only paying \$50,000 to buy the land and losing the property taxes on 20 acres of undeveloped land, which is probably quite small.
- b. The opportunity benefits to the town of Wellville include increased jobs and increased property taxes after the first five years. The opportunity costs include increased congestion and the cost of increased city services. The problems associated with becoming a larger community should also be considered.

2-5: Solution to Cost, Volume, Profit Analysis (20 minutes)

- a. Break-even point of Factory A = $\$20,000,000/(\$0.18 - \$0.10) = 250,000,000$ board-feet

- b. To achieve an after-tax profit of \$2,000,000:

$$[\$10,000,000 + (\$2,000,000/(1 - .3))]/(\$0.18 - \$0.12) = 14,285,717 \text{ board-feet}$$

- c. Factory A has higher fixed costs, but lower variable costs per unit because of its larger capacity. If the demand for lumber is lower than expected, Factory A will have a more

difficult time recovering its fixed costs. The break-even point for factory B is lower than the break-even point for factory A. Therefore, Factory A is the riskier investment.

- d. The after-tax profits of the two factories will be the same when:

$$\begin{aligned}(1 - .3)[(\$0.18 - \$0.10)(\text{Quantity}) - \$20,000,000] \\ = (1 - .3)[(\$0.18 - \$0.12)(\text{Quantity}) - \$10,000,000]\end{aligned}$$

Quantity = 500 million board feet

2-6: Solution to Cost, Volume, Profit Analysis (20 minutes)

- a. Through the postal system, the variable cost per unit is \$10 + \$2 or \$12. Therefore, the break-even point is:

$$\$3,000/(\$20 - \$12) = 375 \text{ handbags}$$

- b. The fixed costs through the freight company are \$3,000 + \$1,000 or \$4,000 if fewer than 1,000 bags are purchased. The variable cost is only the \$10 purchase cost. To make a profit of \$1,000, Leslie must buy and sell:

$$(\$4,000 + \$1,000)/(\$20 - \$10) = 500 \text{ handbags}$$

- c. The two methods would yield the same profit for the following quantity of handbags:

$$\begin{aligned}(\$20 - \$12)(\text{Quantity}) - \$3,000 &= (\$20 - \$10)(\text{Quantity}) - \$4,000 \\ \text{Quantity} &= 500 \text{ handbags}\end{aligned}$$

- d. The 1,000 handbags will be most cheaply transported by container. Leslie's trip expenses of \$3,000 will occur anyway, so they are not relevant for pricing the special order. The incremental cost of the additional 1,000 handbags is the cost of the container (\$1,000) and the purchase cost of the handbags (\$10/handbag)(1,000 handbags) or a total of \$11,000. If the special order has no other effect on long term sales, then Leslie should accept a sales price above the \$11,000 incremental cost.

2-7: Solution to Cost, Volume, Profit Analysis (CMA adapted) (45 minutes)

a.

**Kalifo Company
Budgeted Net Income for 1996**

	<u>Weeders</u>	<u>Hedge Clippers</u>	<u>Leaf Blowers</u>	<u>Total</u>
Unit selling price	\$ 28.00	\$ 36.00	\$ 48.00	
Variable manufacturing cost	\$ 13.00	\$ 12.00	\$ 25.00	
Variable selling cost	5.00	4.00	6.00	
Total variable costs	<u>\$ 18.00</u>	<u>\$ 16.00</u>	<u>\$ 31.00</u>	
Contribution margin	\$ 10.00	\$ 20.00	\$ 17.00	
Unit sales	50,000	50,000	100,000	
Total Contribution	<u>\$500,000</u>	<u>\$1,000,000</u>	<u>\$1,700,000</u>	<u>\$3,200,000</u>
Fixed factory overhead				2,000,000
Fixed selling and administrative expense				<u>600,000</u>
Total fixed costs				<u>2,600,000</u>
Income before taxes				600,000
Income taxes @ 40%				<u>240,000</u>
Budgeted net income				<u>\$ 360,000</u>

b.

	<u>Unit Contribution</u>	<u>Sales Proportion</u>	<u>Proportional Contribution</u>
Weeders	\$10.00	.25	\$ 2.50
Hedge Clippers	20.00	.25	5.00
Leaf Blowers	17.00	.50	<u>8.50</u>
Proportional contribution margin/bundle			<u>\$16.00</u>

Total unit sales to breakeven =

$$= \frac{\$2,600,000}{\$16}$$

$$= \underline{\underline{162,500 \text{ units}}}$$

	<u>Sales Proportion</u>	<u>Total Unit Sales</u>	<u>Product Line Sales</u>
Weeders	.25	162,500	40,625
Hedge Clippers	.25	162,500	40,625
Leaf Blowers	.50	162,500	81,250

c.

