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Managerial 10e – Chapter 2 – Exercises and Problems – Set B

Exercise 2-1B ***Identifying cost behavior***

Borris Copies Company provides professional copying services to customers through the 35 copy stores it operates in the southwestern United States. Each store employs a manager and four assistants. The manager earns $4,000 per month plus a bonus of 3 percent of sales. The assistants earn hourly wages. Each copy store costs $3,000 per month to lease. The company spends $5,000 per month on corporate-level advertising and promotion.

Required

Classify each of the following costs incurred by Borris Copies as fixed, variable, or mixed.

a. Lease cost relative to the number of copies made for customers.
b. Assistants' wages relative to the number of copies made for customers.
c. Store manager's salary relative to the number of copies made for customers.
d. Cost of paper relative to the number of copies made for customers.
e. Lease cost relative to the number of stores.
f. Advertising and promotion costs relative to the number of copies a particular store makes.

Exercise 2-1B

Requirement	Fixed	Variable	Mixed
a.	x		
b.	x		
c.			x
d.		x	
e.		x	
f.	x		

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Managerial 10e – Chapter 2 – Exercises and Problems – Set B

Exercise 2-2B *Identifying cost behavior*

At the various sales levels shown, Parsons Company incurred the following costs.

	Units Sold	50	100	150	200	250
a.	Depreciation cost per unit	$ 30.00	$ 15.00	$ 10.00	$ 7.50	$ 6.00
b.	Total rent cost	600.00	600.00	600.00	600.00	600.00
c.	Total shipping cost	40.00	80.00	120.00	160.00	200.00
d.	Rent cost per unit of merchandise sold	12.00	6.00	4.00	3.00	2.40
e.	Total utility cost	200.00	300.00	400.00	500.00	600.00
f.	Supplies cost per unit	4.00	4.00	4.00	4.00	4.00
g.	Total insurance cost	500.00	500.00	500.00	500.00	500.00
h.	Total salary cost	1,500.00	2,000.00	2,500.00	3,000.00	3,500.00
i.	Cost per unit of merchandise sold	8.00	8.00	8.00	8.00	8.00
j.	Total cost of goods sold	4,000.00	8,000.00	12,000.00	16,000.00	20,000.00

Required

Identify each of these costs as fixed, variable, or mixed.

Exercise 2-2B

Requirement	Fixed	Variable	Mixed
a.	x		
b.	x		
c.		x	
d.	x		
e.			x
f.		x	
g.	x		
h.			x
i.		x	
j.		x	

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Exercise 2-3B *Determining fixed cost per unit*

Tameron Corporation incurs the following annual fixed production costs.

Item	Cost
Insurance cost	$ 26,000
Patent amortization cost	400,000
Depreciation cost	160,000
Property tax cost	14,000

Required

Determine the total fixed production cost per unit if Tameron produces 10,000, 20,000, or 50,000 units.

Exercise 2-3B

Total Fixed Cost:

Item	Cost
Insurance	$ 26,000
Patent amortization	400,000
Depreciation	160,000
Property tax	14,000
Total fixed	$600,000

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Units Produced (a)	10,000	20,000	50,000
Total fixed cost (b)	$600,000	$600,000	$600,000
Fixed cost per unit (b ÷ a)	$60	$30	$12

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Exercise 2-4B ***Determining total variable cost***

The following variable manufacturing costs apply to goods produced by Bure Manufacturing Corporation.

Item	Cost per Unit
Materials	$4.20
Labor	3.40
Variable overhead	1.40
Total	$9.00

Required

Determine the total variable manufacturing cost if Bure produces 4,000, 6,000, or 8,000 units.

Exercise 2-4B

Units Produced (a)	4,000	6,000	8,000
Variable cost per unit (b)	$9.00	$9.00	$9.00
Total variable cost (a x b)	$36,000	$54,000	$72,000

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Exercise 2-5B *Fixed versus variable cost behavior*

Russell Company's production and total cost data for two recent months follow.

	January	February
Units produced	1,000	500
Total depreciation cost	$6,000	$6,000
Total factory supplies cost	$2,000	$1,000

Required

a. Separately calculate the depreciation cost per unit and the factory supplies cost per unit for both January and February.

b. Identify which cost is variable and which is fixed. Explain your answer.

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Exercise 2-5B

a.

	January	February
Units Produced (a)	1,000	500
Total depreciation cost (b)	$6,000	$6,000
Depreciation cost per unit (b ÷ a)	$6.00	$12.00
Total factory supplies cost (c)	$2,000	$1,000
Factory supplies cost per unit (c ÷ a)	$2.00	$2.00

b. Since the <u>total</u> depreciation cost remains unchanged when the number of units produced changes, it is a fixed cost. Since the <u>total</u> factory supplies cost changes in direct proportion to changes in the number of units, it is a variable cost.

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Exercise 2-6B *Fixed versus variable cost behavior*

Nielsen Chairs Corporation produces ergonomically designed chairs favored by architects. The company normally produces and sells from 2,000 to 5,000 chairs per year. The following cost data apply to various production activity levels.

Number of Chairs	2,000	3,000	4,000	5,000
Total costs incurred				
Fixed	$ 80,000			
Variable	20,000			
Total costs	$100,000			
Per-unit chair cost				
Fixed	$ 40.00			
Variable	10.00			
Total cost per chair	$ 50.00			

Required

a. Complete the preceding table by filling in the missing amounts for the levels of activity shown in the first row of the table.

b. Explain why the total cost per chair decreases as the number of chairs increases.

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Exercise 2-6B

a.

Number of Chairs	2,000	3,000	4,000	5,000
Total costs incurred				
Fixed	$ 80,000	$ 80,000	$ 80,000	$ 80,000
Variable	20,000	30,000	40,000	50,000
Total costs	$100,000	$110,000	$120,000	$130,000
Per unit chair cost				
Fixed	$40.00	$26.67*	$20.00	$16.00
Variable	10.00	10.00	10.00	10.00
Total cost per chair	$50.00	$36.67	$30.00	$26.00

*Rounded

Exercise 2-6B (Sol. continued)

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Exercise 2-6B (Sol. continued)

b. The total cost per chair decreases as the number of chairs produced increases because the same amount of fixed cost is spread over an increasingly larger number of chairs.

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Exercise 2-7B ***Fixed versus variable cost behavior***

Shawn Corder needs extra money quickly to help cover some unexpected school expenses. Mr. Corder has learned fortune-telling skills through his long friendship with Fred Molloy, who tells fortunes during the day at the city market. Mr. Molloy has agreed to let Mr. Corder use his booth to tell fortunes during the evening for a rent of $90 per night.

Required

a. What is the booth rental cost both in total and per customer if the number of customers is 5, 10, 15, 20, or 25? Round your figures to two decimal points.

b. Is the cost of renting the fortune-telling booth fixed or variable relative to the number of customers?

c. Draw two graphs. On one, plot total booth rental cost for 5, 10, 15, 20, and 25 customers; on the other, plot booth rental cost per customer for 5, 10, 15, 20, or 25 customers.

d. Mr. Corder has little money. What major business risks would he take by renting the fortune-telling booth? How could he minimize those risks?

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Exercise 2-7B

a.

Number of Customers (a)	5	10	15	20	25
Total rental cost (b)	$90	$90	$90	$90	$90
Cost per customer (b) ÷ (a)	$18.00	$9.00	$6.00	$4.50	$3.60

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Exercise 2-7B (Cont. on next page)

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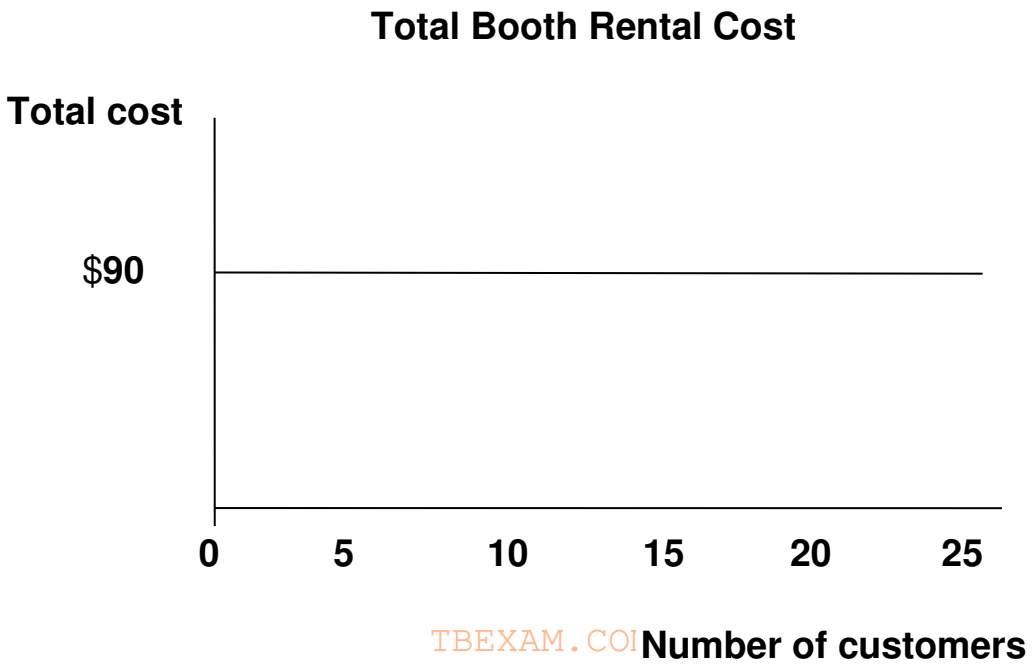
Exercise 2-7B (Continued)

b. **Since the cost of renting the booth is $90 regardless of the number of customers, it is a fixed cost.**

c.



Exercise 2-7B (Cont. on next page)

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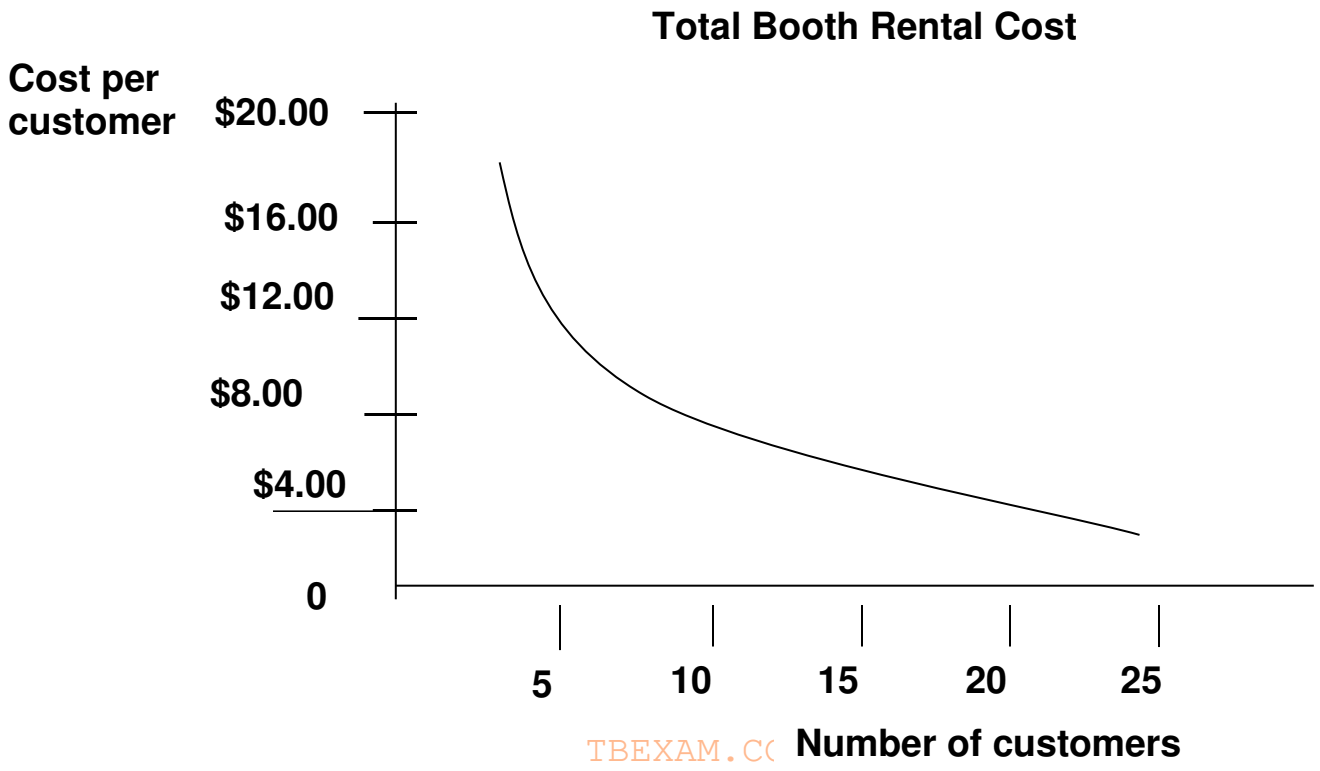
Exercise 2-7B (Continued)



d. Corder's major business risk is the uncertainty about whether he can generate enough revenue to cover the fixed cost. Corder must pay the $90 booth rental fee even if no one has their fortune told. Accordingly, there is a potential for Corder to experience a financial loss instead of income. Since the cost per fortune decreases as volume increases, Corder can sell fortunes for less if more people have their fortune told. Also, lower fortune prices encourage higher sales. Corder must set a price that encourages people to have their fortunes read but also produces sufficient revenue to cover the fixed cost of renting the booth and provide a reasonable profit.

Exercise 2-7B (Sol. continued on next page)

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Exercise 2-7B d. (Continued)

d. To a large extent, Corder's business risk is the result of his cost structure. To minimize the risk, Corder could possibly change that structure. For instance, Corder may want to negotiate with the booth owner to set a flexible rental plan. The booth owner may be paid a particular percentage of the revenue instead of a fixed fee. In other words, the cost structure could be changed from fixed to variable. In this arrangement, Corder's risk of suffering a loss is virtually eliminated. On the other hand, the variable cost structure does not allow Corder to benefit from operating leverage thereby limiting profitability. Therefore, there is a risk of lost profitability. Risk minimization does not mean risk elimination altogether.

Other business risks include competition, economic downturns, theft of cash receipts, and potential litigation. Corder will also likely need to advertise his booth to inform prospective customers about the opportunity to have fortunes told in the evening.

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Since Corder's primary business risk results from the expected relationship between revenue and cost he could try to minimize that risk by changing that relationship. Perhaps he could negotiate a flexible cost scheme, offering to pay Molloy some percentage of revenue instead of a fixed booth rental amount. Such an arrangement would virtually eliminate Corder's risk of suffering a loss. It would not, however, ensure Corder his desired profit. Minimizing risk does not generally totally eliminate risk.

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Exercise 2-8B ***Fixed versus variable cost behavior***

In the evenings, Shawn Corder works telling fortunes using his friend Fred Molloy's booth at the city market. Mr. Molloy pays the booth rental, so Mr. Corder has no rental cost. As a courtesy, Mr. Corder provides each customer a soft drink. The drinks cost him $0.50 per customer.

Required

a. What is the soft drink cost both in total and per customer if the number of customers is 5, 10, 15, 20, or 25?

b. Is the soft drink cost fixed or variable?

c. Draw two graphs. On one, plot total soft drink cost for 5, 10, 15, 20, and 25 customers; on the other, plot soft drink cost per customer for 5, 10, 15, 20, and 25 customers.

d. Comment on the likelihood that Mr. Corder will incur a loss on this business venture.

Exercise 2-8B

a.

Number of Customers (a)	5	10	15	20	25
Total soft drink cost $0.50 x (a)	$2.50	$5.00	$7.50	$10.00	$12.50
Soft drink cost per customer	$0.50	$0.50	$0.50	$0.50	$0.50

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b. Since the total soft drink cost increases proportionately as the number of customers increases, it is variable.

Exercise 2-8B (Sol. cont. on next page)

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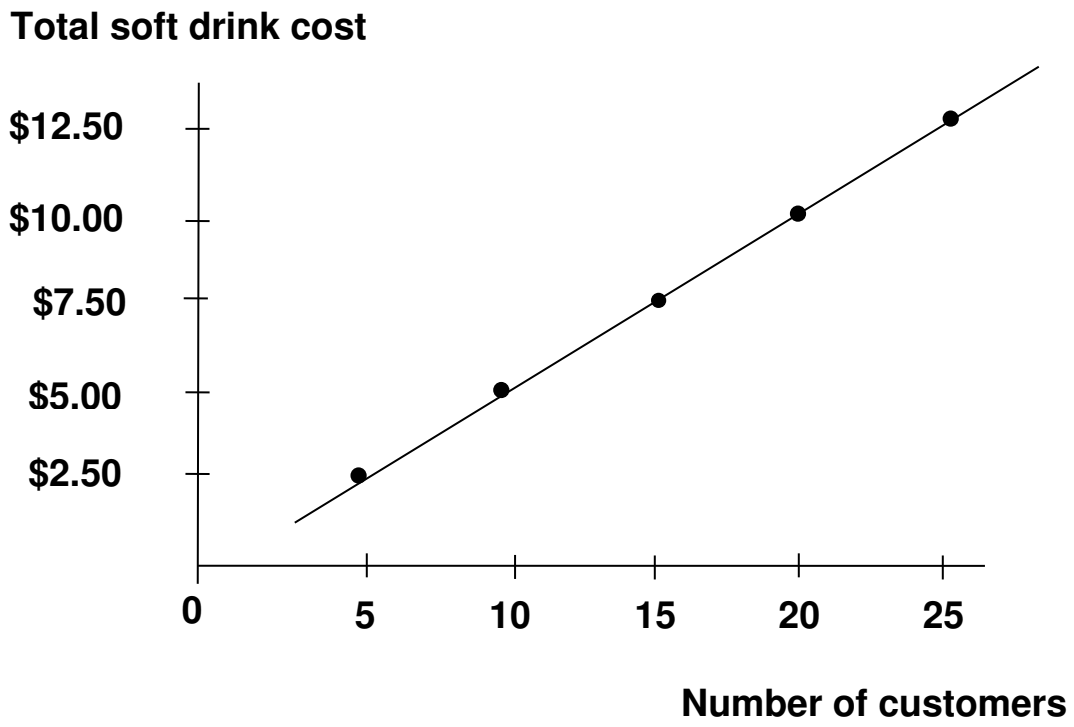
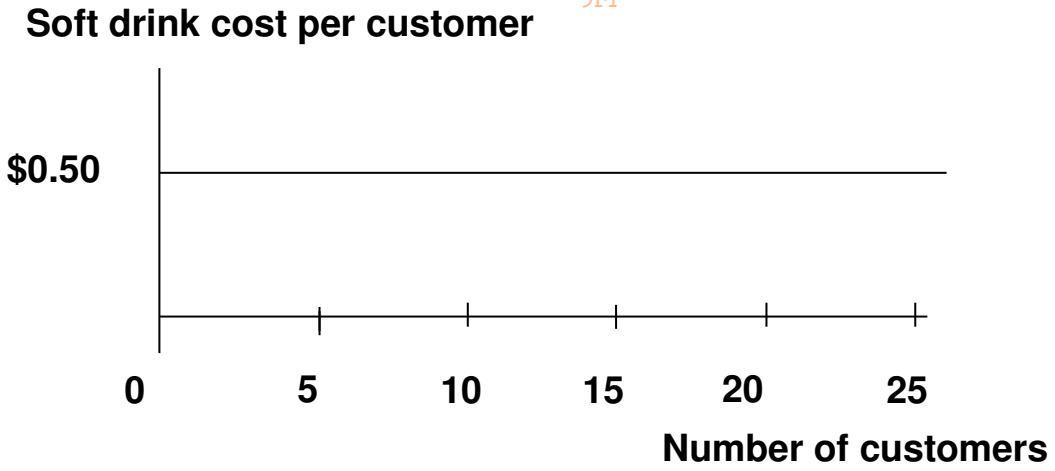
Exercise 2-8B (Continued)

c.





Exercise 2-8B (Sol.continued on next page)

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Exercise 2-8B (Continued)

d. Corder's major business risk is whether his business can generate a desired profit. The soft drink cost and the revenue are both variable. As long as the price he charges each customer is greater than the soft drink cost, Corder will make a profit. However, the number of customers he will serve is uncertain. Corder should set a competitive price for fortune reading. He may need to advertise to attract customers. His ultimate goal is to generate the maximum profit.

Corder's other business risks include competition and unfavorable economic conditions.

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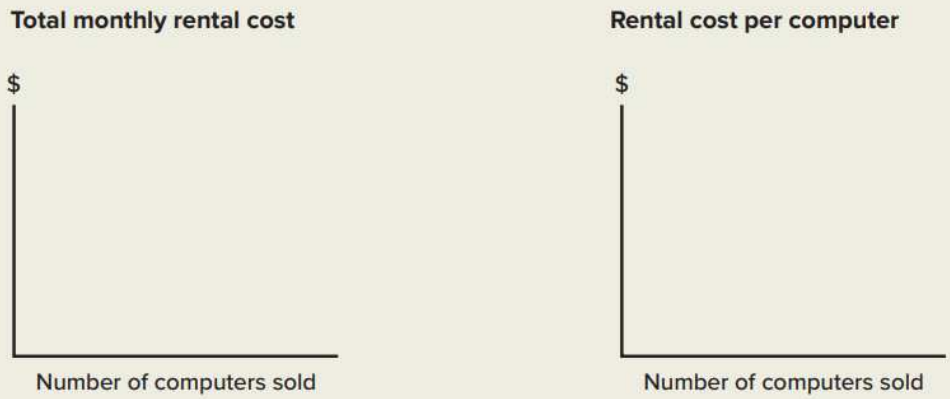
Exercise 2-9B *Graphing fixed cost behavior*

Parry Computers leases space in a mall at a monthly rental cost of $3,000. The following graph setups depict rental cost on the vertical axes and activity level on the horizontal axes.



Required

a. Draw a line that depicts the relationship between the total monthly rental cost and the number of computers sold.

b. Draw a line that depicts the relationship between rental cost per computer and the number of computers sold.