	<u>Selling Price</u>	<u>Sales Proportion</u>	<u>Proportional Selling Price</u>
Weeders	\$28.00	.25	\$ 7.00
Hedge Clippers	36.00	.25	9.00
Leaf Blowers	48.00	.50	<u>24.00</u>
Proportional selling price			<u>\$40.00</u>

Contribution margin rate =

=

= 40 percent

Total dollar sales = $\frac{\text{Fixed costs} + \text{After-tax income} \div (1 - \text{tax rate})}{\text{Contribution margin rate}}$

= $\frac{\$2,600,000 + \frac{\$450,000}{.6}}{.4}$

= $\frac{\$3,350,000}{.4}$

= \$8,375,000

d.

	<u>Unit Contribution</u>	<u>Sales Proportion</u>	<u>Proportional Contribution</u>
Weeders	\$10.00	.20	\$ 2.00
Hedge Clippers ¹	19.00	.20	3.80
Leaf Blowers ²	12.00	.60	<u>7.20</u>
Total proportional contribution margin			<u>\$13.00</u>

Total unit sales to breakeven =

$$= \frac{\$2,600,000}{\$13}$$

$$= \underline{200,000 \text{ units}}$$

	<u>Sales Proportion</u>	<u>Total Unit Sales</u>	<u>Product Line Sales</u>
Weeders	.20	200,000	40,000
Hedge Clippers	.20	200,000	40,000
Leaf Blowers	.60	200,000	120,000

¹ Variable selling costs increase; thus the unit contribution decreases to \$19 [\$36 – (\$12 + 4 + 1)].

² The variable manufacturing cost increase 20 percent; thus, the unit contribution decreases to \$12 [\$48 – (1.2 × 25) – 6].

e. Sylvia Harlow should consider the following limitations when using cost-volume-profit analysis to evaluate Kalifo Company's 1996 budget. This type of analysis assumes that:

- all costs are either fixed or variable or can be broken down into fixed and variable components.
- all costs are linear in the relevant range, i.e., variable costs change in total with a change in activity and fixed costs remain the same at all levels of output and sales in the relevant range.
- sales prices will not change and sales demand is unlimited at the unit selling prices.

2-8: Solution to Breakeven and Cost Volume Profit with Taxes (CMA adapted) (15 minutes)

a. Breakeven = $\frac{\$600,000}{\$16-12} = 150,000 \text{ units}$

b. Sales	200,000 × 16 × 1.1	\$3,520,000
Variable Costs	200,000 × 12 × 1.1	(2,640,000)
Fixed Costs		<u>(600,000)</u>
Net income before tax		280,000
Taxes		<u>(112,000)</u>
Net income after taxes		168,000
Net income @ 200,000 units		<u>120,000</u>
Increase in net income		<u>\$ 48,000</u>

c. Let Q = unit sales. Then,

$$\begin{aligned}
 (16Q - 1.3 \times 10Q - 2Q - 600,000) (60\%) &= 120,000 \\
 Q - 600,000 &= 200,000 \\
 Q &= 800,000 \\
 PQ &= \$16 \times 800,000 = \$12,800,000
 \end{aligned}$$

2-9: Solution to Cost-Volume-Profit of a Make/Buy Decision (CMA adapted) (15 minutes)

- a. Each month Elly incurs \$150,000 of fixed cost to have capacity to produce 84,000 units. They are only using 30,000 units of that capacity now. If they outsource MR24, they will continue to incur 40% of the fixed costs, or \$60,000. However, they save \$90,000 (\$150,000 - \$60,000). Besides saving the fixed costs they save \$330,000 of variable costs (\$11 $\times$ 30,000) or a total cost savings of \$420,000. To be indifferent between outsourcing and continuing to produce, the outside price must be \$14 (\$420,000 $\div$ 30,000). An alternative way to solve the problem and get the same answer is:

$$\text{Outside Price} + \frac{40\% \text{ of Fixed Cost}}{30,000 \text{ Units}} = \text{Variable Cost} + \frac{\text{Fixed Cost}}{30,000 \text{ Units}}$$

$$P = \$11 + \frac{\$150,000}{30,000} - \frac{\$150,000 \times 40\%}{30,000} = \$14.00$$

b.
$$\$12.875 + \frac{40\% \text{ of Fixed Cost}}{Q \text{ Units}} = \$11 + \frac{\$150,000}{Q \text{ Units}}$$

$$\$12.875Q + \$60,000 = \$11Q + \$150,000$$

$$\$1.875Q = \$90,000$$

$$Q = 48,000 \text{ units}$$

2-10: Solution to Opportunity Cost of Purchase Discounts and Lost Sales (CMA adapted) (20 minutes)

- a. Opportunity cost is defined as the profit that could have been realized if a particular action was not chosen. Opportunity costs occur because a firm is faced with alternative uses of resources.