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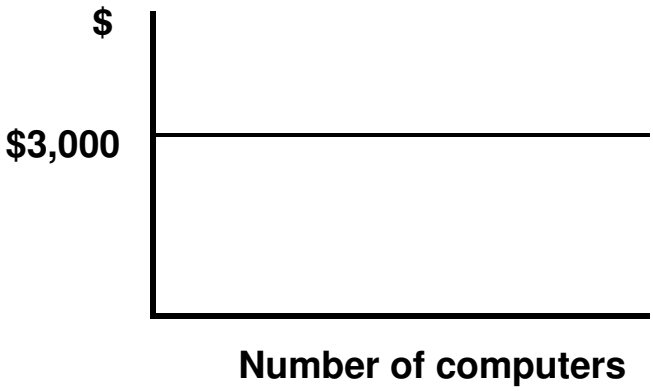
Exercise 2-9B

a. Total monthly rental cost



Exercise 2-9B (Sol. cont. on next page)

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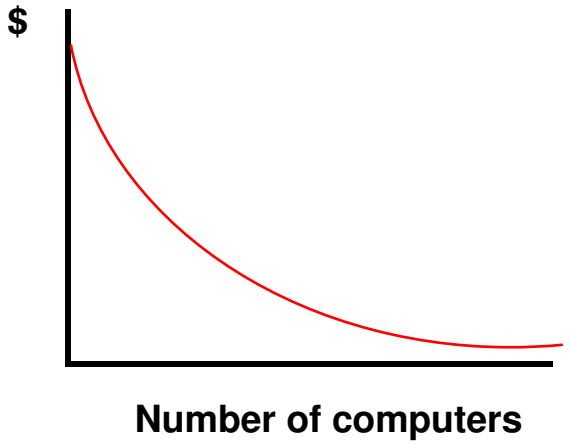
Exercise 2-9B (Continued)

b. Rental cost per computer



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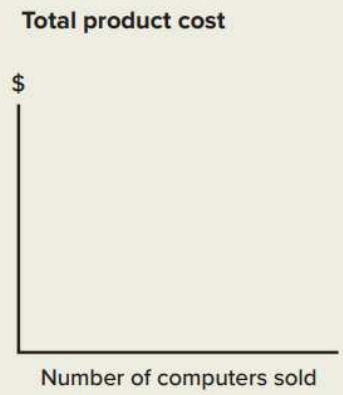
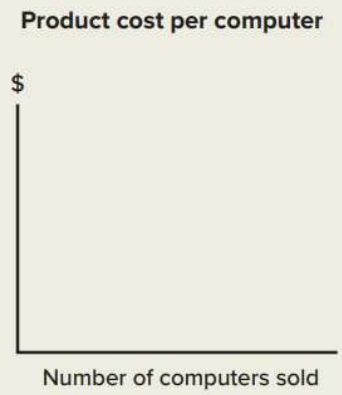
Exercise 2-10B *Graphing variable cost behavior*

Dillon Computers purchases computers from a manufacturer for $500 per computer. The following graph setups depict product cost on the vertical axes and activity level on the horizontal axes.





Required

a. Draw a line that depicts the relationship between total product cost and the number of computers sold.

b. Draw a line that depicts the relationship between product cost per computer and the number of computers sold.

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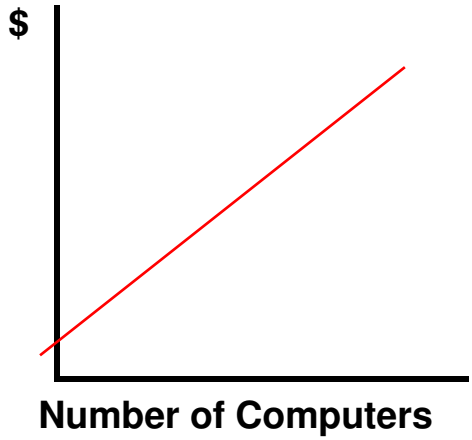
Exercise 2-10B

a. Total product cost



Exercise 2-10B (Solution cont on next page)

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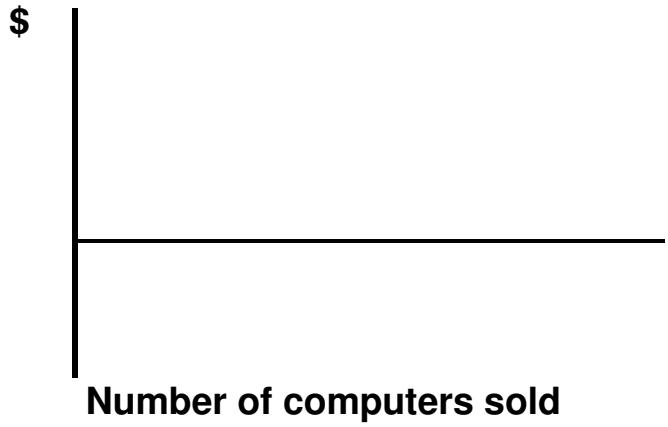
Exercise 2-10B (Continued)

b. Product cost per computer



$500

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Exercise 2-11B *Mixed cost at different levels of activity*

Top Hats Corporation uses workers in Indonesia to manually weave straw hats. The company pays the workers a daily base wage plus $0.50 per completed hat. On Monday, workers produced 100 hats for which the company paid wages of $95.

Required

Calculate the total cost of the workers' wages for each of the following days.

Day	Monday	Tuesday	Wednesday	Thursday
Number of hats woven	100	120	160	80
Total variable cost				
Total fixed cost				
Total wages cost				

Exercise 2-11B

$95 – ($0.50 x 100) = $45
The fixed portion of the mixed cost is, therefore, $45 for any level of activity within the relevant range of production. This cost is the daily base wage and it will be the same each day.

Day	Monday	Tuesday	Wednesday	Thursday
Number of hats woven	100	120	160	80
Total variable cost	$50	$ 60	$ 80	$40
Total fixed cost	45	45	45	45
Total wages cost	$95	$105	$125	$85

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Managerial 10e – Chapter 2 – Exercises and Problems – Set B

Exercise 2-12B *Effect of cost structure on projected profits*

Standard and Variant compete in the same market. The following budgeted income statements illustrate their cost structures.

Income Statements	Company	
	Standard	Variant
Number of customers (a)	150	150
Sales revenue (a × $160)	$24,000	$24,000
Variable cost (a × $90)	N/A	(13,500)
Contribution margin	24,000	10,500
Fixed costs	(13,500)	N/A
Net income	$10,500	$10,500

Required

a. Assume that Standard can lure all 150 customers away from Variant by lowering its sales price to $85 per customer. Reconstruct Standard's income statement based on 300 customers.

b. Assume that Variant can lure all 150 customers away from Standard by lowering its sales price to $85 per customer. Reconstruct Variant's income statement based on 300 customers.

c. Why does the price-cutting strategy increase Standard's profits but result in a net loss for Variant?

Exercise 2-12B

Income Statements		
a. & b.	a.	b.
Company	Standard	Variant
Number of customers (n)	300	300
Sales revenue (n x $85)	$25,500	$ 25,500
Variable cost: Variant (n x $90)		27,000
Variable cost: Standard (n x $0)	0	
Contribution margin	25,500	(1,500)
Fixed cost	(13,500)	0
Net income (loss)	$12,000	$ (1,500)

Exercise 2-12B (Sol. cont. on next page)

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Exercise 2-12B (Sol. cont.)

c. The price-cutting strategy increases each company's revenue by $1,500 ($25,500 – $24,000) because selling to 300 customers at $85 each ($25,500) produces more revenue than selling to 150 customers at $160 each ($24,000). Since Standard's costs are fixed, the entire $1,500 increase in sales revenue increases net income. In contrast, Variant's costs vary with the number of customers it serves. Increasing the number of customers by 150 increases Variant's costs by $13,500 (150 units x $90). The price-cutting strategy increases Variant's revenue by $1,500 and increases its costs by $13,500, resulting in a net decline in profitability of $12,000 ($1,500 of additional revenue less $13,500 in additional costs). Variant's projected results change from $10,500 of net income to $1,500 of net loss.

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Exercise 2-13B ***Using a contribution margin format income statement to measure the magnitude of operating leverage***

Nagano Company, a merchandising firm, reported the following operating results.

Income Statements	
Sales revenue (2,400 units × $100)	$ 240,000
Cost of goods sold (2,400 units × $65)	(156,000)
Gross margin	84,000
Sales commissions (10% of sales revenue)	(24,000)
Administrative salaries expense	(15,000)
Advertising expense	(20,000)
Depreciation expense	(10,600)
Shipping and handling expense (2,400 units × $1)	(2,400)
Net income	$ 12,000

Required

a. Reconstruct the income statement using the contribution margin format.

b. Calculate the magnitude of operating leverage.

c. Use the measure of operating leverage to determine the amount of net income that Nagano will earn if sales revenue increases by 10 percent.

Exercise 2-13B (Sol. on next page)

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Exercise 2-13B (Solution)

a.

Income Statement	
Sales revenue (2,400 units x $100)	$240,000
Less: Variable costs	
Cost of goods sold (2,400 units x $65)	(156,000)
Sales commissions (10% of sales revenue)	(24,000)
Shipping and handling expense (2,400 units x $1)	(2,400)
Contribution margin	57,600
Less: Fixed costs	
Administrative salaries expense	(15,000)
Advertising expense	(20,000)
Depreciation expense	(10,600)
Net income	$ 12,000

b.

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

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$$\text{Operating leverage} = \frac{\$57{,}600}{\$12{,}000} = 4.8 \text{ times}$$

c. A 10 percent increase in sales revenue will produce a 48 percent increase in net income (10 percent x 4.8 = 48 percent) Nagano's net income would increase to $17,760 [$12,000 + ($12,000 x 0.48)].

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Exercise 2-14B ***Assessing the magnitude of operating leverage***

The following budgeted income statement applies to Johnson Company.

Income Statement	
Sales revenue (1,000 units × $89)	$ 89,000
Variable cost (1,000 units × $50)	(50,000)
Contribution margin	39,000
Fixed costs	(26,000)
Net income	$ 13,000

Required

a. Use the contribution margin approach to calculate the magnitude of operating leverage.

b. Use the operating leverage measure computed in Requirement *a* to determine the amount of net income that Johnson Company will earn if sales volume increases by 10 percent. Assume the sales price per unit remains unchanged at $89.

c. Verify your answer to Requirement *b* by constructing an alternative income statement based on a 10 percent increase in sales volume. The sales price per unit remains unchanged at $89. Calculate the percentage change in net income for the two income statements.

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Exercise 2-14B

a.

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

$$\text{Operating leverage} = \frac{\$39{,}000}{\$13{,}000} = 3$$

b. **(10% Change in revenue x 3 Operating leverage) = 30% change in net income**

30% x $13,000 = $3,900 Change

Revised net income = $13,000 + $3,900 = $16,900

Exercise 2-14B (Sol. cont. on next page)

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Exercise 2-14B (Sol. continued)

c.

Annual Income Statements			
Sales volume in units (a)	1,000	% Change	1,100
Sales revenue (a x $89)	$89,000	⇒+10%⇒	$97,900
Variable costs (a x $50)	(50,000)		(55,000)
Contribution margin	39,000		42,900
Fixed cost	(26,000)		(26,000)
Net income	$ 13,000	⇒+30%⇒	$ 16,900

($16,900 – $13,000) ÷ $13,000 = 30%

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Exercise 2-15B *Averaging costs*

Century Entertainment Company operates a movie theater that has monthly fixed expenses of $4,000. In addition, the company pays film distributors $1.00 per ticket sold. The following chart shows the number of tickets Century expects to sell in the coming year.

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
2,000	1,600	3,200	3,400	3,200	4,200	4,700	4,000	5,000	3,100	3,000	2,600	40,000

Required

Assume that Century wants to earn $3.00 per movie patron. What price should it charge for a ticket in January and in September?

Exercise 2-15B

Century should charge the same amount per ticket throughout the year regardless of the number of patrons expected in a given month. Using a cost-plus pricing strategy, Century would set the ticket price as follows: Price = Average fixed cost per patron + Variable cost per patron + Desired profit per patron. The fixed cost must be averaged over the annual total number of patrons. The computations are shown below:

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Computation of average fixed cost per patron:

$$\text{Fixed cost per patron} = \frac{\$4{,}000 \times 12}{40{,}000 \text{ patrons}} = \$1.20$$

Price = Fixed cost per patron + Variable cost per patron + $3.00
Price = $1.20 + $1.00 + $3.00
Price = $5.20

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Exercise 2-16B ***Estimating fixed and variable costs using the high-low method***

Pettit Ice Cream Company produces various ice cream products for which demand is highly seasonal. The company sells more ice cream in warmer months and less in colder ones. Last year, the high point in production activity occurred in August when Pettit produced 50,000 gallons of ice cream at a total cost of $82,000. The low point in production activity occurred in February when the company produced 20,000 gallons of ice cream at a total cost of $46,000.

Required

a. Use the high-low method to estimate the amount of fixed cost per month incurred by Pettit Ice Cream Company.

b. Determine the total estimated monthly cost when 40,000 gallons of ice cream are produced.

c. What factors could cause the estimate determined in Requirement *b* to be inaccurate?

d. Explain how regression analysis could be used to improve accuracy. Your explanation should include a discussion of the R^2 statistic as well as the potential impact of multiple regression analysis.

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Exercise 2-16B

a.

$$\text{Variable cost per gallon} = \frac{\text{Change in total cost}}{\text{Change in volume}} = \frac{\$82{,}000 - \$46{,}000}{50{,}000 - 20{,}000} = \$1.20$$

The fixed cost can be determined by the following formula. The computations shown below are based on the high point. Computations at the low point would produce the same result.

Fixed cost = Total cost – Variable cost
Fixed cost = $82,000 – (50,000 gallons x $1.20)
Fixed cost = $82,000 – $60,000
Fixed cost = $22,000

b. **Total cost = Fixed cost + (Variable cost per unit x Number of units)**
Total cost = $22,000 + ($1.20 x 40,000) = $70,000

c. **If the high and/or low points are not representative of the underlying data set, the estimates will be inaccurate.**

Exercise 2-16B (Sol. cont. on next page)

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Exercise 2-16B (Sol. cont.)

d. Regression analysis includes a statistic (R^2) that represents the percentage of the variation in the dependent variable (total monthly cost) that is explained by variation in the independent variable (number of gallons). If the R^2 is low, multiple regression analysis can be employed to examine the simultaneous effects of a number of independent variables thereby offering the opportunity for improved accuracy by expanding the explanatory base (set of independent variables).

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Problem 2-17B ***Identifying cost behavior***

Required

Identify the following costs as fixed or variable.

Costs related to operating a retail gasoline company follow.

a. Depreciation of equipment relative to the number of customers served at a station.
b. Property and real estate taxes relative to the amount of gasoline sold at a particular station.
c. Depreciation of equipment relative to the number of stations.
d. Cashiers' wages relative to the number of customers served in a station.
e. Salary of a manager of a particular station relative to the number of employees.
f. Gasoline cost relative to the number of customers.
g. Utility cost relative to the number of stations in operation.
h. The company's cost of national TV commercials relative to the number of stations in operation.

Costs related to shuttle bus trips between JFK International Airport and downtown New York follow. Each bus driver receives a specific salary per trip. A manager schedules bus trips and supervises drivers, and an administrative assistant receives phone calls.

i. A driver's salary relative to the number of passengers on a particular trip.
j. Fuel costs relative to the number of trips.
k. Fuel costs relative to the number of passengers on a particular trip.
l. Drivers' salaries relative to the number of trips driven.
m. Office staff salaries relative to the number of passengers on a particular trip.
n. Depreciation relative to the number of buses in service.

Sussie's Barbershop operates several stores in shopping centers. Each store employs a supervisor and three barbers. The supervisor is paid a specific salary per month. Each barber receives a specific salary per month plus a 10 percent commission based on the service revenues the barber has generated. Costs related to Sussie's Barbershop follow.

o. Store rental costs relative to the number of customers.
p. Barbers' commissions relative to the number of customers.
q. Supervisory salaries relative to the number of customers served in a particular store.
r. Barbers' salaries relative to the number of barbers in a particular district.
s. Supplies cost relative to the number of hair services provided in a particular store.
t. Barbers' salaries relative to the number of customers served at a particular store.

Problem 2-17B (Sol. on next page)

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Problem 2-17B (Solution)

Requirement	Fixed	Variable
a.	x	
b.	x	
c.		x
d.	x	
e.	x	
f.		x
g.		x
h.	x	
i.	x	
j.		x
k.	x	
l.	x	
m.	x	
n.		x
o.	x	
p.		x
q.	x	
r.		x
s.		x
t.	x	

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Problem 2-18B *Cost behavior and averaging*

Chris Quill asks you to analyze the operating cost of his lawn services business. He has purchased the needed equipment with a cash payment of $90,000. Upon your recommendation, he agrees to adopt straight-line depreciation. The equipment has an expected life of four years and no salvage value. Mr. Quill pays his workers $20 per lawn service. Material costs, including fertilizer, pesticide, and supplies, are expected to be $10 per lawn service.

Required

a. Determine the total cost of equipment depreciation and the average cost of equipment depreciation per lawn service, assuming that Mr. Quill provides 40, 50, or 60 lawn services during one month. Is the cost of equipment a fixed or a variable cost?

b. Determine the total expected cost of labor and the average expected cost of labor per lawn service, assuming that Mr. Quill provides 40, 50, or 60 lawn services during one month. Is the cost of labor a fixed or a variable cost?

c. Determine the total expected cost of materials and the average expected cost of materials per lawn service, assuming that Mr. Quill provides 40, 50, or 60 lawn services during one month. Is the cost of fertilizer, pesticide, and supplies a fixed or a variable cost?

d. Determine the total expected cost per lawn service, assuming that Mr. Quill provides 40, 50, or 60 lawn services during one month.

e. Determine the average expected cost per lawn service, assuming that Mr. Quill provides 40, 50, or 60 lawn services during one month. Why does the cost per unit decrease as the number of lawn services increases?

f. If Mr. Quill tells you that he prices his services at 30 percent above cost, would you assume that he means average or actual cost? Why?

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Problem 2-18B

a.

Number of Lawn Services (a)	40	50	60
Total expected monthly depreciation cost (b)	$1,875	$1,875	$1,875
Average per unit depreciation cost (b ÷ a)	$46.88*	$37.50	$31.25

*Rounded

Depreciation per month = $90,000 x 1/4 x 1/12 = $1,875

Type of cost: Since the <u>total</u> depreciation cost remains constant at $1,875 regardless of the number of lawn services, it is a fixed cost.

Problem 2-18B (Sol. cont. on next page)

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Problem 2-18B (Sol. cont.)

b.

Number of Lawn Services (a)	40	50	60
Average per unit labor cost (b)	$20	$20	$20
Total labor cost (a x b)	$800	$1,000	$1,200

Type of cost: Since the total labor cost increases proportionately with the number of lawn services, it is a variable cost.

c.

Number of Lawn Services (a)	40	50	60
Average per unit materials cost (b)	$ 10	$ 10	$ 10
Total cost of materials (a x b)	$400	$500	$600

Type of cost: Since the total cost of materials increases proportionately with the number of lawn services, it is a variable cost.

d.

Number of Lawn Services (a)	40	50	60
Total expected depreciation cost	$ 46.88	$37.50	$31.25
Total labor cost	800.00	1,000.00	1,200.00
Total cost of materials	400.00	500.00	600.00
Total cost	$1,246.88	$1,537.50	$1,831.25

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Problem 2-18B (Sol. continued on next page)

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Problem 2-18B (Sol. continued)

e. The amount of <u>total</u> cost shown below was determined in Requirement d.

Number of Lawn Services (a)	40	50	60
Total cost (b)	$1,246.88	$1,537.50	$1,831.25
Cost per unit (b ÷ a)	$31.17*	$30.75	$30.52

*Rounded

The decline in the cost per lawn service is caused by the fixed cost behavior that is applicable to the equipment depreciation.

f. Mr. Quill means average cost per unit. It would be virtually impossible to determine actual cost per unit. For instance, exactly how much pesticide was used in one lawn versus another? Did the service person work on one lawn a few minutes longer than another? Obviously, it would not be practical to determine the exact cost of servicing any specific lawn. The average cost is much easier to determine and more practical for pricing purposes.

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Problem 2-19B *Context-sensitive nature of cost behavior classifications*

Kelly and Valdez Tax Services' Development Department is responsible for establishing new community branches. Each branch opens with four tax accountants. Total cost of payroll per branch is $240,000 per year. Together the four accountants can process up to 5,000 simple tax returns per year. The firm's policy requires closing branches that do not reach the quota of 3,000 tax returns per year. On the other hand, the firm hires an additional accountant for a branch and elevates it to the status of a regular operation if the customer demand for services exceeds 5,000 tax returns.

Required

a. What is the relevant range of activity for a new branch established by the Development Department?

b. Determine the amount of payroll cost in total and the average payroll cost per transaction for a branch that processes 3,000, 4,000, or 5,000 tax returns. In this case (the activity base is the number of tax returns for a specific branch), is the payroll cost a fixed or a variable cost?

c. Determine the amount of payroll cost in total and the average payroll cost per branch for Kelly and Valdez Tax Services assuming that the Development Department operates 20, 30, or 40 branches. In this case (the activity base is the number of branches), is the payroll cost a fixed or a variable cost?

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Problem 2-19B

a. If a branch fails to process at least 3,000 tax returns, the branch is closed. Branches that process more than 5,000 tax returns are transferred out of the Development Department. Accordingly, the relevant range is 3,000 to 5,000 tax returns.

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b.

Number of Tax Returns (a)	3,000	4,000	5,000
Total payroll cost (b)	$240,000	$240,000	$240,000
Average per unit payroll cost (b ÷ a)	$80.00	$60.00	$48.00

Type of Cost: Since the <u>total</u> payroll cost remains constant at $240,000 regardless of the number of tax returns filed, it is a fixed cost.

c.

Number of Branches (a)	20	30	40
Payroll cost per branch (b)	$ 240,000	$ 240,000	$ 240,000
Total payroll cost (a x b)	$4,800,000	$7,200,000	$9,600,000

Type of cost: Since the <u>total</u> payroll cost increases proportionately with the number of branches in operation, the cost is a variable cost.

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Problem 2-20B ***Context-sensitive nature of cost behavior classifications***

Sean Franklin sells a newly developed camera, Panorama Vision. He purchases the cameras from the manufacturer for $150 each and rents a store in a shopping mall for $6,000 per month.

Required

a. Determine the average cost of sales per unit if Mr. Franklin sells 100, 200, 300, 400, or 500 units of Panorama Vision per month. Use the following chart to organize your answer.

	Sales Volume in Units (a)				
	100	200	300	400	500
Total cost of cameras (a × $150)	$15,000				
Total cost of store rental	6,000				
Total cost of sales (b)	$21,000				
Average cost per unit (b ÷ a)	$210.00				

b. If Mr. Franklin wants to make a gross profit of $30 on each camera he sells, what price should he charge at sales volumes of 100, 200, 300, 400, or 500 units?

c. Record the total cost of store rental if Mr. Franklin opens a camera store at one, two, three, four, or five shopping malls. Record your answers in the following chart. Is the cost of store rental fixed or variable relative to the number of stores opened?

	Shopping Malls				
	1	2	3	4	5
Total cost of store rental	$6,000				

d. Mr. Franklin provides decorative ornaments to customers who purchase cameras. Some customers take the ornaments, others do not, and some take more than one. The number of ornaments varies in relation to the number of cameras sold, but the relationship is not proportional. Assume that, on average, Mr. Franklin gives away $150 worth of ornaments for every 100 cameras sold. What is the additional cost per camera sold? Is the cost fixed or variable?

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Problem 2-20B (Sol. on next page)

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Problem 2-20B (Solution)

a.

Sales Volume in cameras (a)	100	200	300	400	500
Total cost of cameras (a x $150)	$15,000	$30,000	$45,000	$60,000	$75,000
Total cost of store rental	6,000	6,000	6,000	6,000	6,000
Total cost of sales (b)	$21,000	$36,000	$51,000	$66,000	$81,000
Average cost per camera (b ÷ a)	$210.00	$180.00	$170.00	$165.00	$162.00

b.

Sales Volume in cameras	100	200	300	400	500
Average cost per unit (a)	$210	$180	$170	$165	$162
Price per package (a + $30)	$240	$210	$200	$195	$192

c.

Shopping Malls (a)	1	2	3	4	5
Total cost of store rental (a x $6,000)	$6,000	$12,000	$18,000	$24,000	$30,000

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Type of cost: Since the <u>total</u> rental cost increases proportionately with the number of stores in operation, it is a variable cost.

d. The additional cost is $150 ÷100 units = $1.50 per camera sold. The cost would be treated as a variable cost for decision making purposes. While it is not purely proportional, its behavior pattern closely approximates a variable cost pattern.

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Problem 2-21B *Effects of operating leverage on profitability*

CFEs R Us conducts CFE review courses. Public universities that permit free use of a classroom support the classes. The only major expense incurred by CFEs R Us is the salary of instructors, which is $5,000 per course taught. The company recently planned to offer a review course in Boston for $400 per candidate; it estimated that 50 candidates would attend the course.

Complete these requirements based on the preceding information.

Part 1:

Required

a. Relative to the number of CFE candidates in a single course, is the cost of instruction a fixed or a variable cost?

b. Determine the profit, assuming that 50 candidates attend the course.

c. Determine the profit, assuming a 10 percent increase in enrollment (i.e., enrollment increases to 55 students). What is the percentage change in profitability?

d. Determine the profit, assuming a 10 percent decrease in enrollment (i.e., enrollment decreases to 45 students). What is the percentage change in profitability?

e. Explain why a 10 percent shift in enrollment produces more than a 10 percent shift in profitability. Use the term that identifies this phenomenon.

Part 2:

The instructor has offered to teach the course for a percentage of tuition fees. Specifically, the instructor wants $100 per candidate attending the class. Assume that the tuition fee remains at $400 per candidate.

Required

f. Is the cost of instruction a fixed or a variable cost?

g. Determine the profit, assuming that 50 candidates take the course.

h. Determine the profit, assuming a 10 percent increase in enrollment (i.e., enrollment increases to 55 students). What is the percentage change in profitability?

i. Determine the profit, assuming a 10 percent decrease in enrollment (i.e., enrollment decreases to 45 students). What is the percentage change in profitability?

j. Explain why a 10 percent shift in enrollment produces a proportional 10 percent shift in profitability.

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Problem 2-21B (Problem cont. on next page)

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Problem 2-21B (Problem continued)

Part 3:

CFEs R Us sells a workbook to each student who attends the course. The workbook contains printed material unique to each course. Workbooks that are not sold must be destroyed. Prior to the first class, CFEs R Us printed 50 copies of the books based on the estimated number of people who would attend the course. Each workbook costs $32 and is sold for $50. This cost includes a royalty fee paid to the author and the cost of duplication.

Required

k. Calculate the total cost and the cost per candidate of the workbooks, assuming that 45, 50, or 55 candidates attempt to attend the course. Round your figures to two decimal points.

l. Classify the cost of workbooks as fixed or variable relative to the number of candidates attending the course.

m. Discuss the risk of holding inventory as it applies to the workbooks.

n. Explain how a just-in-time inventory system can reduce the cost and risk of holding inventory.

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Problem 2-21B
Part 1

a. Since the total cost remains constant at $5,000 regardless of how many CFE candidates attend the course, the cost of instruction is a fixed cost.

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b. c. & d.

Number of Candidates	45	% Change	50	% Change	55
Revenue ($400 per candidate)	$18,000	⇐(10%)⇐	$20,000	⇒+10%⇒	$22,000
Cost of instruction (fixed)	5,000		5,000		5,000
Gross profit	$13,000	⇐(13%)⇐	$15,000	⇒+13%⇒	$17,000

Percentage change in revenue: ±$2,000 ÷ $20,000 = ±10%
Percentage change in profit: ±$2,000 ÷ $15,000 = ±13% (rounded)

e. Operating leverage caused the percentage change in profitability to be higher than the percentage change in revenue. Since the fixed costs have been covered and no variable costs exist, each additional dollar of revenue contributes directly to additional profitability and vice versa.

Problem 2-21B (Sol. cont. on next page)

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Problem 2-21B (Sol. continued)

Part 2

f. Since the total cost changes proportionately with changes in the number of candidates, the cost of instruction is a variable cost.

g. h. and i.

Number of Candidates	45	% Change	50	% Change	55
Revenue ($400 per candidate)	$18,000	⇐(10%)⇐	$20,000	⇒+10%⇒	$22,000
Cost of instruction (variable)	4,500		5,000		5,500
Gross profit	$13,500	⇐(10%)⇐	$15,000	⇒+10%⇒	$16,500

Percentage change in revenue: ±$2,000 ÷ $20,000 = ±10%
Percentage change in profit: ±$1,500 ÷ $15,000 = ±10%

j. Since costs as well as revenue change in direct proportion to changes in the number of CFE candidates attending the course, the change in profit is proportional to the change in revenue.

Part 3

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k.

Number of Candidates Attempting to Attend	45	50	55
Number of candidates accepted (a)	45	50	50
Total cost of workbooks [b = (50 x $32)]	$1,600	$1,600	$1,600
Cost per candidate (b ÷ a)	35.56	32.00	32.00

l. Since the workbooks must be produced in advance, the total cost is incurred before any workbook is sold. Subsequently, the number of workbooks sold does not affect the total cost. This is, therefore, a fixed cost.

m. CFEs R Us faces the risk of producing too many or too few workbooks. When too many are produced, the company will incur expenses due to waste. When too few are produced, the company will miss the opportunity to earn additional profits. Also, CFEs R Us faces the risk associated with the incursion of costs such as storage, maintenance, and interest.

Problem 2-21B (Sol. continued)

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Problem 2-21B (Sol. cont.)

n. A just-in-time inventory system would produce goods as needed to meet sales demand. Accordingly, there would be no risk of over or under production. Further, there would be no stockpiling of inventory; therefore, inventory holding costs such as storage, maintenance, and interest would be avoided.

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Problem 2-22B ***Effects of fixed and variable cost behavior on the risk and rewards of business opportunities***

Canton Club and Tobin Club are competing health and recreation clubs in Orlando. They both offer tennis training clinics to adults. Canton pays its coaches $4,800 per season. Tobin pays its coaches $120 per student enrolled in the clinic per season. Both clubs charge a tuition fee of $200 per season.

Required

a. Prepare income statements for Canton and Tobin, assuming that 40 students per season attend each clinic.

b. The ambitious new director of Canton Club tries to increase the club's market share by reducing the club's tuition per student to $112 per clinic. Prepare an income statement for Canton, assuming that the club attracts all of Tobin's customers and therefore is able to enroll 80 students in its clinics.

c. Independent of Requirement *b*, Tobin Club tries to lure Canton's students by lowering its price to $112 per student. Prepare an income statement for Tobin, assuming that the club succeeds in enrolling 80 students in its clinics.

d. Explain why the strategy described in Requirement *b* produced a profit while the same strategy described in Requirement *c* produced a loss.

e. Prepare an income statement for Canton Club and Tobin Club, assuming that 20 students attend a clinic at the original $200 tuition price.

f. It is always better to have fixed rather than variable cost. Explain why this statement is false.

g. It is always better to have variable rather than fixed cost. Explain why this statement is false.

Problem 2-22B

a.

Club	Canton		Tobin
Tuition revenue (40 x $200)	$8,000		$8,000
Total cost of instruction (Fixed)	(4,800)	(40 x $120)	(4,800)
Net income	$3,200		$3,200

b.

Club	Canton
Tuition revenue (80 x $112)	$8,960
Total cost of instruction (fixed)	4,800
Net income	$4,160

Problem 2-22B (Sol. continued on next page)

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Problem 2-22B (Sol. continued)

c.

Club		Tobin
Tuition revenue	(80 x $112)	$8,960
Total cost of instruction (variable)	(80 x $120)	(9,600)
Net loss		$ (640)

d. The strategy in Requirement b produced a profit because Canton's cost of coaching was fixed. Accordingly, the increase in the number of students did not increase the total cost of coaching. In contrast, the cost of coaching for Tobin was variable. As a result, when the number of students increased, the total cost of coaching increased as well. Since the increase in revenue was not sufficient to cover the increase in the cost of coaching, the strategy in Requirement c produced a loss.

e.

Club		Canton		Tobin
Tuition revenue	(20 x $200)	$4,000		$4,000
Total cost of instruction	(fixed)	(4,800)	(20 x $120)	(2,400)
Net income (loss)		$(800)		$1,600

f. When volume is insufficient to produce revenue that is above the level of fixed cost, the enterprise will produce a loss. This condition is demonstrated in Requirement e above. The loss could be avoided if the cost of instruction were variable. Accordingly, fixed costs are not always better than variable costs.

g. When the revenue per unit is below the variable cost per unit, the enterprise will incur additional losses for each unit produced and sold. This condition is depicted in Requirement c above. As demonstrated in Requirement b, lower per unit revenue can be offset by increases in sales volume when costs are fixed. Accordingly, variable costs are not always better than fixed costs.

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Problem 2-23B *Analysis of operating leverage*

June Wade has invested in two startup companies. At the end of the first year, she asks you to evaluate their operating performance. The following operating data apply to the first year.

	Company Name	
	Cook	Penn
Variable cost per unit (a)	$ 16	$ 8
Sales revenue (8,000 units × $25)	$ 200,000	$200,000
Variable cost (8,000 units × a)	(128,000)	(64,000)
Contribution margin	72,000	136,000
Fixed cost	(40,000)	(104,000)
Net income	$ 32,000	$ 32,000

Required

a. Use the contribution margin approach to compute the operating leverage for each firm.

b. If the economy expands in the coming year, Cook and Penn will both enjoy a 10 percent per year increase in sales volume, assuming that the selling price remains unchanged. (*Note:* Since the number of units increases, both revenue and variable cost will increase.) Compute the change in net income for each firm in dollar amount and in percentage.

c. If the economy contracts in the following year, Cook and Penn will both suffer a 10 percent decrease in sales volume, assuming that the selling price remains unchanged. (*Note:* Since the number of units decreases, both revenue and variable cost decrease.) Compute the change in net income for each firm in both dollar amount and percentage.

d. Write a memo to June Wade with your evaluation and recommendations.

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Problem 2-23B

a.

Company Name	Cook	Penn
Contribution margin	$72,000	$136,000
Divided by net income	÷ 32,000	÷ 32,000
Operating leverage	2.25	4.25

Problem 2-23B (Sol. cont. on next page)

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Problem 2-23B (Sol. cont.)

b.

Company Name	Cook	Penn
Variable cost per unit (a)	$16	$8
Sales revenue (8,000 units x $25 x 110%)	$220,000	$220,000
Variable cost (8,000 units x a x 110%)	(140,800)	(70,400)
Contribution margin	$ 79,200	$149,600
Fixed cost	(40,000)	(104,000)
Net income	$ 39,200	$ 45,600
Percentage change *	22.5%	42.5%

*Cook: $39,200 – $32,000 = $7,200; $7,200 ÷ $32,000 = 22.5%
Penn: $45,600 – $32,000 = $13,600; $13,600 ÷ $32,000 = 42.5%

c.

Company Name	Cook	Penn
Variable cost per unit (a)	$16	$8
Sales revenue (8,000 units x 90% x$25)	$180,000	$180,000
Variable cost (8,000 units x 90% x a)	(115,200)	(57,600)
Contribution margin	$ 64,800	$122,400
Fixed cost	(40,000)	(104,000)
Net income	$ 24,800	$ 18,400
Percentage change **	(22.5%)	(42.5%)

** Cook: $24,800 – $32,000 = $(7,200); $(7,200) ÷ $32,000 = (22.5%)
Penn: $18,400 – $32,000 = $(13,600); $(13,600) ÷ $32,000 = (42.5%)

Problem 2-23B (Sol. continued on next page)

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Problem 2-23B (Sol. continued)

d. The following memo is just an example. Students can form different opinions from their analyses. However, the main focus of the analyses should be the risk and reward relationship as demonstrated by the data of the two investments.

Memorandum

TO: Ms. June Wade
FROM: John Doe
SUBJECT: Analysis and Recommendation Regarding Investments
DATE: October 23, 20XX

I have evaluated the income statements of Cook and Penn. Even though both companies had the same amounts of sales and net income last year, the risk and reward structures of the two companies are quite different. From my analysis, Cook's operating leverage is 2.25 while Penn's is 4.25. The analytical data suggests that Penn's future income may be much more volatile than Cook's.

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If the economy prospers in the long run, Penn will be the better choice for investment. Otherwise, Cook will be better. If we can't forecast future economic conditions with a reasonable degree of confidence, a conservative investor should choose Cook whereas an aggressive investor should invest in Penn.

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Problem 2-24B

a.

Day	M	Tu	W	Th	F	Sat	Sun
Total cost (a)	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000
No. people (b)	400	350	300	500	800	1,250	1,400
Per unit (a ÷ b)	$7.50	$8.57	$10.00	$6.00	$3.75	$2.40	$2.14

b.

Day	M	Tu	W	Th	F	Sat	Sun
Per unit cost	$7.50	$ 8.57	$10.00	$6.00	$3.75	$2.40	$2.14
Mark-up	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Ticket price	$9.50	$10.57	$12.00	$8.00	$5.75	$4.40	$4.14

c. A more rational pricing policy would base the computation of average cost on weekly totals. Total contract cost is $21,000 (i.e., $3,000 x 7 days). Total expected attendance for the week is 5,000. Average cost per ticket sold is $4.20 (i.e., $21,000 ÷ 5,000 tickets). Given a desired profit of $2.00 per ticket, the price would be set at $6.20 (i.e., $4.20 + $2.00).

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Problem 2-24B (Sol. cont. on next page)

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Problem 2-24B (Sol. continued)

d. As indicated in Requirement b, prices based on daily attendance would vary from a low of $4.14 per ticket to a high of $12.00 per ticket. This pricing structure is unrealistic. It suggests that higher prices should be charged when demand is low. If implemented, the pricing policy would likely drive the small number of Wednesday customers away. Very few people would be interested in $12.00 circus tickets if the same tickets were available for much less the day before or after.

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Problem 2-25B ***Identifying relevant issues for cost averaging***

West Tours, Inc., organizes adventure tours for people interested in visiting a desert environment. A desert tour generally lasts three days. West provides food, equipment, and guides. Dan Silva, the president of West Tours, needs to set prices for the coming year. He has available the company's past cost data in the following table.

	Span of Time		
	Recent Tour	One Year	Ten Years
Total cost of tours (a)	$4,800	$234,000	$1,620,000
Number of tourists (b)	32	1,500	12,000
Cost per tourist (a ÷ b)	$ 150	$ 156	$ 135

Required

Write a memo to Mr. Silva explaining the potential advantages and disadvantages of using each of the different per-tourist cost figures as a basis for establishing a price to charge tourists during the coming year. What other factors must Mr. Silva consider in developing a pricing strategy?

Problem 2-25B

Using information from a single recent tour can distort the predictive value of the data because certain variables may not represent normal averages. For example, the most recent tour served 32 tourists. The average number of tourists that normally makes a trip could be larger or smaller than the number that made the most recent trip. While recent data is more relevant, it can be distorted if the time frame is too short to provide representative results. Similarly, data that is too old may not be representative. For example, the cost of equipment, salaries, and food is likely different today as compared to ten years ago. Accordingly, the data drawn from the one-year average is likely to provide the best indication of future conditions. Additional factors to be considered for pricing strategies include market demand, competition, and the general economy.

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Problem 2-25B (Sol. cont. on next page)

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Problem 2-25B (Sol. continued)

Memorandum

TO: Dan Silva, President
FROM: John Doe, Accountant
SUBJECT: Analysis and Recommendation Regarding the Use of Per Unit Cost for Pricing Decisions
DATE: October 1, 20XX

I have evaluated the Company's data about cost per tour over three different time periods: recent, one year, and ten years. It is my recommendation that the cost per tour data over the one-year period be used for pricing decisions.

The recent tour data includes only 32 tourists, a small number that may not represent normal operations. The ten-year tour data extends too far to past periods that may not reflect the current costs of operations. The one-year tour data represents an appropriate base for our cost estimation for the coming year.

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I suggest that you consider other factors such as future market demand, competition, and the general economy to adjust the cost estimate and devise a successful pricing strategy.

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Problem 2-26B *Estimating fixed and variable costs*

Kane Legal Services provides legal advice to clients. The following data apply to the first six months of operation.

	Month					
	Jan.	Feb.	Mar.	Apr.	May	June
Service hours	80	100	140	180	200	220
Revenue	$8,000	$10,000	$14,000	$18,000	$20,000	$22,000
Operating costs	7,400	8,200	9,660	10,600	10,900	11,600

Required

a. What is the average service revenue per hour for the six-month time period?

b. Use the high-low method to estimate the total monthly fixed cost and the variable cost per hour.

c. Determine the average contribution margin per hour.

d. Use the scattergraph method to estimate the total monthly fixed cost and the variable cost per hour.

e. Compare the results of the two methods and comment on any differences.

Problem 2-26B

a.

Month	Jan.	Feb.	Mar.	Apr.	May	June	Total
Revenue	$8,000	$10,000	$14,000	$18,000	$20,000	$22,000	$ 92,000
Service hours	80	100	140	180	200	220	920
Revenue/Hour	$100	$100	$100	$100	$100	$100	$100

b.

Month		Operating Costs		Service Hours		Variable Cost/Unit
June	High	$11,600		220		
Jan.	Low	7,400	÷	80		
Difference		$4,200		140	=	$30/hour

Fixed cost = $11,600 – ($30 x 220) = $5,000 or,
= $7,400 – ($30 x 80) = $5,000

c. Contribution margin per hour = $100 – $30 = $70

Problem 2-26B (Sol. continued on next page)

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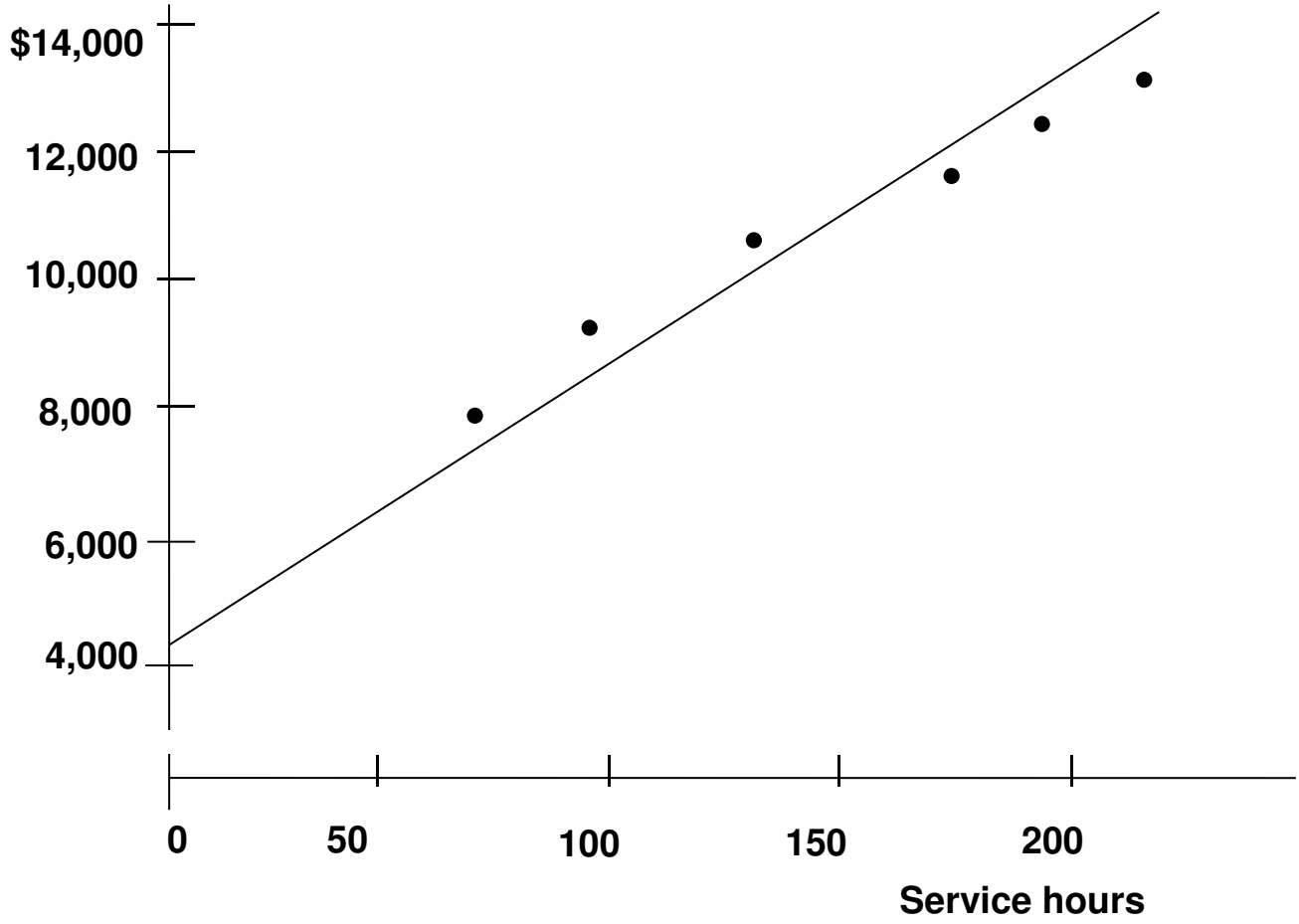
Problem 2-26B (Sol. continued)

d.

Operating costs



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Problem 2-26B (Sol. continued)

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Problem 2-26B (Sol. continued)

e. The results of the two methods are very similar. In b, the high-low method relies on the relationship between the highest point and the lowest point to define the variable cost and the fixed cost. In d, the scattergraph method relies on human observation to fit a straight line among the six given points. As it turns out, the variable cost per unit (the slope of the straight line) determined in the scattergraph method is less than that determined in the high-low method. The fixed cost determined in the scattergraph is about $4,600, which is less than $5,000 as determined in the high-low method.

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Problem 2-27B *Estimating fixed and variable cost*

Jenkins Frames Company, which manufactures ornate frames for original art work, began operations in January, Year 1. Bruce Preston, the owner, asks for your assistance. He believes that he needs to better understand the cost of the frames for pricing purposes. You have collected the following data concerning actual production over the past year.

Month	Number of Frames Produced	Total Cost
January	1,600	$42,000
February	7,200	65,000
March	3,920	59,000
April	1,200	37,200
May	3,200	58,000
June	2,600	54,000
July	2,200	51,200
August	3,600	62,000
September	4,560	64,000
October	5,880	63,000
November	6,560	64,000
December	800	33,000

Required

a. To understand the department's cost behavior, you decide to plot the points on graph paper and sketch a total cost line.

(1) Enter the number of units and their costs in increasing order.

(2) Plot the points on the graph.

(3) Sketch a graph so the line "splits" all of the points (half of the points appear above and half appear below the line).

(4) Using the line you just sketched, visually estimate the total cost to produce 4,000 units.

b. Using the high-low method, compute the total cost equation for the preceding data.

(1) Compute the variable cost per unit.

(2) Compute total fixed costs.

(3) Sketch a line between the high and low points on your graph.

(4) Using the high-low method, estimate the total cost to produce 4,000 units.

c. Name a third method that could be used to determine the fixed and variable cost estimate and comment on the advantages of your suggested approach.