Opportunity costs are not ordinarily incorporated in formal accounting systems because

- they do not involve cash receipts or outlays (absence of a transaction).
- the next best opportunity is often difficult to determine.

- these types of costs often are not readily measurable.

b. Opportunity cost in 2008 = Units sold × Opportunity cost per unit

Units sold =

$$= \frac{\$5,000,000}{\$100}$$

$$= 50,000 \text{ units sold}$$

$$= 50,000 \times (\$130 - \$100)$$

$$= \$1,500,000 \text{ opportunity cost in 2006}$$

If the opportunity cost of Winter's pricing decision were to be reported in the revenue section of Winter's income statement, it would appear as shown below (there would be no change in Winter's net income for 2010):

Revenue (50,000 × \$130)	\$6,500,000
Loss from product pricing (50,000 × \$30)	<u>1,500,000</u>
Net revenue	<u>\$5,000,000</u>

c. The selection of the \$130 selling price for the W899 will increase Winter's 2011 operating income by \$1,050,000. This is equal to the increase in total contribution shown in the analysis of the 2011 projected sales of the W899 presented below.

	\$100 Selling Price	\$130 Selling price
Revenue per unit	\$100	\$130
Variable cost per unit	<u>70</u>	<u>70</u>
Contribution margin per unit	<u>\$ 30</u>	<u>\$ 60</u>

Total contribution:

At \$130 selling price	
60,000 units × \$60	= \$3,600,000
At \$100 selling price	
85,000 units × \$30	= <u>2,550,000</u>
Net gain in total contribution	= <u>\$1,050,000</u>

2-11: Solution to Make/Buy and the Opportunity Cost of Freed Capacity (CMA adapted) (20 minutes)

a. Cost of outside purchase:
Payment to Scott

\$15,000

Continuing cost of idle capacity (12,000 × 2/3)	<u>8,000</u>
	\$23,000

Cost if continue to make:	<u>21,200</u>
Incremental cost of purchase	<u>\$ 1,800</u>

Explicit assumption: the two-thirds of the fixed manufacturing overhead (\$8,000) is not a sunk cost and will still be incurred if the facility is idle.

b.	Cost of outside purchase:	
	Payment to Scott	\$15,000
	Continuing cost of capacity	8,000
	Lease receipts (\$25,000 ÷ 10 units)	<u>(2,500)</u>
	Net cash outlay of purchase	20,500
	Cost if continue to make	<u>21,200</u>
	Incremental cost of making	<u>\$ 700</u>

Explicit assumption: the two-thirds of the fixed manufacturing overhead (\$8,000) is not a sunk cost and will still be incurred if the facility is idle.

c.	Cost of outside purchase:	
	Payment to Scott	\$15,000
	Continuing cost of capacity	8,000
	Contribution from new product (\$52,000 ÷ 10 units)	<u>(5,200)</u>
	Net cash outlay from purchase	\$17,800
	Cost in continue to make	<u>21,200</u>
	Incremental cost of manufacturing	<u>\$ 3,400</u>

2-12: Solution to Analyzing the Results from a Cost Regression Model (20 minutes)

The regression results, on their surface, indicate that both fixed costs and variable costs per unit are negative. These findings are counter-intuitive. However, based on the regression one cannot conclude that the system is out of control. Several econometric problems can cause estimated fixed costs and variable costs to have negative point estimates, including the following:

1. The data have not been adjusted for price-level changes, causing the residuals to be serially correlated. While serially-correlated residuals do not cause the estimated coefficients to be biased, they will be measured with extremely large error.
2. The quantity of oil consumed depends on cutting time. But, the cost of oil is the product of price and quantity. Ideally, the dependent variable should be the quantity of oil consumed, not cost. At least this should control for price fluctuations, which again increase the sampling variability of the estimated coefficients.

3. Monthly oil cost data likely vary over the year if the business is seasonal. This again induces autocorrelation into the residuals, unless some adjustments are made.
4. Using the last five years of data assumes that the same system has been in operation for the last five years with no changes in technology or types of machines using the oil system. That is, the underlying process must have been stationary in order to use five years of data. This is unlikely to have been true.
5. Another critical assumption underlying the regression is that all of the cutting machines using the oil system are homogeneous and thus an hour of cutting time on each consumes roughly the same amount of oil.
6. The accounting system records oil purchases and not necessarily oil consumption in any given month. If oil is not inventoried when purchased but rather is expensed, then there is a mismatch between oil consumption and oil cost. This mismatch introduces further errors into the regression and increases the imprecision of the estimated fixed and variable costs.

One should look at the reported standard errors of the estimated coefficients. Given the preceding problems, the standard errors are probably large relative to the estimated coefficients suggesting that one cannot conclude that the coefficients are non-zero. While a detailed engineering study might be warranted, aberrations in the data are likely causing the estimated coefficients to be measured with substantial error thus making any inferences drawn from the results meaningless.