Problem 2-27B (Solution on next page)

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Problem 2-27B (Solution)

a. (1)

Month	# of Frames Produced	Total Cost
December	800	$33,000
April	1,200	37,200
January	1,600	42,000
July	2,200	51,200
June	2,600	54,000
May	3,200	58,000
August	3,600	62,000
March	3,920	59,000
September	4,560	64,000
October	5,880	63,000
November	6,560	64,000
February	7,200	65,000

a. (2 & 3) (Sol. a. (4) on next page)

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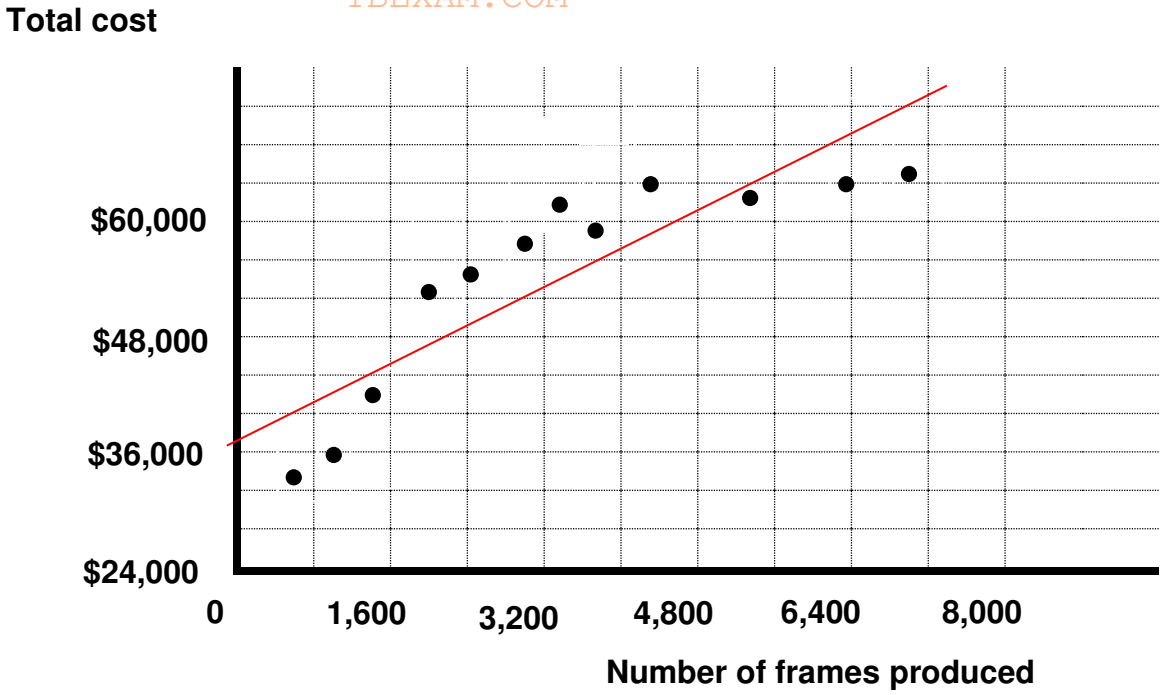

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Problem 2-27B (Sol. continued)

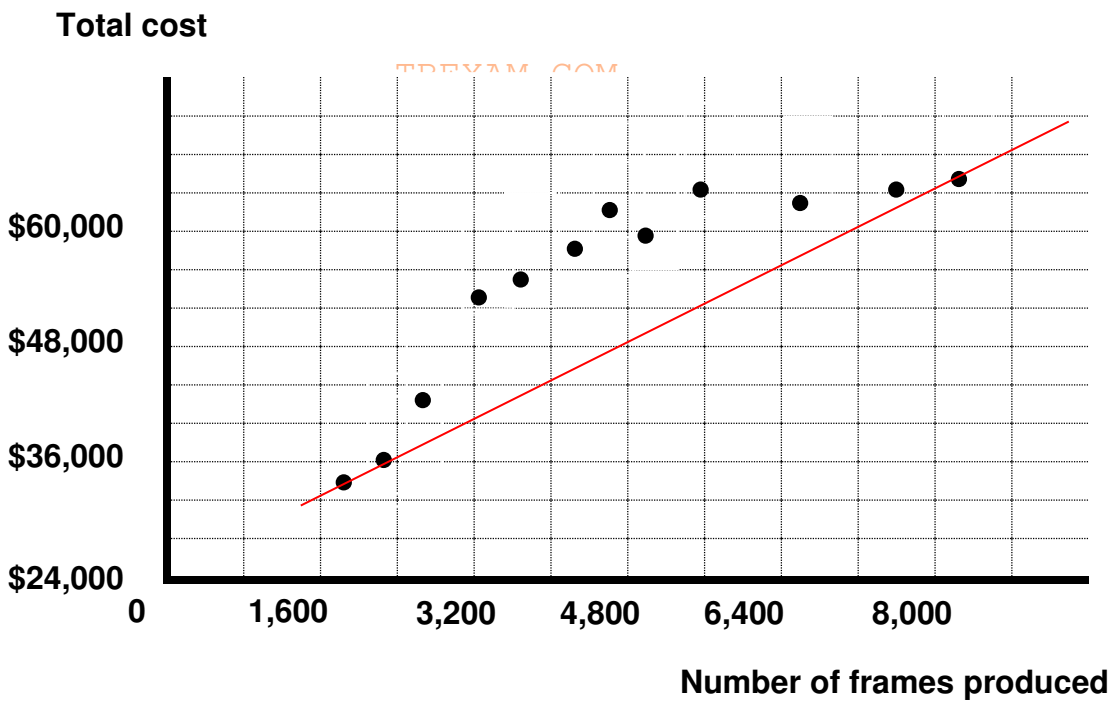
a. (4) The total cost of producing 4,000 frames should be about $56,000.

b. (1) (Sol. to b. (4) on next page)

	Total Cost		# of Frames Produced		
High	$65,000		7,200		
Low	33,000		800		
	$32,000	÷	6,400	=	$5 per frame (variable cost)

b. (2) Fixed cost = $65,000 – ($5 x 7,200) = $29,000

b. (3)



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Problem 2-27B (Sol. continued)

b. (4) Total cost = Fixed cost + (Variable cost per frame x Number of frames)

Total cost = $29,000 + ($5 x 4,000) = $49,000

c. A third method that could be used is regression analysis. The regression method produces statistics that help in determining the reliability of the cost estimates. Multiple regression can be used to evaluate the simultaneous effect of a number of independent variables as opposed to being limited to a single variable analysis.

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Problem 2-28B ***Estimating fixed and variable cost using the regression method***

Stan Fox, the production manager of Hollis Construction Components, is trying to figure out the cost behavior of his factory supplies cost. The company uses machine hours as the cost driver. Joe Parrish, the assistant manager, collected the following cost data for the last 32 weeks.

Week No.	Machine Hours	Supplies Costs	Week No.	Machine Hours	Supplies Costs
1	86	$3,819	17	64	$3,856
2	72	3,610	18	88	4,279
3	79	3,916	19	129	5,633
4	62	2,915	20	137	5,298
5	91	4,327	21	144	6,721
6	42	2,214	22	37	2,448
7	37	2,106	23	56	3,528
8	33	2,390	24	49	2,837
9	23	2,107	25	12	1,359
10	96	4,868	26	57	3,296
11	94	5,021	27	54	3,472
12	91	4,811	28	65	3,264
13	72	3,580	29	77	3,925
14	60	2,800	30	85	4,002
15	48	2,269	31	92	4,583
16	53	2,748	32	82	3,523

Required

a. The company uses the number of machine hours as the cost driver for factory supplies costs. Use an algebraic equation to describe how total factory supplies costs can be estimated.

b. Use a spreadsheet program to perform a regression analysis. Use factory supplies costs as the dependent variable (Y) and the machine hours as the independent variable (X). Determine the total fixed cost per week and variable cost per machine hour.

c. Identify the R^2 statistic provided by the Excel program and explain what it means.

d. Identify a potential weakness of regression analysis and explain what can be done to minimize it.

e. Determine the estimated total cost of factory supplies if machine-hour usage amounts to 100 hours for the next week. What portion of the total cost is fixed and what portion is variable?

Problem 2-28B (Solution on next page)

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Problem 2-28B (Solution)

a. Assume the following:

X = the number of machine hours
Y = the dollar amount supplies cost

The algebraic equation should be as follows:

Y = a + bX

Where a represents the fixed cost and b represents the variable cost per machine hour.

b. The result of regression analysis follows:

Regression Statistics	
Multiple R	0.95883
R Square	0.91936
Adjusted R Square	0.91667
Standard Error	339.596
Observations	32

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ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	3.9E+07	3.9E+07	342.002	6E-18
Residual	30	3459755	115325		
Total	31	4.3E+07			

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Problem 2-28B (Sol. cont. on next page)

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Problem 2-28B (Sol. continued)

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*
Intercept	1001.66	153.295	6.53425	3.2E-07	688.596	1314.73	688.596
X Variable 1	36.8204	1.99101	18.4933	6E-18	32.7542	40.8865	32.7542

RESIDUAL OUTPUT

Observation	*Predicted Y*	*Residuals*
1	4168.21	-349.21
2	3652.73	-42.73
3	3910.47	5.52774
4	3284.53	-369.53
5	4352.32	-25.317
6	2548.12	-334.12
7	2364.02	-258.02
8	2216.74	173.264
9	1848.53	258.468
10	4536.42	331.582
11	4462.78	558.222
12	4352.32	458.683
13	3652.73	-72.73
14	3210.89	-410.89
15	2769.04	-500.04
16	2953.14	-205.14
17	3358.17	497.833
18	4241.86	37.1446
19	5751.49	-118.49
20	6046.05	-748.05
21	6303.8	417.205
22	2364.02	83.9826
23	3063.6	464.396
24	2805.86	31.1383
25	1443.51	-84.509
26	3100.42	195.576
27	2989.96	482.037
28	3394.99	-130.99
29	3836.83	88.1684
30	4131.39	-129.39
31	4389.14	193.863
32	4020.93	-497.93

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Problem 2-28B (Sol. cont. on next page)

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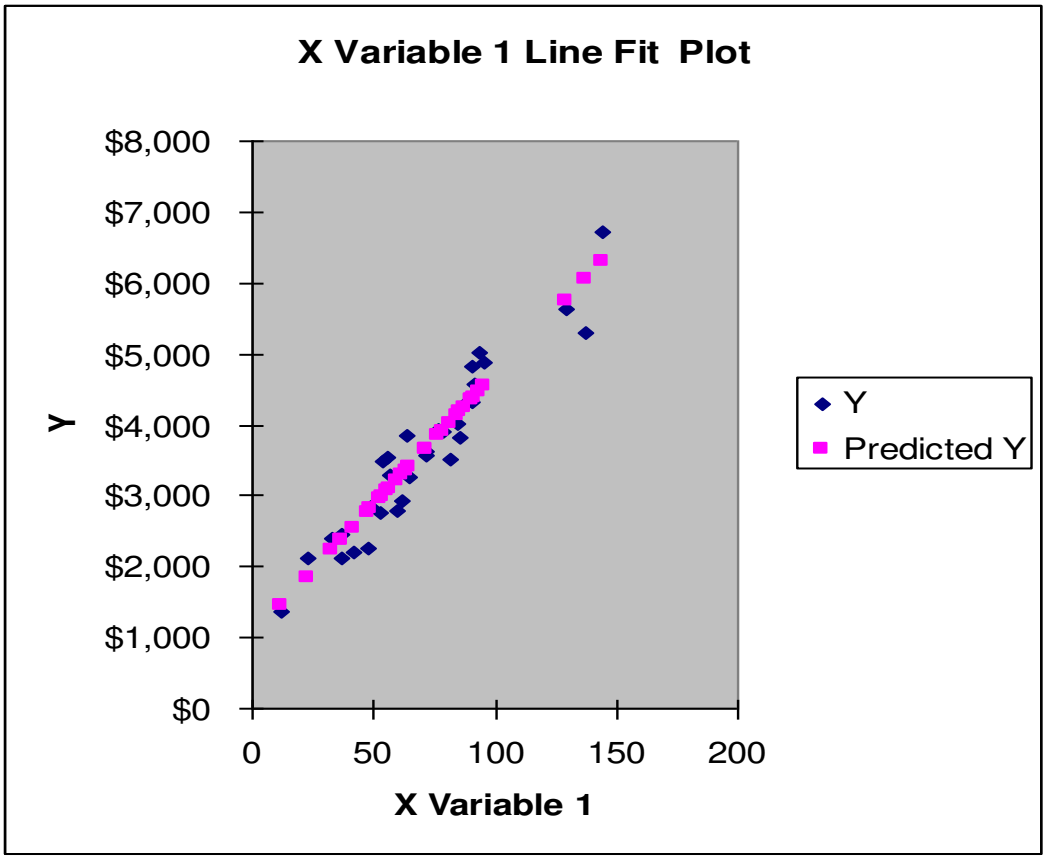
Problem 2-28B (Sol. continued)



Fixed cost = $1,002 (rounded)
Variable cost per machine hour = $36.82 (rounded)

c. The R^2 statistic is 0.91936. This means that approximately 92% of the variation of the cost of supplies (dependent variable) can be explained by variation in the number of machine hours (independen + variable).

d. Outliers in the data set can skew the cost estimates. A visual fit scatter graph highlights the outliers so that analysts can adjust for their impact.

Problem 2-28B (Sol. cont. on next page)

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Problem 2-28B (Sol. continued)

e. Total cost = $1,002 + ($36.82 x 100) = $4,684

Total cost = Fixed cost + (Variable cost per machine hour x Number of machine hours)

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Managerial 10e – Chapter 2 – Exercises and Problems – Set B

Exercise 2-1B ***Identifying cost behavior***

Borris Copies Company provides professional copying services to customers through the 35 copy stores it operates in the southwestern United States. Each store employs a manager and four assistants. The manager earns $4,000 per month plus a bonus of 3 percent of sales. The assistants earn hourly wages. Each copy store costs $3,000 per month to lease. The company spends $5,000 per month on corporate-level advertising and promotion.

Required

Classify each of the following costs incurred by Borris Copies as fixed, variable, or mixed.

a. Lease cost relative to the number of copies made for customers.
b. Assistants' wages relative to the number of copies made for customers.
c. Store manager's salary relative to the number of copies made for customers.
d. Cost of paper relative to the number of copies made for customers.
e. Lease cost relative to the number of stores.
f. Advertising and promotion costs relative to the number of copies a particular store makes.

Exercise 2-1B

Requirement	Fixed	Variable	Mixed
a.	x		
b.			
c.			
d.			
e.			
f.			

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Managerial 10e – Chapter 2 – Exercises and Problems – Set B

Exercise 2-2B *Identifying cost behavior*

At the various sales levels shown, Parsons Company incurred the following costs.

	Units Sold	50	100	150	200	250
a.	Depreciation cost per unit	$ 30.00	$ 15.00	$ 10.00	$ 7.50	$ 6.00
b.	Total rent cost	600.00	600.00	600.00	600.00	600.00
c.	Total shipping cost	40.00	80.00	120.00	160.00	200.00
d.	Rent cost per unit of merchandise sold	12.00	6.00	4.00	3.00	2.40
e.	Total utility cost	200.00	300.00	400.00	500.00	600.00
f.	Supplies cost per unit	4.00	4.00	4.00	4.00	4.00
g.	Total insurance cost	500.00	500.00	500.00	500.00	500.00
h.	Total salary cost	1,500.00	2,000.00	2,500.00	3,000.00	3,500.00
i.	Cost per unit of merchandise sold	8.00	8.00	8.00	8.00	8.00
j.	Total cost of goods sold	4,000.00	8,000.00	12,000.00	16,000.00	20,000.00

Required

Identify each of these costs as fixed, variable, or mixed.

Exercise 2-2B

Requirement	Fixed	Variable	Mixed
a.	x		
b.			
c.			
d.			
e.			
f.			
g.			
h.			
i.			
j.			

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Exercise 2-3B *Determining fixed cost per unit*

Tameron Corporation incurs the following annual fixed production costs.

Item	Cost
Insurance cost	$ 26,000
Patent amortization cost	400,000
Depreciation cost	160,000
Property tax cost	14,000

Required

Determine the total fixed production cost per unit if Tameron produces 10,000, 20,000, or 50,000 units.

Exercise 2-3B

Total Fixed Cost:

Item	Cost
Total fixed cost	

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Units Produced	10,000	20,000	50,000
Total fixed cost			
Fixed cost per unit			

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Exercise 2-4B ***Determining total variable cost***

The following variable manufacturing costs apply to goods produced by Bure Manufacturing Corporation.

Item	Cost per Unit
Materials	$4.20
Labor	3.40
Variable overhead	1.40
Total	$9.00

Required

Determine the total variable manufacturing cost if Bure produces 4,000, 6,000, or 8,000 units.

Exercise 2-4B

Units Produced (a)	4,000	6,000	8,000
Variable cost per unit			
Total variable cost			

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Managerial 10e – Chapter 2 – Exercises and Problems – Set B

Exercise 2-5B *Fixed versus variable cost behavior*

Russell Company's production and total cost data for two recent months follow.

	January	February
Units produced	1,000	500
Total depreciation cost	$6,000	$6,000
Total factory supplies cost	$2,000	$1,000

Required

a. Separately calculate the depreciation cost per unit and the factory supplies cost per unit for both January and February.

b. Identify which cost is variable and which is fixed. Explain your answer.

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Exercise 2-5B

a.

	January	February
Units Produced (a)	1,000	500
Total depreciation cost		
Depreciation cost per unit		
Total factory supplies cost		
Factory supplies cost per unit		

b. Variable:

Fixed:

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Exercise 2-6B *Fixed versus variable cost behavior*

Nielsen Chairs Corporation produces ergonomically designed chairs favored by architects. The company normally produces and sells from 2,000 to 5,000 chairs per year. The following cost data apply to various production activity levels.

Number of Chairs	2,000	3,000	4,000	5,000
Total costs incurred				
Fixed	$ 80,000			
Variable	20,000			
Total costs	$100,000			
Per-unit chair cost				
Fixed	$ 40.00			
Variable	10.00			
Total cost per chair	$ 50.00			

Required

a. Complete the preceding table by filling in the missing amounts for the levels of activity shown in the first row of the table.

b. Explain why the total cost per chair decreases as the number of chairs increases.

Exercise 2-6B

a.

Number of Chairs	2,000	3,000	4,000	5,000
Total costs incurred				
Fixed				
Variable				
Total costs				
Per unit chair cost				
Fixed				
Variable				
Total cost per chair				

*Rounded

Exercise 2-6B (Sol. cont. on next page)

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Exercise 2-6B (Sol. cont.)

b. Why cost per chair decreases as the number of chairs increases:

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Exercise 2-7B ***Fixed versus variable cost behavior***

Shawn Corder needs extra money quickly to help cover some unexpected school expenses. Mr. Corder has learned fortune-telling skills through his long friendship with Fred Molloy, who tells fortunes during the day at the city market. Mr. Molloy has agreed to let Mr. Corder use his booth to tell fortunes during the evening for a rent of $90 per night.

Required

a. What is the booth rental cost both in total and per customer if the number of customers is 5, 10, 15, 20, or 25? Round your figures to two decimal points.

b. Is the cost of renting the fortune-telling booth fixed or variable relative to the number of customers?

c. Draw two graphs. On one, plot total booth rental cost for 5, 10, 15, 20, and 25 customers; on the other, plot booth rental cost per customer for 5, 10, 15, 20, or 25 customers.

d. Mr. Corder has little money. What major business risks would he take by renting the fortune-telling booth? How could he minimize those risks?

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Exercise 2-7B

a.

Number of Customers (a)	5	10	15	20	25
Total rental cost					
Cost per customer					

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Exercise 2-7B (Cont. on next page)

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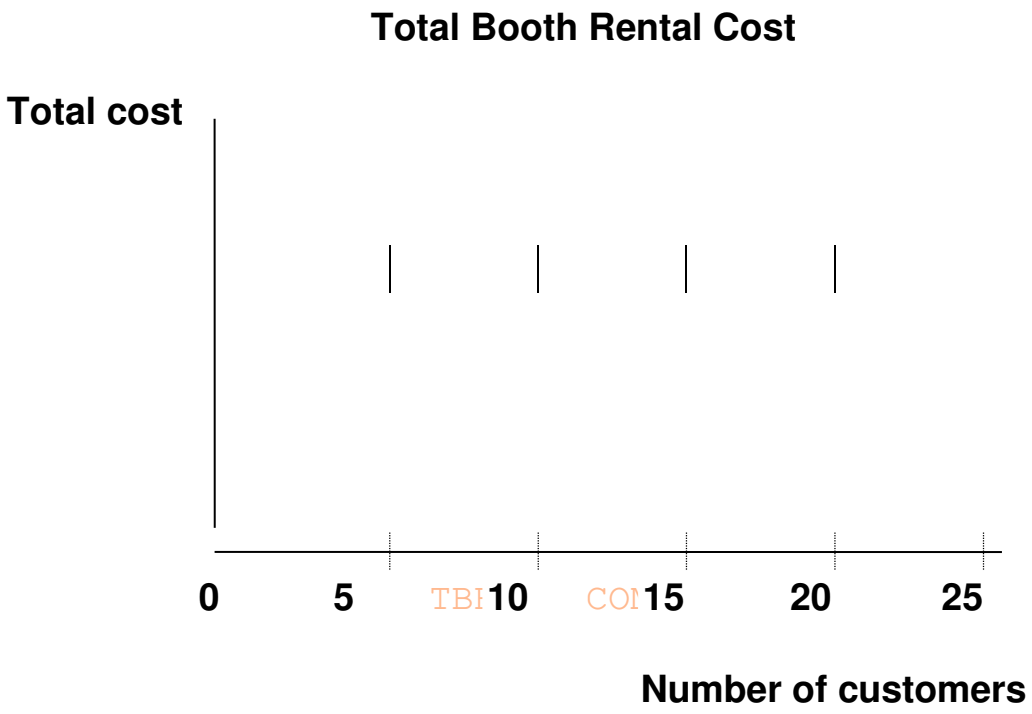
Exercise 2-7B (Continued)

b. The cost of renting the booth is:

c.



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Exercise 2-7B (Sol. cont.)

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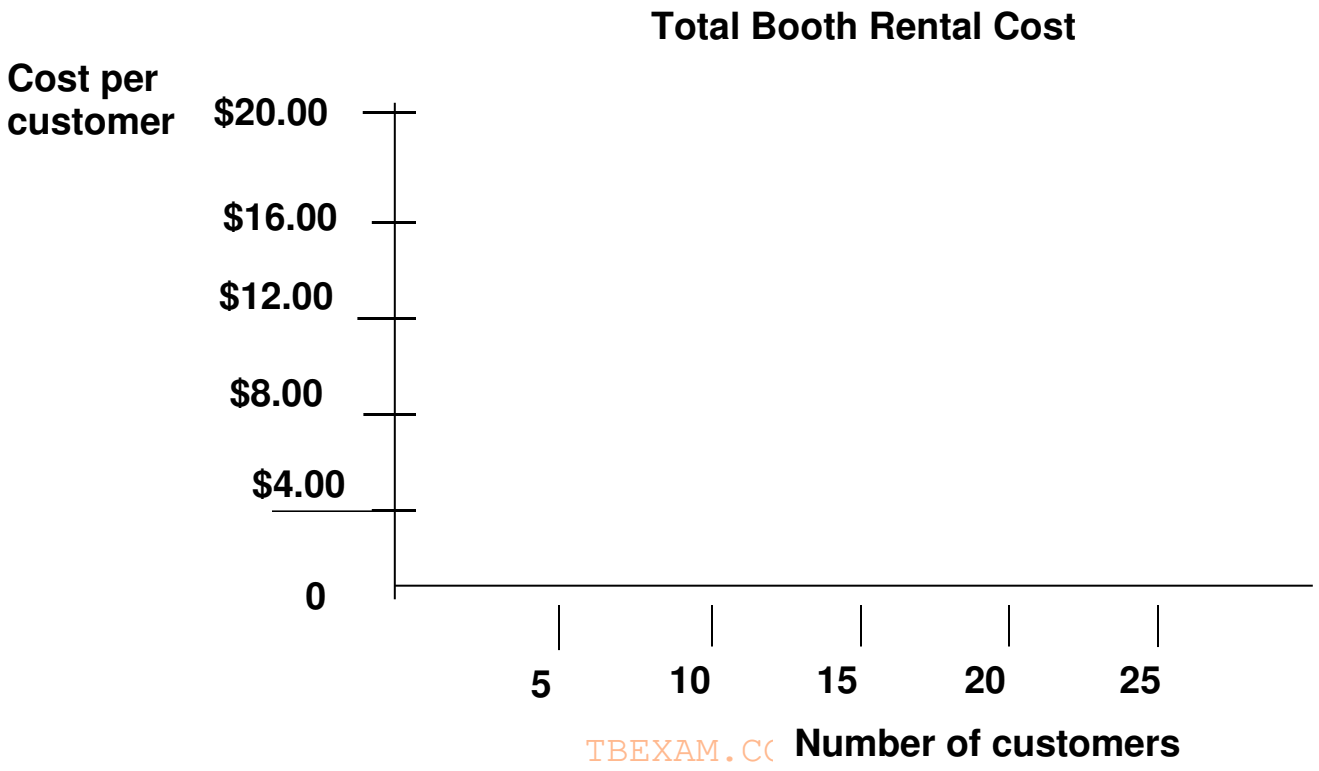
Exercise 2-7B c. (Sol. continued)



d. Corder's major business risk is:

Exercise 2-7B (Sol. continued on next page)

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Exercise 2-7B d. (Sol. continued)

d. How to minimize:

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Exercise 2-8B ***Fixed versus variable cost behavior***

In the evenings, Shawn Corder works telling fortunes using his friend Fred Molloy's booth at the city market. Mr. Molloy pays the booth rental, so Mr. Corder has no rental cost. As a courtesy, Mr. Corder provides each customer a soft drink. The drinks cost him $0.50 per customer.

Required

a. What is the soft drink cost both in total and per customer if the number of customers is 5, 10, 15, 20, or 25?

b. Is the soft drink cost fixed or variable?

c. Draw two graphs. On one, plot total soft drink cost for 5, 10, 15, 20, and 25 customers; on the other, plot soft drink cost per customer for 5, 10, 15, 20, and 25 customers.

d. Comment on the likelihood that Mr. Corder will incur a loss on this business venture.

Exercise 2-8B

a.

Number of Customers (a)	5	10	15	20	25
Total soft drink cost					
Soft drink cost per customer					

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b. The total soft drink cost is_____(fixed/variable).

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Exercise 2-8B (Sol. cont. on next page)

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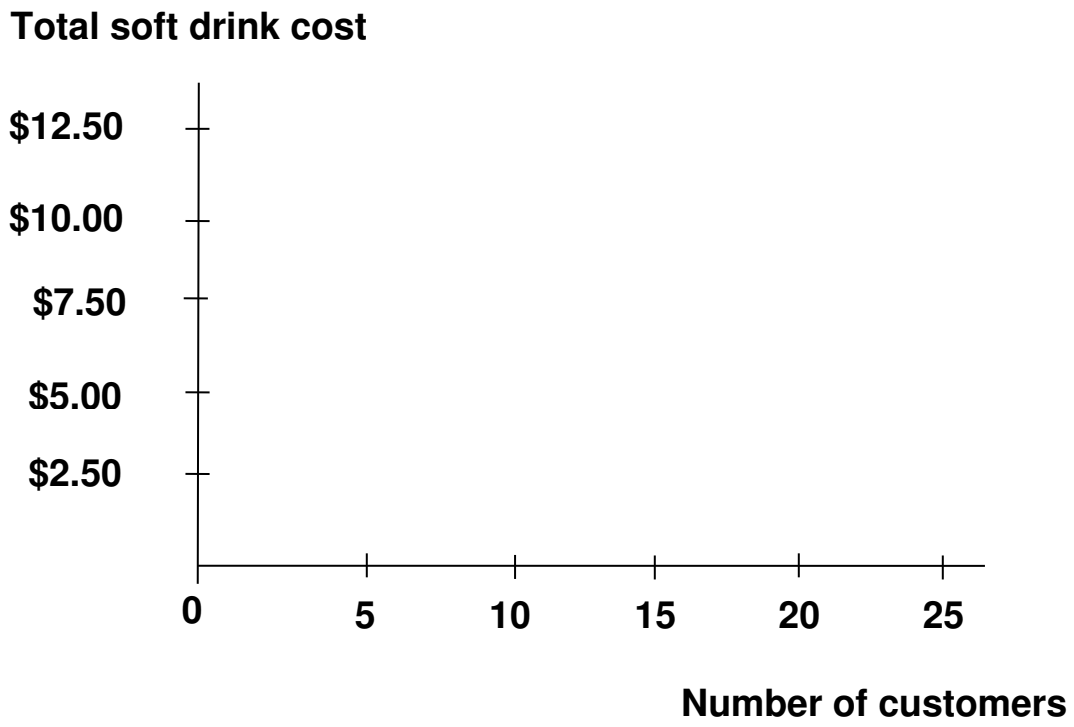
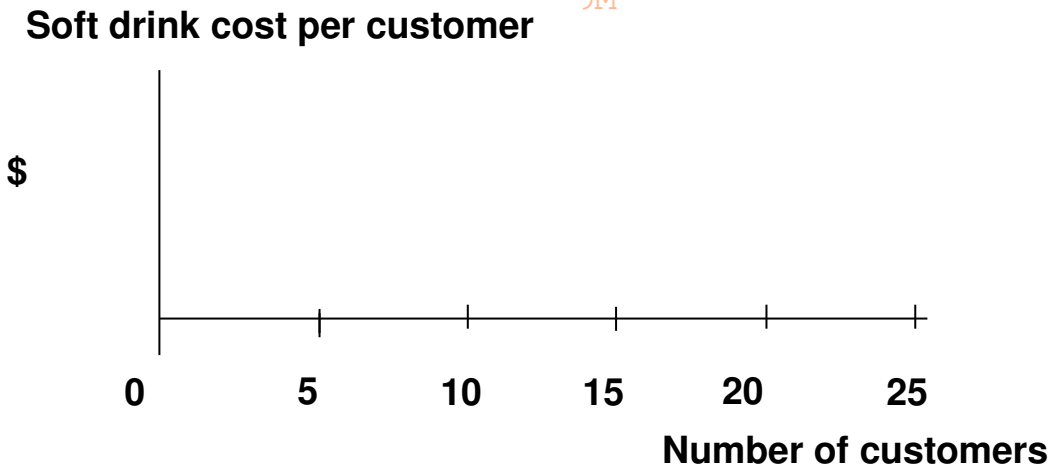
Exercise 2-8B (Sol. cont.)

c.





Exercise 2-8B (Sol .cont on next page)

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Exercise 2-8B (Sol. continued)

d. Likelihood Corder will incur a loss:

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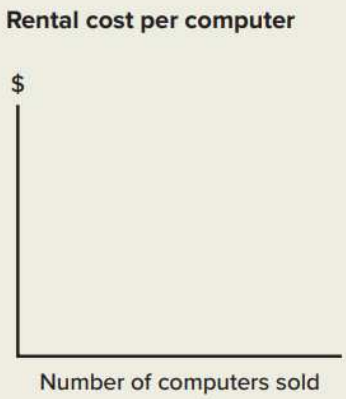
Exercise 2-9B *Graphing fixed cost behavior*

Parry Computers leases space in a mall at a monthly rental cost of $3,000. The following graph setups depict rental cost on the vertical axes and activity level on the horizontal axes.



Required

a. Draw a line that depicts the relationship between the total monthly rental cost and the number of computers sold.

b. Draw a line that depicts the relationship between rental cost per computer and the number of computers sold.

Exercise 2-9B

a. Total monthly rental cost

Exercise 2-9B (Sol. cont. on next page)

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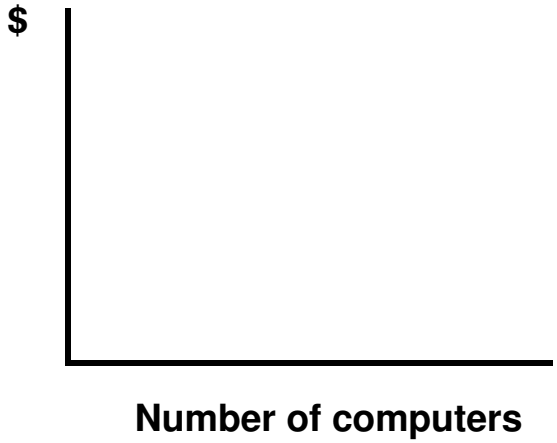
Exercise 2-9B (Sol. cont.)

b. Rental cost per computer



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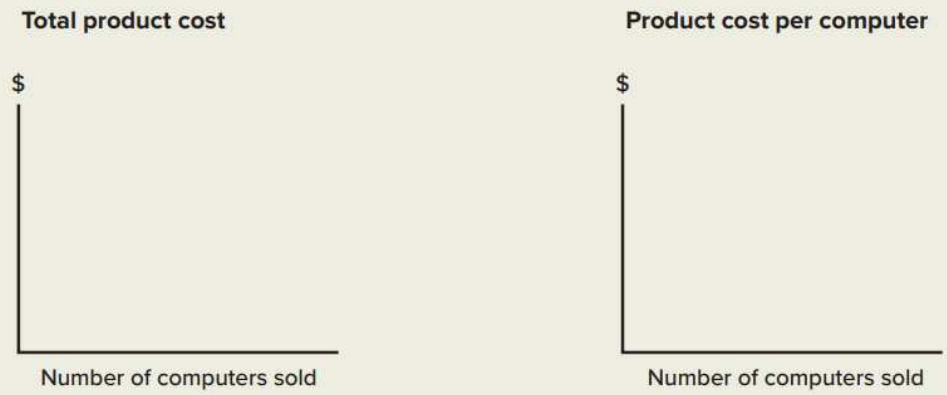
Exercise 2-10B *Graphing variable cost behavior*

Dillon Computers purchases computers from a manufacturer for $500 per computer. The following graph setups depict product cost on the vertical axes and activity level on the horizontal axes.



Required

a. Draw a line that depicts the relationship between total product cost and the number of computers sold.

b. Draw a line that depicts the relationship between product cost per computer and the number of computers sold.

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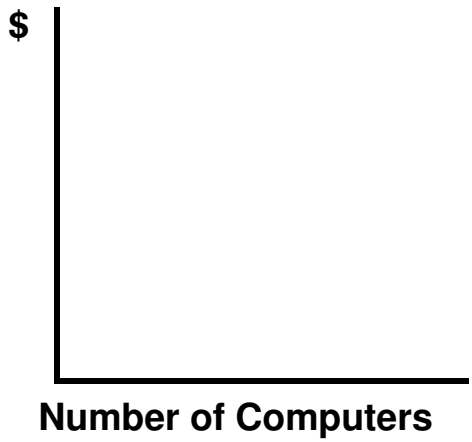
Exercise 2-10B

a. Total product cost



Exercise 2-10B (Solution cont. on next page)

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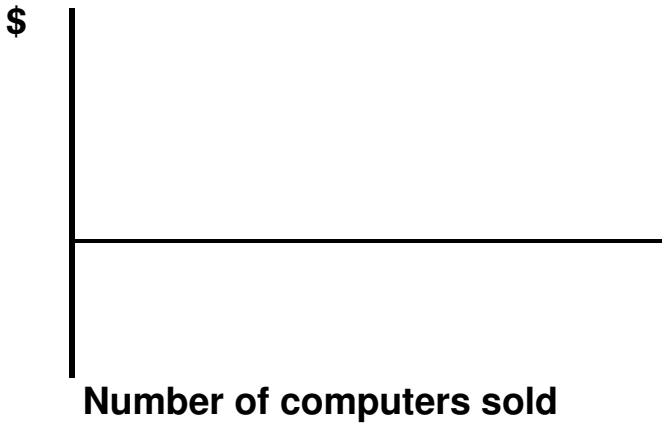
Exercise 2-10B (Sol. continued)

b. Product cost per computer



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Exercise 2-11B *Mixed cost at different levels of activity*

Top Hats Corporation uses workers in Indonesia to manually weave straw hats. The company pays the workers a daily base wage plus $0.50 per completed hat. On Monday, workers produced 100 hats for which the company paid wages of $95.

Required

Calculate the total cost of the workers' wages for each of the following days.

Day	Monday	Tuesday	Wednesday	Thursday
Number of hats woven	100	120	160	80
Total variable cost				
Total fixed cost				
Total wages cost				

Exercise 2-11B

Day	Monday	Tuesday	Wednesday	Thursday
Number of hats woven	100	120	160	80
Total variable cost				
Total fixed cost				
Total wages cost				

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Exercise 2-12B *Effect of cost structure on projected profits*

Standard and Variant compete in the same market. The following budgeted income statements illustrate their cost structures.

Income Statements	Company	
	Standard	Variant
Number of customers (a)	150	150
Sales revenue (a × $160)	$24,000	$24,000
Variable cost (a × $90)	N/A	(13,500)
Contribution margin	24,000	10,500
Fixed costs	(13,500)	N/A
Net income	$10,500	$10,500

Required

a. Assume that Standard can lure all 150 customers away from Variant by lowering its sales price to $85 per customer. Reconstruct Standard's income statement based on 300 customers.

b. Assume that Variant can lure all 150 customers away from Standard by lowering its sales price to $85 per customer. Reconstruct Variant's income statement based on 300 customers.

c. Why does the price-cutting strategy increase Standard's profits but result in a net loss for Variant?

Exercise 2-12B

Income Statements		
a. & b.	a.	b.
Company	Standard	Variant
Number of customers	300	300
Sales revenue		
Variable cost: Variant		
Variable cost: Standard		
Contribution margin		
Fixed cost		
Net income (loss)		

Exercise 2-12B (Sol. cont. on next page)

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Exercise 2-12B (Sol. cont.)

c. The price-cutting strategy effect on the companies with explanation:

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Exercise 2-13B ***Using a contribution margin format income statement to measure the magnitude of operating leverage***

Nagano Company, a merchandising firm, reported the following operating results.

Income Statements	
Sales revenue (2,400 units × $100)	$ 240,000
Cost of goods sold (2,400 units × $65)	(156,000)
Gross margin	84,000
Sales commissions (10% of sales revenue)	(24,000)
Administrative salaries expense	(15,000)
Advertising expense	(20,000)
Depreciation expense	(10,600)
Shipping and handling expense (2,400 units × $1)	(2,400)
Net income	$ 12,000

Required

a. Reconstruct the income statement using the contribution margin format.

b. Calculate the magnitude of operating leverage.

c. Use the measure of operating leverage to determine the amount of net income that Nagano will earn if sales revenue increases by 10 percent.

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Exercise 2-13B (Sol. on next page)

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Exercise 2-13B (Solution)

a.

Income Statement	
Sales revenue	
Contribution margin	
Net income	

b.

Operating leverage = TBEXAM.COM

c. A 10 percent increase in sales revenue will:

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Exercise 2-14B ***Assessing the magnitude of operating leverage***

The following budgeted income statement applies to Johnson Company.

Income Statement	
Sales revenue (1,000 units × $89)	$ 89,000
Variable cost (1,000 units × $50)	(50,000)
Contribution margin	39,000
Fixed costs	(26,000)
Net income	$ 13,000

Required

a. Use the contribution margin approach to calculate the magnitude of operating leverage.

b. Use the operating leverage measure computed in Requirement *a* to determine the amount of net income that Johnson Company will earn if sales volume increases by 10 percent. Assume the sales price per unit remains unchanged at $89.

c. Verify your answer to Requirement *b* by constructing an alternative income statement based on a 10 percent increase in sales volume. The sales price per unit remains unchanged at $89. Calculate the percentage change in net income for the two income statements.

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Exercise 2-14B

a.

Operating leverage =

b. 10% change in revenue:

Exercise 2-14B (Sol. cont. on next page)

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Exercise 2-14B (Sol. cont.)

c.

Annual Income Statements			
Sales volume in units (a)	1,000	% Change	
Sales revenue		⇒+10%⇒	
Variable costs			
Contribution margin			
Fixed cost			
Net income		⇒ %⇒	

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Exercise 2-15B *Averaging costs*

Century Entertainment Company operates a movie theater that has monthly fixed expenses of $4,000. In addition, the company pays film distributors $1.00 per ticket sold. The following chart shows the number of tickets Century expects to sell in the coming year.

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
2,000	1,600	3,200	3,400	3,200	4,200	4,700	4,000	5,000	3,100	3,000	2,600	40,000

Required

Assume that Century wants to earn $3.00 per movie patron. What price should it charge for a ticket in January and in September?

Exercise 2-15B

Century should charge:

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Exercise 2-16B ***Estimating fixed and variable costs using the high-low method***

Pettit Ice Cream Company produces various ice cream products for which demand is highly seasonal. The company sells more ice cream in warmer months and less in colder ones. Last year, the high point in production activity occurred in August when Pettit produced 50,000 gallons of ice cream at a total cost of $82,000. The low point in production activity occurred in February when the company produced 20,000 gallons of ice cream at a total cost of $46,000.

Required

a. Use the high-low method to estimate the amount of fixed cost per month incurred by Pettit Ice Cream Company.

b. Determine the total estimated monthly cost when 40,000 gallons of ice cream are produced.

c. What factors could cause the estimate determined in Requirement *b* to be inaccurate?

d. Explain how regression analysis could be used to improve accuracy. Your explanation should include a discussion of the R^2 statistic as well as the potential impact of multiple regression analysis.

Exercise 2-16B

a.

Variable cost per gallon =

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Fixed cost per month =

b. Total cost@ 40,000: =

c. Factors that would cause b. to be inaccurate:

Exercise 2-16B (Sol. cont. on next page)

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Exercise 2-16B (Sol. cont.)

d. How regression analysis can improve accuracy:

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Problem 2-17B *Identifying cost behavior*

Required

Identify the following costs as fixed or variable.

Costs related to operating a retail gasoline company follow.

a. Depreciation of equipment relative to the number of customers served at a station.
b. Property and real estate taxes relative to the amount of gasoline sold at a particular station.
c. Depreciation of equipment relative to the number of stations.
d. Cashiers' wages relative to the number of customers served in a station.
e. Salary of a manager of a particular station relative to the number of employees.
f. Gasoline cost relative to the number of customers.
g. Utility cost relative to the number of stations in operation.
h. The company's cost of national TV commercials relative to the number of stations in operation.

Costs related to shuttle bus trips between JFK International Airport and downtown New York follow. Each bus driver receives a specific salary per trip. A manager schedules bus trips and supervises drivers, and an administrative assistant receives phone calls.

i. A driver's salary relative to the number of passengers on a particular trip.
j. Fuel costs relative to the number of trips.
k. Fuel costs relative to the number of passengers on a particular trip.
l. Drivers' salaries relative to the number of trips driven.
m. Office staff salaries relative to the number of passengers on a particular trip.
n. Depreciation relative to the number of buses in service.

Sussie's Barbershop operates several stores in shopping centers. Each store employs a supervisor and three barbers. The supervisor is paid a specific salary per month. Each barber receives a specific salary per month plus a 10 percent commission based on the service revenues the barber has generated. Costs related to Sussie's Barbershop follow.

o. Store rental costs relative to the number of customers.
p. Barbers' commissions relative to the number of customers.
q. Supervisory salaries relative to the number of customers served in a particular store.
r. Barbers' salaries relative to the number of barbers in a particular district.
s. Supplies cost relative to the number of hair services provided in a particular store.
t. Barbers' salaries relative to the number of customers served at a particular store.

Problem 2-17B (Sol. on next page)

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Problem 2-17B (Solution cont.)

Requirement	Fixed	Variable
a.	x	
b.		
c.		
d.		
e.		
f.		
g.		
h.		
i.		
j.		
k.		
l.		
m.		
n.		
o.		
p.		
q.		
r.		
s.		
t.		

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Problem 2-18B *Cost behavior and averaging*

Chris Quill asks you to analyze the operating cost of his lawn services business. He has purchased the needed equipment with a cash payment of $90,000. Upon your recommendation, he agrees to adopt straight-line depreciation. The equipment has an expected life of four years and no salvage value. Mr. Quill pays his workers $20 per lawn service. Material costs, including fertilizer, pesticide, and supplies, are expected to be $10 per lawn service.

Required

a. Determine the total cost of equipment depreciation and the average cost of equipment depreciation per lawn service, assuming that Mr. Quill provides 40, 50, or 60 lawn services during one month. Is the cost of equipment a fixed or a variable cost?

b. Determine the total expected cost of labor and the average expected cost of labor per lawn service, assuming that Mr. Quill provides 40, 50, or 60 lawn services during one month. Is the cost of labor a fixed or a variable cost?

c. Determine the total expected cost of materials and the average expected cost of materials per lawn service, assuming that Mr. Quill provides 40, 50, or 60 lawn services during one month. Is the cost of fertilizer, pesticide, and supplies a fixed or a variable cost?

d. Determine the total expected cost per lawn service, assuming that Mr. Quill provides 40, 50, or 60 lawn services during one month.

e. Determine the average expected cost per lawn service, assuming that Mr. Quill provides 40, 50, or 60 lawn services during one month. Why does the cost per unit decrease as the number of lawn services increases?

f. If Mr. Quill tells you that he prices his services at 30 percent above cost, would you assume that he means average or actual cost? Why?

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Problem 2-18B

a.

Number of Lawn Services (a)	40	50	60
Total expected monthly depreciation cost			
Average per unit depreciation cost			

*Rounded

Depreciation per month =

Type of cost:

Problem 2-18B (Sol. cont. on next page)

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Problem 2-18B (Sol. cont.)

b.

Number of Lawn Services (a)	40	50	60
Average per unit labor cost			
Total labor cost			

Type of cost:

c.

Number of Lawn Services (a)	40	50	60
Average per unit materials cost			
Total cost of materials			

Type of cost:

d.

Number of Lawn Services (a)	40	50	60
Total _____ cost			
Total _____ cost			
Total _____ cost			
Total cost			

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Problem 2-18B (Sol. continued on next page)

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Problem 2-18B (Sol. continued)

e. The amount of <u>total</u> cost shown below was determined in Requirement d.

Number of Lawn Services (a)	40	50	60
Total cost			
Cost per unit			

*Rounded

The decline in the cost per lawn service is caused by:

f. Mr. Quill means:

Explanation:

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Problem 2-19B ***Context-sensitive nature of cost behavior classifications***

Kelly and Valdez Tax Services' Development Department is responsible for establishing new community branches. Each branch opens with four tax accountants. Total cost of payroll per branch is $240,000 per year. Together the four accountants can process up to 5,000 simple tax returns per year. The firm's policy requires closing branches that do not reach the quota of 3,000 tax returns per year. On the other hand, the firm hires an additional accountant for a branch and elevates it to the status of a regular operation if the customer demand for services exceeds 5,000 tax returns.

Required

a. What is the relevant range of activity for a new branch established by the Development Department?

b. Determine the amount of payroll cost in total and the average payroll cost per transaction for a branch that processes 3,000, 4,000, or 5,000 tax returns. In this case (the activity base is the number of tax returns for a specific branch), is the payroll cost a fixed or a variable cost?

c. Determine the amount of payroll cost in total and the average payroll cost per branch for Kelly and Valdez Tax Services assuming that the Development Department operates 20, 30, or 40 branches. In this case (the activity base is the number of branches), is the payroll cost a fixed or a variable cost?

Problem 2-19B

a. The relevant range is:

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b.

Number of Tax Returns (a)	3,000	4,000	5,000
Total payroll cost			
Average per unit payroll cost			

Type of Cost:

c.

Number of Branches (a)	20	30	40
Payroll cost per branch			
Total payroll cost			

Type of cost:

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Problem 2-20B *Context-sensitive nature of cost behavior classifications*

Sean Franklin sells a newly developed camera, Panorama Vision. He purchases the cameras from the manufacturer for $150 each and rents a store in a shopping mall for $6,000 per month.

Required

a. Determine the average cost of sales per unit if Mr. Franklin sells 100, 200, 300, 400, or 500 units of Panorama Vision per month. Use the following chart to organize your answer.

	Sales Volume in Units (a)				
	100	200	300	400	500
Total cost of cameras (a × $150)	$15,000				
Total cost of store rental	6,000				
Total cost of sales (b)	$21,000				
Average cost per unit (b ÷ a)	$210.00				

b. If Mr. Franklin wants to make a gross profit of $30 on each camera he sells, what price should he charge at sales volumes of 100, 200, 300, 400, or 500 units?

c. Record the total cost of store rental if Mr. Franklin opens a camera store at one, two, three, four, or five shopping malls. Record your answers in the following chart. Is the cost of store rental fixed or variable relative to the number of stores opened?

	Shopping Malls				
	1	2	3	4	5
Total cost of store rental	$6,000				

d. Mr. Franklin provides decorative ornaments to customers who purchase cameras. Some customers take the ornaments, others do not, and some take more than one. The number of ornaments varies in relation to the number of cameras sold, but the relationship is not proportional. Assume that, on average, Mr. Franklin gives away $150 worth of ornaments for every 100 cameras sold. What is the additional cost per camera sold? Is the cost fixed or variable?

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Problem 2-20B (Solution)

a.

Sales Volume in cameras (a)	100	200	300	400	500
Total cost of cameras (a x $150)	$15,000				
Total cost of store rental	6,000				
Total cost of sales (b)	$21,000				
Average cost per camera (b ÷ a)	$210.00				

b.

Sales Volume in cameras	100	200	300	400	500
Average cost per unit					
Price per package					

c.

Shopping Malls (a)	1	2	3	4	5
Total cost of store rental	$6,000				

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Type of cost:

d. The additional cost is:

The cost would be treated as a:

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Problem 2-21B *Effects of operating leverage on profitability*

CFEs R Us conducts CFE review courses. Public universities that permit free use of a classroom support the classes. The only major expense incurred by CFEs R Us is the salary of instructors, which is $5,000 per course taught. The company recently planned to offer a review course in Boston for $400 per candidate; it estimated that 50 candidates would attend the course.

Complete these requirements based on the preceding information.

Part 1:

Required

a. Relative to the number of CFE candidates in a single course, is the cost of instruction a fixed or a variable cost?

b. Determine the profit, assuming that 50 candidates attend the course.

c. Determine the profit, assuming a 10 percent increase in enrollment (i.e., enrollment increases to 55 students). What is the percentage change in profitability?

d. Determine the profit, assuming a 10 percent decrease in enrollment (i.e., enrollment decreases to 45 students). What is the percentage change in profitability?

e. Explain why a 10 percent shift in enrollment produces more than a 10 percent shift in profitability. Use the term that identifies this phenomenon.

Part 2:

The instructor has offered to teach the course for a percentage of tuition fees. Specifically, the instructor wants $100 per candidate attending the class. Assume that the tuition fee remains at $400 per candidate.

Required

f. Is the cost of instruction a fixed or a variable cost?

g. Determine the profit, assuming that 50 candidates take the course.

h. Determine the profit, assuming a 10 percent increase in enrollment (i.e., enrollment increases to 55 students). What is the percentage change in profitability?

i. Determine the profit, assuming a 10 percent decrease in enrollment (i.e., enrollment decreases to 45 students). What is the percentage change in profitability?

j. Explain why a 10 percent shift in enrollment produces a proportional 10 percent shift in profitability.

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Problem 2-21B (Problem cont. on next page)

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Problem 2-21B (Problem continued)

Part 3:

CFEs R Us sells a workbook to each student who attends the course. The workbook contains printed material unique to each course. Workbooks that are not sold must be destroyed. Prior to the first class, CFEs R Us printed 50 copies of the books based on the estimated number of people who would attend the course. Each workbook costs $32 and is sold for $50. This cost includes a royalty fee paid to the author and the cost of duplication.

Required

k. Calculate the total cost and the cost per candidate of the workbooks, assuming that 45, 50, or 55 candidates attempt to attend the course. Round your figures to two decimal points.

l. Classify the cost of workbooks as fixed or variable relative to the number of candidates attending the course.

m. Discuss the risk of holding inventory as it applies to the workbooks.

n. Explain how a just-in-time inventory system can reduce the cost and risk of holding inventory.

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Problem 2-21B
Part 1

a. The cost of instruction is: TBEXAM.COM

b. c. & d.

Number of Candidates		% Change	50	% Change	
Revenue		⇐(-10%)⇐		⇒+10%⇒	
Cost of instruction					
Gross profit		⇐(- %)⇐		⇒+ %⇒	

Percentage change in revenue:
Percentage change in profit:

e. _____ caused the percentage change in profitability to be higher than the percentage change in revenue.
Explain:

Problem 2-21B (Sol. cont. on next page)

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Problem 2-21B (Sol. continued)

Part 2

f. The cost of instruction is:

g. h. and i.

Number of Candidates	45	% Change	50	% Change	55
Revenue		⇐(10%)⇐		⇒+10%⇒	
Cost of instruction					
Gross profit		⇐(%)⇐		⇒+ %⇒	

Percentage change in revenue:
Percentage change in profit:

j. Explain the results of i. above:

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Part 3

k.

Number of Candidates Attempting to Attend	45	50	55
Number of candidates accepted			
Total cost of workbooks			
Cost per candidate			

l. The cost of workbooks is:

m. The risks of holding workbooks:

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Problem 2-21B (Sol. continued)

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Problem 2-21B (Sol. cont.)

n. A just-in-time inventory system's effect on risk and cost:

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Problem 2-22B ***Effects of fixed and variable cost behavior on the risk and rewards of business opportunities***

Canton Club and Tobin Club are competing health and recreation clubs in Orlando. They both offer tennis training clinics to adults. Canton pays its coaches $4,800 per season. Tobin pays its coaches $120 per student enrolled in the clinic per season. Both clubs charge a tuition fee of $200 per season.

Required

a. Prepare income statements for Canton and Tobin, assuming that 40 students per season attend each clinic.

b. The ambitious new director of Canton Club tries to increase the club's market share by reducing the club's tuition per student to $112 per clinic. Prepare an income statement for Canton, assuming that the club attracts all of Tobin's customers and therefore is able to enroll 80 students in its clinics.

c. Independent of Requirement *b*, Tobin Club tries to lure Canton's students by lowering its price to $112 per student. Prepare an income statement for Tobin, assuming that the club succeeds in enrolling 80 students in its clinics.

d. Explain why the strategy described in Requirement *b* produced a profit while the same strategy described in Requirement *c* produced a loss.

e. Prepare an income statement for Canton Club and Tobin Club, assuming that 20 students attend a clinic at the original $200 tuition price.

f. It is always better to have fixed rather than variable cost. Explain why this statement is false.

g. It is always better to have variable rather than fixed cost. Explain why this statement is false.

Problem 2-22B

a.

Club	Canton		Tobin
Tuition revenue			
Total cost of instruction			
Net income			

b.

Club	Canton
Tuition revenue	
Total cost of instruction	
Net income	

Problem 2-22B (Sol. cont. on next page)

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Problem 2-22B (Sol. cont.)

c.

Club	calculation	Tobin
Tuition revenue		
Total cost of instruction		
Net loss		

d. The strategy in Requirement b produced a profit because:

The strategy in Requirement c produced a loss because:

e.

Club		Canton		Tobin
Tuition revenue				
Total cost of instruction				
Net income (loss)				

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f. Fixed costs are not always better than variable costs. Explain this statement:

g. Variable costs are not always better than fixed costs. Explain this statement.

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Problem 2-23B *Analysis of operating leverage*

June Wade has invested in two startup companies. At the end of the first year, she asks you to evaluate their operating performance. The following operating data apply to the first year.

	Company Name	
	Cook	Penn
Variable cost per unit (a)	$ 16	$ 8
Sales revenue (8,000 units × $25)	$ 200,000	$200,000
Variable cost (8,000 units × a)	(128,000)	(64,000)
Contribution margin	72,000	136,000
Fixed cost	(40,000)	(104,000)
Net income	$ 32,000	$ 32,000

Required

a. Use the contribution margin approach to compute the operating leverage for each firm.

b. If the economy expands in the coming year, Cook and Penn will both enjoy a 10 percent per year increase in sales volume, assuming that the selling price remains unchanged. (*Note:* Since the number of units increases, both revenue and variable cost will increase.) Compute the change in net income for each firm in dollar amount and in percentage.

c. If the economy contracts in the following year, Cook and Penn will both suffer a 10 percent decrease in sales volume, assuming that the selling price remains unchanged. (*Note:* Since the number of units decreases, both revenue and variable cost decrease.) Compute the change in net income for each firm in both dollar amount and percentage.

d. Write a memo to June Wade with your evaluation and recommendations.

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Problem 2-23B

a.

Company Name	Cook	Penn
_____		
Divided by _____ =	_____	_____
Operating leverage		

Problem 2-23B (Sol. cont. on next page)

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Problem 2-23B (Sol. cont.)

b.

Company Name	Cook	Penn
Variable cost per unit		
Sales revenue		
Variable cost		
Contribution margin		
Fixed cost		
Net income		
Percentage change	%	%

c.

Company Name	Cook	Penn
Variable cost per unit		
Sales revenue		
Variable cost		
Contribution margin		
Fixed cost		
Net income		
Percentage change		

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Problem 2-23B (Sol. continued on next page)

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Problem 2-23B (Sol. continued)

d. The main focus of the analyses should be the risk and reward relationship as demonstrated by the data of the two investments.

Memorandum

TO: Ms. June Wade
FROM: John Doe
SUBJECT: Analysis and Recommendation Regarding Investments
DATE: October 23, 20XX

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Problem 2-24B

a.

Day	M	Tu	W	Th	F	Sat	Sun
Total cost							
No. people	400	350	300	500	800	1,250	1,400
Per unit							

b.

Day	M	Tu	W	Th	F	Sat	Sun
Per unit cost							
Mark-up							
Ticket price							

c. The computation of price using weekly averaging:

Problem 2-24B (Sol. cont. on next page)

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Problem 2-24B (Sol. cont.)

d. Why weekly averaging may be more useful:

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Problem 2-25B ***Identifying relevant issues for cost averaging***

West Tours, Inc., organizes adventure tours for people interested in visiting a desert environment. A desert tour generally lasts three days. West provides food, equipment, and guides. Dan Silva, the president of West Tours, needs to set prices for the coming year. He has available the company's past cost data in the following table.

	Span of Time		
	Recent Tour	One Year	Ten Years
Total cost of tours (a)	$4,800	$234,000	$1,620,000
Number of tourists (b)	32	1,500	12,000
Cost per tourist (a ÷ b)	$ 150	$ 156	$ 135

Required

Write a memo to Mr. Silva explaining the potential advantages and disadvantages of using each of the different per-tourist cost figures as a basis for establishing a price to charge tourists during the coming year. What other factors must Mr. Silva consider in developing a pricing strategy?

Problem 2-25B

Comment on data that is too recent or too old. Additional factors to be considered for pricing strategies include market demand, competition, and the general economy.

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Problem 2-25B (Sol. cont. on next page)

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Problem 2-25B (Sol. continued)

Memorandum

TO: Dan Silva, President
FROM: John Doe, Accountant
SUBJECT: Analysis and Recommendation Regarding the Use of Per Unit Cost for Pricing Decisions
DATE: October 1, 20XX

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Problem 2-26B *Estimating fixed and variable costs*

Kane Legal Services provides legal advice to clients. The following data apply to the first six months of operation.

	Month					
	Jan.	Feb.	Mar.	Apr.	May	June
Service hours	80	100	140	180	200	220
Revenue	$8,000	$10,000	$14,000	$18,000	$20,000	$22,000
Operating costs	7,400	8,200	9,660	10,600	10,900	11,600

Required

a. What is the average service revenue per hour for the six-month time period?
b. Use the high-low method to estimate the total monthly fixed cost and the variable cost per hour.
c. Determine the average contribution margin per hour.
d. Use the scattergraph method to estimate the total monthly fixed cost and the variable cost per hour.
e. Compare the results of the two methods and comment on any differences.

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Problem 2-26B

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a.

Jan. Feb. Mar. Apr. May June

b. Calculations for high low method:

Fixed cost =
Variable cost per hour =

c. Contribution margin per hour =

Problem 2-26B (Sol. cont. on next page)

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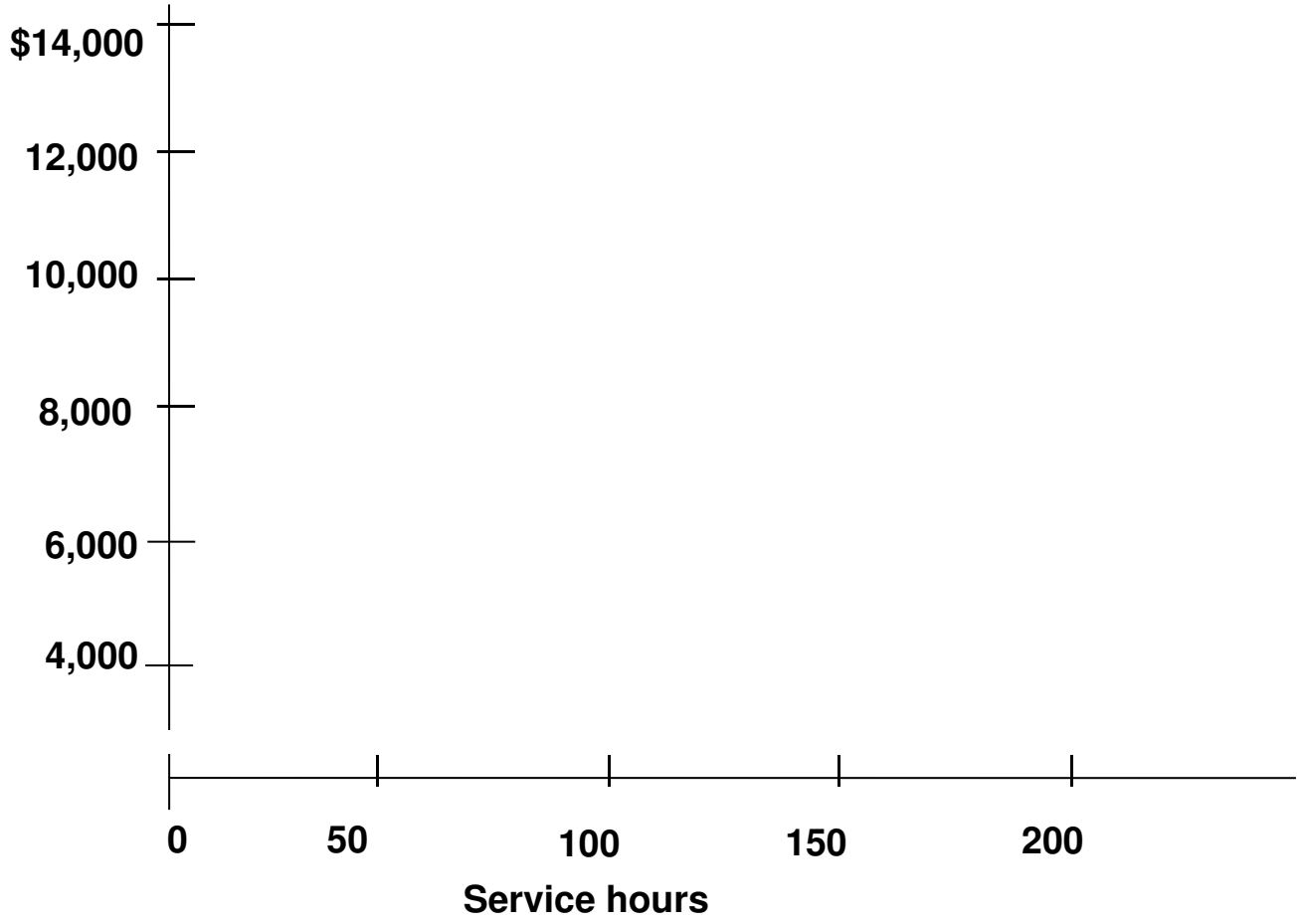
Problem 2-26B (Sol. continued)

d.

Operating costs



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Problem 2-26B (Sol. continued)

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Problem 2-26B (Sol. continued)

e. Compare the results of the two methods and comment on differences:

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Problem 2-27B *Estimating fixed and variable cost*

Jenkins Frames Company, which manufactures ornate frames for original art work, began operations in January, Year 1. Bruce Preston, the owner, asks for your assistance. He believes that he needs to better understand the cost of the frames for pricing purposes. You have collected the following data concerning actual production over the past year.

Month	Number of Frames Produced	Total Cost
January	1,600	$42,000
February	7,200	65,000
March	3,920	59,000
April	1,200	37,200
May	3,200	58,000
June	2,600	54,000
July	2,200	51,200
August	3,600	62,000
September	4,560	64,000
October	5,880	63,000
November	6,560	64,000
December	800	33,000

Required

a. To understand the department's cost behavior, you decide to plot the points on graph paper and sketch a total cost line.

(1) Enter the number of units and their costs in increasing order.

(2) Plot the points on the graph.

(3) Sketch a graph so the line "splits" all of the points (half of the points appear above and half appear below the line).

(4) Using the line you just sketched, visually estimate the total cost to produce 4,000 units.

b. Using the high-low method, compute the total cost equation for the preceding data.

(1) Compute the variable cost per unit.

(2) Compute total fixed costs.

(3) Sketch a line between the high and low points on your graph.

(4) Using the high-low method, estimate the total cost to produce 4,000 units.

c. Name a third method that could be used to determine the fixed and variable cost estimate and comment on the advantages of your suggested approach.

Problem 2-27B (Solution on next page)

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Problem 2-27B (Solution)

a. (1)

Month	# of Frames Produced	Total Cost

a. (2 & 3) (Sol. a. (4) on next page)

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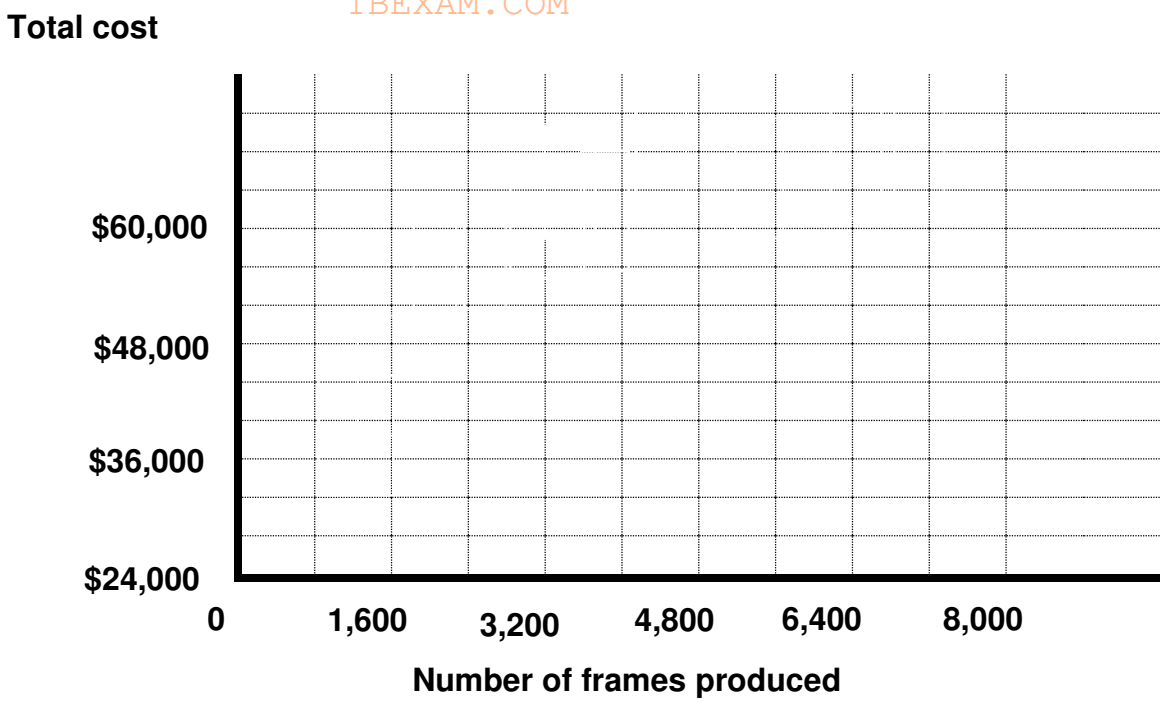

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Problem 2-27B (Sol. continued)

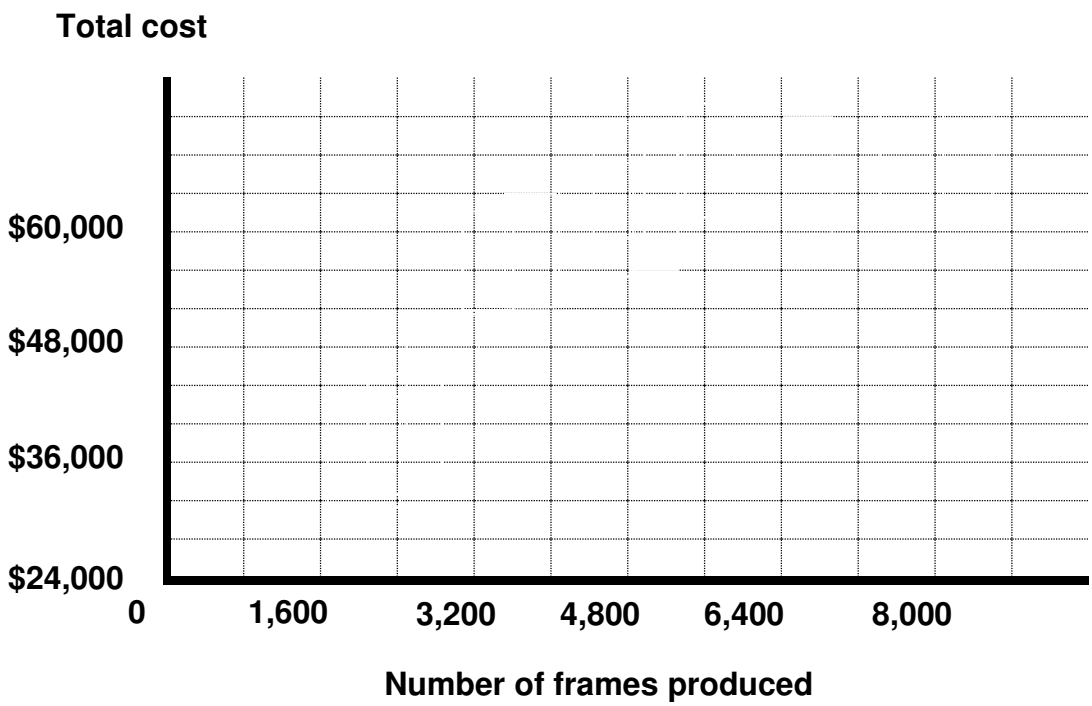
a. (4) The total cost of producing 4,000 frames:

b. (1) (Sol. to b. (4) on next page)

	Total Cost		# of Frames Produced		
High					
Low	_____		_____		
Diff.	_____	÷	_____	=	$__ per frame

b. (2) Fixed cost =

b. (3)



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Problem 2-27B (Sol. continued)

b. (4) Total cost=

c. A third method that could be used is regression analysis.

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Problem 2-28B ***Estimating fixed and variable cost using the regression method***

Stan Fox, the production manager of Hollis Construction Components, is trying to figure out the cost behavior of his factory supplies cost. The company uses machine hours as the cost driver. Joe Parrish, the assistant manager, collected the following cost data for the last 32 weeks.

Week No.	Machine Hours	Supplies Costs	Week No.	Machine Hours	Supplies Costs
1	86	$3,819	17	64	$3,856
2	72	3,610	18	88	4,279
3	79	3,916	19	129	5,633
4	62	2,915	20	137	5,298
5	91	4,327	21	144	6,721
6	42	2,214	22	37	2,448
7	37	2,106	23	56	3,528
8	33	2,390	24	49	2,837
9	23	2,107	25	12	1,359
10	96	4,868	26	57	3,296
11	94	5,021	27	54	3,472
12	91	4,811	28	65	3,264
13	72	3,580	29	77	3,925
14	60	2,800	30	85	4,002
15	48	2,269	31	92	4,583
16	53	2,748	32	82	3,523

Required

a. The company uses the number of machine hours as the cost driver for factory supplies costs. Use an algebraic equation to describe how total factory supplies costs can be estimated.

b. Use a spreadsheet program to perform a regression analysis. Use factory supplies costs as the dependent variable (Y) and the machine hours as the independent variable (X). Determine the total fixed cost per week and variable cost per machine hour.

c. Identify the R^2 statistic provided by the Excel program and explain what it means.

d. Identify a potential weakness of regression analysis and explain what can be done to minimize it.

e. Determine the estimated total cost of factory supplies if machine-hour usage amounts to 100 hours for the next week. What portion of the total cost is fixed and what portion is variable?

Problem 2-28B (Solution on next page)

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Problem 2-28B (Solution)

a. Assume the following:

X = the number of machine hours
Y = the dollar amount supplies cost

The algebraic equation should be as follows:

Where a represents the _____ and b represents the _____.

b. The result of regression analysis follows:
)Paste your results over the like tables and graphs)

Regression Statistics	
Multiple R	
R Square	
Adjusted R Square	
Standard Error	
Observations	

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ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression					
Residual					
Total					

Problem 2-28B (Sol. cont. on next page)

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Problem 2-28B (Sol. continued)

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*
Intercept							
X Variable 1							

RESIDUAL OUTPUT

Observation	*Predicted Y*	*Residuals*
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
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26		
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28		
29		
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32		

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Problem 2-28B (Sol. cont. on next page)

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Problem 2-28B (Sol. continued)

X Variable 1 Line Fit Plot :

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Fixed cost =
Variable cost per machine hour =

c. The R^2 statistic is 0.91936. This means that :

d. Weaknesses:

What can be done to mininize these weaknesses :

Problem 2-28B (Sol. cont. on next page)

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Problem 2-28B (Sol. continued)

e. Total cost =

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Teaching Notes for Chapter 2

To help students understand the complexities of cost behavior we suggest a ***divide and conquer*** strategy: isolate the points of confusion and address them one at a time. Students find three particular concepts confusing.

The first point of confusion is that cost behavior patterns for ***total costs*** differ from cost behavior patterns for ***unit costs***. Although the terms *fixed* and *variable* accurately describe ***total cost*** behavior patterns, they are inconsistent with ***per-unit cost*** behavior patterns. For example, the ***total*** rental fee for store space may remain constant (fixed) regardless of how many items are sold during an accounting period. The term ***fixed cost*** is logically consistent with the *total* cost behavior pattern. However, the *per-unit* behavior pattern of the rental cost changes; it decreases as volume increases and increases as volume decreases. The same semantic contradiction exists with respect to variable cost. In other words, ***variable cost*** expressed on a per-unit basis ***remains constant*** when the volume of activity changes.

The most effective means we have found to help students comprehend these semantic contradictions is to demonstrate visually the behavior patterns of a particular cost for several levels of activity. For example, the following chart demonstrates the cost behavior patterns for a fixed annual store rental fee of $2,400 assuming 1,000, 2,000, 3,000, and 4,000 units of product are sold in the store.

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Units of Product Sold (a)	1,000	2,000	3,000	4,000
Total Expected Rental Cost (b)	$2,400	$2,400	$2,400	$2,400
Average **Per-Unit** Rental Cost (b ÷ a)	$2.40	$1.20	$0.80	$0.60

Contrast this behavior pattern with that of a variable cost. For example, the following chart demonstrates the behavior pattern of cost of goods sold for sales of 1,000, 2,000, 3,000, and 4,000 units, assuming a cost of $9 per unit.

Units of Product Sold (a)	1,000	2,000	3,000	4,000
Cost Per Unit (b)	$9	$9	$9	$9
Total Cost of Goods Sold (a × b)	$9,000	$18,000	$27,000	$36,000

A second point of confusion involves the ***context-sensitive nature*** of the terminology. A particular cost may be fixed in one context and variable in a different context. For example, the managerial salary cost for a store is fixed relative to the number of customers visiting the store, but managerial salary cost is variable relative to the number of stores a company operates. Students must develop the ***conditional assessment skills*** to identify the appropriate cost classification based on the circumstances. They must learn to interpret whether a cost is fixed or variable relative to a given activity measure.

To teach this concept, we have devised a number of exercises and problems that ask students to identify whether a cost is fixed or variable in a variety of circumstances. For

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example, is the cost of rent for a Wendy's restaurant fixed or variable with respect to the number of hamburgers sold at a particular location? Is the cost of rent fixed or variable with respect to the number of restaurants operated by the company? In the first case, the rent cost is fixed. In the second case, the rent cost is variable.

Finally, student failure to grasp the idea of ***relevant range*** frequently leads to confusion. Suppose you explain that rent cost for a department store is fixed relative to sales volume because it remains unchanged regardless of sales levels. Now, suppose a student argues that rent cost is variable because more sales volume requires more store space and, therefore, higher rent cost. The student's confusion stems from failure to understand the concept of relevant range. Explain that a cost exhibits fixed or variable behavior patterns within a certain range of activity. For example, rent cost may be fixed for sales volumes between $500,000 and $1,000,000. Beyond this range of activity, rent cost will indeed change as more space is needed. However, the cost is fixed so long as the sales volume remains within the relevant range.

Once students master these three concepts, they should be able to identify and describe fixed and variable cost behavior in a variety of different circumstances. You are ready to discuss why effective business management requires understanding cost behavior. Why care whether a cost exhibits fixed or variable behavior? Business managers care because understanding cost behavior improves their abilities to assess risk and improve profitability. If management establishes a predominantly fixed cost structure and achieves high sales volume, costs per unit will be smaller and profitability is likely to be higher. However, if volume is low, costs per unit will skyrocket and profitability will suffer. This relationship between fixed cost and volume is commonly called ***operating leverage***. You must not only teach students how to classify costs as fixed or variable, but also teach them why such classification matters. We have included several exercises and problems specifically designed to develop students' understanding of operating leverage.

This chapter also offers an opportunity to distinguish between financial and managerial accounting. Begin by acknowledging that classifying *actual* costs as fixed and variable would be a difficult task in a large company. To avoid the record-keeping problems associated with measuring actual cost, managerial accountants frequently use estimated rather than actual costs. This discussion provides a good segue into covering methods used to estimate fixed and variable costs, including the high-low method, scattergraphs, and regression analysis.

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Detailed Outline of a Lesson Plan for Chapter 2

I. **Define the terms *fixed cost* and *variable cost*.** *Point out that the terms* fixed *and* variable *are logically consistent with the behavior of* ***total*** *cost.* ***Emphasize that the terms*** **fixed** ***and*** **variable** ***are inconsistent with cost per unit behavior***.

A. **Introduce fixed cost behavior.** Begin with the following example. Suppose two children each ask to bring a friend along on a family vacation. The children argue that it won't cost anything extra to bring friends because the rental cost of the condo is the same regardless of whether four people (two parents and the two children) or six people (the four family members and two friends) stay in it. The kids have a point. The cost is **fixed** (does not change) regardless of whether four, five, or six people stay in the condo. Note that the cost per unit decreases as the number of people increases. Illustrate the point by assuming the condo costs $1,200 per week, and you may wish to construct the following table.

Number of People (a)	4	5	6
Total Expected Rental Cost (b)	$1,200	$1,200	$1,200
Average Per Unit Rental Cost (b ÷ a)	$300	$240	$200

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Emphasize that the condo rental is a **fixed cost**. Note that the **total cost** remains unchanged regardless of whether four or six people stay in the condo. The **cost per person** changes inversely with changes in the activity measure (number of people). ***This example demonstrates that a cost classified as fixed will, in fact, vary when it is expressed on a per-unit basis.*** Make sure students understand that ***the word*** **fixed** ***relates to the behavior of total cost***.

B. **Have the students work Exercise 2-3A from the textbook as an in-class assignment for further understanding about fixed cost.** Walk around and observe students' work. If many students are having difficulty, you may want to work the problem on the board. Once you are satisfied that the class has mastered this topic, you are ready to move forward.

C. **Introduce variable cost behavior.** While it is true that the cost of the condo is fixed, what about the cost of food? What happens to food cost if you bring along two hungry teenagers? Suppose weekly food costs average $100 per person. Construct a table that shows the per-unit food cost and the total food cost for four, five, or six people.

Number of People (a)	4	5	6
Cost Per Person (b)	$100	$100	$100
Total Food Cost (a × b)	$400	$500	$600

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Note that the total cost varies in direct proportion to the number of people eating. Conversely, the ***cost per unit*** (per person) remains constant regardless of the number of people. It is traditional practice to classify a cost based on how its total behaves.

D. Mixed costs have both fixed and variable cost components. Review examples of mixed costs in Exhibit 2.8 and have the students work **Exercise 2-11A** from the textbook as an in-class assignment for further understanding about mixed cost.

E. Explain relevant range. Return to the original situation where the family is considering whether to allow the children to bring friends on a *single vacation*. What happens if the kids want to ask two friends each? The cost behavior may be affected. It may be necessary to rent a house instead of a condo, changing the amount of fixed cost. The family may decide to cook more meals in the condo and eat out less, thereby lowering the variable food cost per person. The point to emphasize is that the definitions of fixed and variable cost apply only within a **relevant range** of activity.

F. Emphasize that fixed and variable cost classifications are context sensitive by having students compute the total commission cost using different assumptions. Refer to **Demonstration Problem 2-1**. Assume AAI pays the artist $20,000 **per** exhibition. First compute the total commission cost and the cost per person, assuming 1,000, 2,000, or 4,000 people attend one exhibition. Under these circumstances the artist's commission is a fixed cost. Next, compute the total commission cost and the cost per exhibition assuming AAI sponsors one, two, or three exhibitions. In this context the commission cost is a variable cost. Point out that a cost (the artist's commission) can behave as a fixed or a variable cost depending upon the context. To further reinforce context-sensitive classifications, include group work in class or assign **Problems 2-19A** and **2-20A**.

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G. Explain that the definitions for fixed and variable costs are context sensitive. Whether a cost is classified as fixed or variable depends on the underlying circumstances. A cost can be classified as fixed in one context and as variable in a different context. To demonstrate this point, return to the condo rental example. Ask the students to prepare a table that shows the total cost and the cost per unit (vacations) assuming that the family takes one, two, or three one-week vacations. Recall that the weekly cost of the condo is $1,200. The result should be as follows.

Number of Vacations (a)	1	2	3
Cost of Condo Rental Per Vacation (b)	$1,200	$1,200	$1,200
Total Rental Cost (a × b)	$1,200	$2,400	$3,600

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Based on this behavior pattern, is the cost fixed or variable? Clearly, under these circumstances the cost is variable. ***Emphasize that students must learn how to assess the conditions that dictate cost behavior classification***. To reinforce their understanding, have the students work **Exercise 2-1A** from the textbook.

II. Introduce the concept of operating leverage.

A. Copy and distribute **Demonstration Problem 2-1**. This problem is helpful for both LO 2-2 and LO 2-4 coverage.

Suppose AAI expects 4,000 people to attend the exhibition if tickets are priced at $6 each. Have students prepare a budgeted income statement using this assumption.

B. Suppose actual attendance is 10 percent higher than expected. Have students prepare a revised income statement assuming that 4,400 people attend the exhibition. Have them calculate the percentage change in revenue and in net income. Many students have weak math skills when it comes to calculating percentage changes. It may be helpful to take a few minutes to cover this topic. Have them identify the <u>base measure</u> (revenue or net income at the original estimate of 4,000 patrons) and the <u>alternative measure</u> (revenue or net income at the alternative point of 4,400 patrons). Once students can identify the base and alternative measures, teach them to calculate the percentage change using the following formula:

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Alternative Measure – Base Measure = Difference
Difference ÷ Base Measure = Percentage Change

Although students should come to accounting knowing how to compute percentage changes, frequently they do not. Spending a few minutes covering these basics can significantly reduce confusion.

C. Highlight that a relatively small percentage change in revenue produced a significantly larger percentage change in profit (net income). Then introduce the term **operating leverage**. Students seem to grasp things better if they see the point before they learn the term. Always try to get students to focus on understanding the concepts as opposed to memorizing the terms. Have the students work **Exercise 2-14A** from the textbook as an in-class assignment for further understanding about fixed cost.

D. **The relationship between risk and reward:** Point out that the fixed commission cost poses significant risk. Refer to **Demonstration Problem 2-1**. Suppose AAI pays $20,000 for the right to exhibit the paintings and no one attends the exhibition. It stands to lose a lot of money (the $20,000 commission). How can AAI avoid this risk? We usually ask students to ponder

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the question before providing the answer. Frequently, someone suggests an appropriate solution. AAI can avoid the risk by converting the fixed cost to a variable cost. Suppose AAI agrees to pay the artist a $5 commission fee per person attending. Now suppose no one buys a ticket. The company loses nothing. Suppose only one person attends. AAI makes a buck ($6 revenue – $5 commission fee). Have the students work **Exercise 2-4A** from the textbook as an in-class assignment for further understanding about variable cost.

E. Demonstrate the risks and rewards of converting a fixed cost to a variable cost. Refer to **Demonstration Problem 2-1**. Have students prepare a budgeted income statement assuming that 4,000 people pay $6 to attend the exhibition and that AAI pays the artist a commission of $5 per ticket. Next, have students prepare an alternative income statement assuming a 10 percent increase in attendance. Ask them to compute the percentage change in revenue and net income. Repeat the exercise assuming a 10 percent decrease in attendance. Compare these results with those computed earlier, assuming the artist's payment was fixed. Note that reducing risk (the decline in net income is less dramatic when attendance falls from 4,000 to 3,600) also reduces reward (the increase in net income is less dramatic when attendance increases from 4,000 to 4,400).

III. Income statement under the contribution margin approach.

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A. Illustrate the impact of fixed and variable costs in a competitive business environment. We use **Demonstration Problem 2-2** as an in-class group exercise to introduce the effect of cost behavior on business strategy. "Upstream, Inc." has a fixed cost structure while "Downstream, Inc." has a variable cost structure. In an effort to lure customers away from Downstream, Inc., Upstream, Inc. sets the tour price just below the variable operating cost of Downstream, Inc. If Upstream, Inc. successfully lures additional customers, its cost per customer will decrease as the number of rafters increases. As volume increases, Upstream, Inc. will become increasingly profitable. If Downstream, Inc. follows suit with a price reduction, it will lose money with each additional customer. As volume increases Downstream's profits will decrease. Once students understand the scenario, you are ready to proceed with the problem. Assume that you, the professor, own Upstream, Inc. and that the students own Downstream, Inc. Ask students to provide a defensive strategy. Our suggested solution to the demonstration problem includes some of the responses we have received from our classes. Familiarize yourself with these possibilities before using the problem in your class. Even so, our list of feasible strategies is not comprehensive. Your students will likely offer other responses. This is an excellent problem that students enjoy while learning a meaningful lesson about the relationship among the volume of activity, cost behavior, and profitability. We encourage you to give it a try.

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B. Copy and distribute **Demonstration Problem 2-3** in order to introduce the connection between these topics and operating leverage in the next section.

IV. Measuring operating leverage using contribution margin.

A. Use **Demonstration Problem 2-3** as an in-class discussion problem.

B. Refer to **Demonstration Problem 2-1**. Begin by reinforcing the concepts previously introduced. First, have students calculate for AAI the **total commission cost** and the **commission cost per person** (part a.1.) if 1,000, 2,000, or 4,000 people attend the art exhibition. Then, ask students to classify the commission cost according to its behavior (fixed or variable). Show students how the data can be useful in making decisions by asking them how the cost per unit data could be used in setting the ticket price. Obviously, expected attendance will affect the pricing decision. We usually ask students to discuss how to estimate the number of people who would attend. The specific answers are not important. The point to make is that managerial accounting information is frequently based on estimates. This is a good opportunity to bring up the issue of **accuracy versus relevance**.

C. Next, have students calculate the total cost of books and the cost per book (part a.2.) if 1,000, 2,000, or 4,000 books are distributed to the people who attend the exhibition. Then, have students classify the book cost according to its behavior (fixed or variable). Suppose the company prints 2,000 books but distributes only 1,500? Suppose it prints 2,000 and 2,500 people attend? Excess production results in waste, while insufficient production results in shortages. Shortages have an opportunity cost—lost additional profits—and can lead to customer ill will. Discuss just-in-time inventory systems as a means of minimizing inventory holding risk. Suppose the company took orders and subsequently mailed books to the patrons. It could then produce the books just in time for mailing, thereby eliminating the possibility of over- or underproduction. Let the discussion continue as long as you deem appropriate. This exercise reinforces the introduction to just-in-time inventory that was provided in Chapter 1. Accustom students to the idea that managerial accounting concepts carry over from one chapter to the next.

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V. Cost averaging.

A. *Cost per unit* is an average cost that is easier to compute than the actual cost of each unit and is more relevant to decision making than actual cost. Accountants must use judgment when choosing the time span from which to draw data for computing the average cost per unit. Distortions can result from using either too long or too short a time span. Use **Exercise 2-15A** to demonstrate this point.

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B. Pricing problems can be solved by using a **cost averaging** approach, which averages the costs over a longer span of time. To reinforce their understanding, assign **Problem 2-18A** regarding cost behavior and averaging.

VI. Explain estimates in real-world problems.

A. You may omit these subjects without affecting coverage of future material.

B. Use **Exercise 2-16A** from the textbook as a demonstration problem if you decide to cover the high-low method.

C. Use **Problem 2-28A** from the textbook to reinforce regression method advantages if you decide to cover this topic.

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Demonstration Problems for Chapter 2

Demonstration Problem 2-1 Applying Cost Behavior Concepts to Business Decisions

Artisan's Arch, Inc. (AAI) contracts with artists to exhibit their work to the public. AAI has agreed to pay a well-known artist a $20,000 commission for the right to exhibit his work for one month.

Required

Part a: Identifying Cost Behavior

1. Determine the total commission cost and the commission cost per person if 1,000, 2,000, or 4,000 people attend the exhibition. Is the commission cost fixed or variable?
2. AAI sells books illustrating the artist's work to patrons. The books cost AAI $5 each. Determine the total cost of books and the cost per person if 1,000, 2,000, or 4,000 people attend the exhibition and wish to purchase the books. Is the book cost fixed or variable?

Part b: Operating Leverage and Risk/Reward Relationship

1. AAI pays an artist a $20,000 commission. It sells 4,000 tickets at $6 each. Prepare an income statement. Then prepare revised income statements assuming 10 percent more than 4,000 and 10 percent fewer than 4,000 patrons attend the exhibition. Calculate the percentage changes in revenue and net income if attendance increases or decreases 10 percent.
2. Alternatively, AAI pays the artist a commission of $5 per ticket sold. It sells 4,000 tickets at $6 each. Prepare an income statement. Then prepare revised income statements assuming 10 percent more than 4,000 and 10 percent fewer than 4,000 patrons attend the exhibition. Calculate the percentage change in revenue and net income if attendance increases or decreases 10 percent.

Part c: Fixed and Variable Cost Definitions Are Context Sensitive

1. AAI pays the artist a commission of $20,000 per exhibition. What is the total commission cost and the commission cost per person if 1,000, 2,000, or 4,000 people attend the exhibition? (Same as part a.1.)
2. AAI pays the artist a commission of $20,000 per exhibition. What is the total commission cost and the commission cost per exhibition if AAI sponsors one, two, or three exhibitions?

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Demonstration Problem 2-2 Effect of Cost Structure

Upstream, Inc. and Downstream, Inc. provide rafting tours on Big Bear River. Upstream pays tour guides fixed salaries. It budgets salaries expense at $160,000 per year. Downstream pays tour guides $40 per rafter served. Rafters are charged $50 per tour. Both companies expect to carry approximately 4,000 rafters during the year.

Required

a. Prepare budgeted annual income statements for the two companies.
b. In an effort to lure rafters away from Downstream, Inc., Upstream, Inc. lowers the price per rafter to $39. Prepare revised income statements for both companies. Assume that Upstream serves 6,000 rafters who each pay $39 per tour, while Downstream serves only 2,000 rafters who pay $50 per tour.
c. Assume you are president of Downstream, Inc. Offer defensive strategies.
d. Suppose Downstream, Inc. matches the $39 price set by Upstream, Inc. Prepare income statements for both companies assuming that each company serves 4,000 customers.

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Demonstration Problem 2-3 Effect of Operating Leverage

Shannon Vargas owns a delivery service company. She charges customers $10 per delivery. The company's variable expenses average $2 per delivery and fixed costs are $600 per month. Ms. Vargas provided 100 deliveries during the most recent month.

Required

a. Prepare an income statement using a contribution margin format.
b. Determine the magnitude of operating leverage. Use your answer to determine the percentage change in net income if sales increase by 10%.
c. Assume that sales increase by 10% (deliveries increase to 110). Prepare a contribution margin format income statement assuming 110 deliveries. Calculate the percentage change in net income and compare your answer with your solution to part b.

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Demonstration Problem 2-4 High-Low Method

MKS Industries wishes to use the high-low method to estimate its machine maintenance costs. MKS has gathered data for the first 6 months of Year 1:

Month	Machine Hours	Machine Maintenance Cost
January	17,000	$48,750
February	23,500	65,000
March	21,500	58,500
April	17,500	47,500
May	24,000	63,750
June	22,000	61,500

Required

a. Use the high-low method to determine the estimated variable cost per unit.
b. Use the high-low method to determine the estimated total fixed cost.
c. Use the results to estimate machine maintenance cost for 19,000 machine hours.

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Solutions to Demonstration Problems

Demonstration Problem 2-1 Solution

a.1.

Number of People Attending (a)	1,000	2,000	4,000
Total Commission Cost (b)	$20,000	$20,000	$20,000
Average Commission Cost Per Person (b ÷ a)	$20	$10	$5

Type of cost: Because the total commission cost remains constant at $20,000 regardless of the number of people attending, it is a fixed cost.

a.2.

Number of People Attending (a)	1,000	2,000	4,000
Total Cost of Books [b = (a × c)]	$5,000	$10,000	$20,000
Average Per-Unit Book Cost (c)	$5	$5	$5

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Type of cost: Because the total cost changes in direct proportion with the number of people receiving books, it is a variable cost.

b.1.

Number of Tickets Sold	3,600	% Change	4,000	% Change	4,400
Revenue ($6 Per Ticket)	$21,600	⇐(10%)⇐	$24,000	⇒+10%⇒	$26,400
Commission Cost (Fixed)	20,000		20,000		20,000
Net Income	$ 1,600	⇐(60%)⇐	$ 4,000	⇒+60%⇒	$ 6,400

Percentage Change in Revenue: ± $2,400 ÷ $24,000 = ±10%
Percentage Change in Net Income: ± $2,400 ÷ $4,000 = ±60%

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b.2.

Number of Tickets Sold	3,600	% Change	4,000	% Change	4,400
Revenue ($6 Per Ticket)	$21,600	⇐(10%)⇐	$24,000	⇒+10%⇒	$26,400
Commission Cost (Variable)	18,000		20,000		22,000
Net Income	$ 3,600	⇐(10%)⇐	$ 4,000	⇒+10%⇒	$ 4,400

Percentage Change in Revenue: ± $2,400 ÷ $24,000 = ±10%
Percentage Change in Net Income: ± $400 ÷ $4,000 = ±10%

c.1. (Same as part a.1.)

Number of People Attending (a)	1,000	2,000	4,000
Total Commission Cost (b)	$20,000	$20,000	$20,000
Average Commission Cost Per Person (b ÷ a)	$20	$10	$5

Type of cost: Because the total commission cost remains constant at $20,000 regardless of the number of people attending, it is a fixed cost.

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c.2.

Number of Exhibitions (a)	1	2	3
Total Expected Commission Cost (a × b)	$20,000	$40,000	$60,000
Cost Per Exhibition (b)	$20,000	$20,000	$20,000

Type of cost: Because the total cost changes in direct proportion with the number of exhibitions, it is a variable cost.

Note carefully that a given cost (the artist's commission) can be fixed or variable depending upon the context.

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Demonstration Problem 2-2 Solution

a.

		Upstream, Inc.	Downstream, Inc.
Number of Rafters (a)		4,000	4,000
Revenue ($50 × a)		$200,000	$200,000
Cost of Guides Upstream, Inc.	Fixed	(160,000)	
Cost of Guides Downstream, Inc. ($40 × a)	Variable		(160,000)
Net income		$ 40,000	$ 40,000

b.

		Upstream, Inc.	Downstream, Inc.
Number of Rafters (a)		6,000	2,000
Revenue Upstream, Inc. ($39 × a)		$234,000	
Revenue Downstream, Inc. ($50 × a)			$100,000
Cost of Guides Upstream, Inc.	Fixed	(160,000)	
Cost of Guides Downstream, Inc. ($40 × a)	Variable		(80,000)
Net Income		$ 74,000	$ 20,000

Upstream, Inc. was able to increase total revenue because the decrease in price was offset by an increase in volume. In other words, 6,000 customers paying $39 each produce more revenue ($234,000) than do 4,000 customers paying $50 each ($200,000). Since Upstream's costs are fixed, the increase in the number of customers served does not increase costs. Consequently, the $34,000 ($234,000 – $200,000) increase in revenue produces a corresponding $34,000 ($74,000 – $40,000) increase in net income. Conversely, Downstream's profitability declines in proportion to its loss of customers. In this case, Downstream, Inc. experienced a $20,000 decline in income ($40,000 – $20,000). Using this strategy, Upstream could eventually run Downstream

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out of business. Upstream stands to gain an additional $78,000 ($39 × 2,000) of revenue when it takes over Downstream's remaining customers. This additional revenue will be pure profit. Indeed, Upstream's profitability may increase more dramatically because the company could then raise prices in the absence of competition.

c.

The most common strategy students offer is to create product differentiation. Many variations of this strategy are possible. Downstream, Inc. could use a different type of raft, travel different routes, schedule different start and stop times, or maintain a superior safety record. Product differentiation is a valid answer. However, watch for errors in logic such as "we will provide a free lunch or a free night's lodging." While such items are free to customers, they are not free to the business providing them. Such offerings will increase Downstream's variable cost and thereby intensify the competitive disadvantage.

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Students also commonly suggest cutting costs by paying the tour guides less. Students often offer strategies involving employees without considering employee reaction. You may wish to emphasize the importance of establishing good employee relations.

Occasionally someone suggests a merger. The merged company could retain the salaried tour guides and dismiss those paid on a variable basis. Emphasize the effects of operating leverage. When fixed costs remain unchanged and volume increases, profits soar. This may be a hard-hearted approach, but it is highly profitable and illustrates one reason why companies choose to merge.

The response that applies most directly to the subject of cost behavior is for Downstream, Inc. to match Upstream's price and hold firm. As shown in part d, Upstream, Inc. cannot benefit from the price-cutting strategy unless volume increases. If both companies retain their market share of 4,000 customers, both will

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incur losses at a price of $39 per rider. In business it is often necessary to incur short-term losses in order to maintain market share. This situation illustrates one of many reasons that a strong capital structure can be essential for survival.

d.

		Upstream, Inc.	Downstream, Inc.
Number of Rafters (a)		4,000	4,000
Revenue ($39 × a)		$156,000	$156,000
Cost of Guides Upstream, Inc.	Fixed	(160,000)	
Cost of Guides Downstream, Inc. ($40 × a)	Variable		(160,000)
Net Loss		$ (4,000)	$ (4,000)

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Demonstration Problem 2-3 Solution

a. Income Statement Using a Contribution Margin Format, Volume of 100 Deliveries

Revenue ($10 × 100 deliveries)	$1,000
Variable Expenses ($2 × 100 deliveries)	(200)
Contribution Margin	800
Fixed Expenses	(600)
Net Income	$ 200

b. Magnitude of Operating Leverage = Contribution Margin ÷ Net Income:

$800 ÷ $200 = 4 times.

Therefore, a 10% increase in sales will produce a 40% (10% × 4) increase in net income. Similarly, a 10% decrease in sales will produce a 40% decrease in net income.

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c. Income Statement Using a Contribution Margin Format, Volume of 110 Deliveries

Revenue ($10 × 110 deliveries)	$1,100
Variable Expenses ($2 × 110 deliveries)	(220)
Contribution Margin	880
Fixed Expenses	(600)
Net Income	$ 280

(Alternative Net Income – Base Net Income) ÷ Base
($280 – $200) ÷ $200 = 40%

The answer to part c confirms the answer determined in part b.

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Demonstration Problem 2-4 Solution

a. The high point of the data set is May, with 24,000 machine hours and machine maintenance cost of $63,750. (Note that February had higher maintenance cost of $65,000 but to use the high level of machine hours and associated cost for the high point.)

The low point of the data set is January, with 17,000 machine hours and machine maintenance cost of $48,750. (Note that April had lower maintenance cost of $47,500 but to use the low level of machine hours and associated cost for the low point.)

The estimated variable cost per unit is the difference in total cost divided by the difference in volume. In this case:

$$\text{Variable cost} = \frac{(\$63{,}750 - \$48{,}750)}{(24{,}000 - 17{,}000)} = \frac{\$15{,}000}{7{,}000} = \$2.14 \text{ per unit}$$

b. Determine the fixed cost by subtracting the variable cost from the total cost using either the high point or the low point. (You will get the same result.) Using the high point:

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Fixed cost + Variable cost = Total cost

Fixed cost = Total cost – Variable cost

Fixed cost = $63,750 – ($2.14 × 24,000)

Fixed cost = $12,390

c. Estimated machine maintenance cost for 19,000 units = $12,390 + ($2.14 × 19,000 units) = $53,050

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Work Papers for Demonstration Problems

Demonstration Problem 2-1 Work Papers

a.1.

Number of People Attending	1,000	2,000	4,000
Total Commission Cost			
Average Commission Cost Per Person			

Type of cost:

a.2.

Number of People Attending	1,000	2,000	4,000
Total Cost of Books			
Average Per-Unit Book Cost			

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Type of cost:

b.1.

Number of Tickets Sold	3,600	% Change	4,000	% Change	4,400
Revenue ($6 Per Ticket)		⇐(%)⇐		⇒+ %⇒	
Commission Cost (Fixed)					
Net Income	$ 1,600	⇐(%)⇐	$ 4,000	⇒+ %⇒	$ 6,400

Percentage Change in Revenue:
Percentage Change in Net Income:

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b.2.

Number of Tickets Sold	3,600	% Change	4,000	% Change	4,400
Revenue ($6 Per Ticket)		⇐(%)⇐	$24,000	⇒+ %⇒	
Commission Cost (Variable)			20,000		
Net Income	$ 3,600	⇐(%)⇐	$ 4,000	⇒+ %⇒	$ 4,400

Percentage Change in Revenue:
Percentage Change in Net Income:

c.1. (Same as part a.1.)

Number of People Attending	1,000	2,000	4,000
Total Commission Cost			
Average Commission Cost Per Person			

Type of cost:

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c.2.

Number of Exhibitions (a)	1	2	3
Total Expected Commission Cost			
Cost Per Exhibition			

Type of cost:

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Demonstration Problem 2-2 Work Papers

a.

		Upstream, Inc.	Downstream, Inc.
Number of Rafters		4,000	4,000
Revenue			
Cost of Guides Upstream, Inc.	Fixed		
Cost of Guides Downstream, Inc.	Variable		
Net income			

b.

		Upstream, Inc.	Downstream, Inc.
Number of Rafters (a)		6,000	2,000
Revenue Upstream, Inc.			
Revenue Downstream, Inc.			
Cost of Guides Upstream, Inc.	Fixed		
Cost of Guides Downstream, Inc.	Variable		
Net Income			

d.

		Upstream, Inc.	Downstream, Inc.
Number of Rafters		4,000	4,000
Revenue			
Cost of Guides Upstream, Inc.	Fixed		
Cost of Guides Downstream, Inc.	Variable		
Net Loss			

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Demonstration Problem 2-3 Work Papers

a. Income Statement Using a Contribution Margin Format, Volume of 100 Deliveries

Revenue	
Variable Expenses	
Contribution Margin	
Fixed Expenses	
Net Income	_____

b. Magnitude of Operating Leverage = Contribution Margin ÷ Net Income:

$_____ ÷ $_____ = ___ times.

Therefore, a 10% increase in sales will produce a _____ increase in net income. Similarly, a 10% decrease in sales will produce a _____ decrease in net income.

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c. Income Statement Using a Contribution Margin Format, Volume of 110 Deliveries

Revenue	
Variable Expenses	
Contribution Margin	
Fixed Expenses	
Net Income	_____

(Alternative Net Income – Base Net Income) ÷ Base:

($_____ – $_____) ÷ $_____ = _____%

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Quiz Questions for Chapter 2

Use the following information to answer the next four questions.

At lunchtime, Mustard's Last Stand sells hotdogs, chips, and soft drinks from five portable hotdog carts stationed on busy street corners. The depreciation cost on the carts is $1,000 per year for each cart. The company buys supplies (hotdogs, chips, cups, napkins) as needed. The five cart operators are each paid $8,000 per year plus 5 percent of sales revenue.

1. Relative to the number of hotdogs sold, the depreciation cost is:
   a. fixed.
   b. variable.
   c. mixed.
   d. strategic.

2. Relative to the number of hotdog carts, the depreciation cost is:
   a. fixed.
   b. variable.
   c. mixed.
   d. strategic.

3. Relative to the number of hours worked, the total compensation cost for the cart operators is:
   a. fixed.
   b. variable.
   c. mixed.
   d. strategic.

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4. The cost of supplies relative to the number of customers served at a particular hotdog cart and relative to the number of customers served by all five of the hotdog carts is, respectively:
   a. variable; fixed.
   b. fixed; fixed.
   c. variable; fixed.
   d. variable; variable.

5. At a production and sales level of 3,000 units, Clarkson Company incurred $60,000 of fixed cost and $36,000 of variable cost. When 4,000 units of product are produced and sold, the company's total cost is expected to be:
   a. $116,000.
   b. $108,000.
   c. $128,000.
   d. $96,000.

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Use the following information to answer the next two questions:

Fowler's Quilts
Income Statement
For 2017

Sales Revenue (250 @ $600 per unit)		$150,000
Cost of Goods Sold:	Variable (250 @ $300 per unit)	(75,000)
	Fixed	(8,000)
Gross Margin		67,000
Sales Commissions (250 @ $20)		(5,000)
Depreciation		(10,000)
Net Income		$ 52,000

6. The company's contribution margin is:
   a. $67,000.
   b. $61,000.
   c. $70,000.
   d. $141,000.

7. The magnitude of Fowler's operating leverage is approximately (round to nearest hundredth):
   a. 1.29.
   b. 1.15.
   c. 1.35.
   d. 2.88.

8. Callahan's Canine Spa and Barkley's Salon are competing canine grooming salons. Each company currently serves 4,500 customers per year. Both companies charge $35 to groom a dog. Callahan's pays its dog groomers fixed salaries. Salary expense totals $45,000 per year. Barkley's pays its groomers $10 per dog groomed. Callahan's lures 2,000 customers from Barkley's by lowering its grooming price to $25. Barkley's maintains its $35 price. Which of the following is true?
   a. Profits at both companies will decrease.
   b. Callahan's profits will increase and Barkley's profits will decrease.
   c. Barkley's will suffer a net loss.
   d. All the statements are false.

9. At a sales level of $270,000, the magnitude of operating leverage for the Cake Factory is 2.8. If sales increase by 15%, profits will increase by:
   a. 2.8%
   b. 15%
   c. 42%
   d. 18.67%

10. Rugged Country produces backpacks. In Year 1, its highest and lowest production levels occurred in July and January, respectively. In July, it produced 4,000 backpacks at a total cost of $110,000. In January, it produced 2,500 backpacks at a total cost of $87,500. Using the high-low method, the average variable cost of producing a backpack was:
   a. $15.00
   b. $31.25
   c. $30.38
   d. $27.50

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Solutions to Quiz Questions

Question	Answer	Explanation
1	A	**Fixed.** The total amount of a fixed cost does not change when volume changes. The word fixed relates to the behavior of total cost.
2	B	**Variable.** Total fixed cost remains constant (fixed) when activity changes. However, there is a contradiction between the term fixed cost per unit and the per-unit behavior pattern of a fixed cost. Fixed cost per unit is not fixed.
3	C	**Mixed.** Mixed costs (semivariable costs) include both fixed and variable components. $8,000 paid per year to cart operators is a fixed cost. The 5% of sales revenue paid to cart operators is a variable cost.
4	D	**Variable -** the cost of supplies relative to the number of customers served at a particular hot dog cart. **Variable** – cost of supplies relative to the number of customers served by all five of the hot dog carts.
5	B	**Total cost $108,000** = fixed costs $60,000 + variable costs [($36,000 / 3,000 units) x 4,000 units].
6	C	**Contribution margin $70,000** = Sales revenue $150,000 – cost of goods sold variable $75,000 – sales commissions $5,000.
7	C	**Magnitude of operating leverage 1.35** = Contribution margin $70,000 (see answer to #6) / net income $52,000.
8	B	**Callahan's profits will increase and Barkley's profits will decrease.** Callahan's profit increases from $112,500 (revenue 4,500 customers x $35 - salary expense $45,000) to $117,500 (revenue 6,500 customers x $25 – salary expense $45,000). Barkley's profit decreases from $112,500 (revenue 4,500 customers x $35 – salary expense 4,500 x $10) to $62,500 (revenue 2,500 customers x $35 – salary expense 2,500 x $10).
9	C	**Profits will increase by 42%** (15% increase in profits x 2.8 magnitude of operating leverage)**.**
10	A	**$15 average variable cost** ($110,000 – 87,500 total costs / 4,000 – 2,500 backpacks).

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Summary of Topics to be Covered in Lesson Plan for Chapter 2

I. Define the terms *fixed cost* and *variable cost*.

A. **Introduce fixed cost behavior.** Use the example in which two children each ask to bring a friend along on vacation.
B. **Have the students work Exercise 2-3A from the textbook as an in-class assignment for further understanding about fixed cost.**
C. **Introduce variable cost behavior.** Continue the example.
D. **Review examples of mixed costs.**
E. **Explain relevant range.** What if the kids invite two friends each?
F. **Explain that the definitions for fixed and variable costs are context sensitive.** In the previous example, condo cost is variable relative to the number of vacations. Have the students work **Exercise 2-1A** for reinforcement.
G. **Continue to show that the definitions for fixed and variable costs are context sensitive.**

II. Introduce the concept of operating leverage.

Use part b of **Demonstration Problem 2-1**. Explain how to compute percentage changes.

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III. Explain the income statement under the contribution margin approach.

IV. Measuring operating leverage using contribution margin.

V. Explain cost averaging.

VI. Explain estimates in real-world problems.

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ANSWERS TO QUESTIONS - CHAPTER 2

1. **A fixed cost is a cost that in total remains constant as volume of activity changes but on a per unit basis varies inversely with changes in volume of activity. A variable cost is a cost that in total changes directly and proportionately with changes in volume of activity but on a per unit basis is constant as volume of activity changes. An example of a fixed cost is a supervisor's salary in relation to units produced. An example of a variable cost is direct materials cost in relation to units produced.**

2. **Most business decisions are based on cost information. The behavior of cost in relation to volume affects total costs and cost per unit. For example, knowing that total fixed cost stays constant in relation to volume and that total variable cost increases proportionately with changes in volume affects a company's cost structure decisions. Knowing that volume is expected to increase would favor a fixed cost structure because of the potential benefits of operating leverage.**

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3. **Operating leverage is the condition whereby a small percentage increase in sales volume can produce a significantly higher percentage increase in profitability. It is the result of fixed cost behavior and measures the extent to which fixed costs are being used. The higher the proportion of fixed cost to total cost the greater the operating leverage. As sales increase, fixed cost does not increase proportionately but stays the same, allowing greater profits with the increased volume.**

4. **Operating leverage is calculated by dividing the contribution margin by net income. The result is the number of times greater the percentage increase in profit is to a percentage increase in sales. For example, if operating leverage is four, a 20% increase in sales will result in an 80% increase in profit.**

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5. **The concept of operating leverage is limited in predicting profitability because in practice, changes in sales volume are usually related to changes in sales price, variable costs, and fixed costs, which all affect profitability.**

6. **With increasing volume, a company would benefit more from a fixed cost structure because of operating leverage, where each sales dollar represents pure profit once fixed costs are covered. If volume is decreasing, the variable cost structure would be more advantageous because costs would decrease proportionately with decreases in volume. With a pure fixed cost structure, costs stay constant even when sales revenue is decreasing, eventually resulting in a loss.**

7. **A company with a variable cost structure would not suffer a loss as long as its sales price is equal to or greater than its variable cost per unit (*i.e.*, the contribution margin is equal to or greater than zero.) This condition is not affected by decreasing volume of sales. On the other hand, another company with a fixed cost structure would need to have a positive contribution margin per unit and sufficient volume of sales to accumulate enough total contribution margin to offset its total fixed cost before any profit can be realized. In conclusion, a variable cost structure is more advantageous if volume is decreasing.**

8. **Fixed costs can provide financial rewards with increases in volume, since increases in volume reduce fixed costs per unit, thereby increasing profits. The risk involved with fixed costs is that decreases in volume are not accompanied by decreases in costs, eventually resulting in losses.**

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9. **Fixed costs can provide financial rewards with increases in volume, since increases in volume do not cause corresponding increases in fixed costs. This kind of cost behavior results in increasing profits (decreases in cost per unit). But this does not mean that companies with a fixed cost structure will be more profitable. Predominately fixed cost structures entail risks. Decreases in volume are not accompanied by decreases in costs, which can eventually result in losses (increases in cost per unit).**

10. **The definitions of both fixed and variable costs are based on volume being within the relevant range (normal range of activity). If volume is outside the relevant range, fixed costs may increase in total if volume increases require that additional fixed assets be acquired (whereby, depreciation charges would increase). Likewise, variable costs may decrease per unit if increases in volume allow quantity discounts on materials. Increases or decreases in volume that are outside the relevant range can invalidate the definitions of fixed and variable costs.**

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11. **The average is more relevant for pricing purposes. Customers want standardized pricing in order to know the price of a service in advance. They don't want to wait until after the service is performed to know how much it costs. Average cost is also more relevant for performance evaluation and for control purposes. Knowing the actual cost of each service is usually of little value in evaluating cost efficiency and knowing when to take corrective action.**

12. **The high-low method is the appropriate method when simplicity is more important than accuracy. Least squares regression is more appropriate when accuracy is more important.**

13. **A fixed cost structure would have more risk because profits vary more with changes in volume. Small changes in volume can cause dramatic changes in profits. In addition, with a fixed cost structure, losses occur until fixed costs are covered. Given high fixed costs, a company would need high volume to reap the rewards associated with this cost structure.**

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14. The president appears to be in error because fixed costs frequently can be changed. For example, fixed costs such as advertising expense, training, and product improvement result from short-term decisions and may be easily changed. While it is more difficult, even fixed costs such as depreciation expense can be reduced and changed by selling long-term assets.

15. The statement is false for two reasons. More importantly, the statement ignores the concept of relevant range. The terms fixed cost and variable cost apply over some level of activity within which the company normally operates. Accordingly, the definitions of fixed and variable costs only apply within the relevant range. Secondly, even if a business ceases operation and produces zero products, it incurs some fixed costs such as property taxes, maintenance, and insurance.

16. Norel could calculate the average heating cost by dividing total annual expected heating cost by total annual production. The result could then be multiplied by monthly production to determine the amount of monthly heating cost to assign to inventory. This procedure would have the effect of averaging the seasonal fluctuations and would, therefore, result in a more stable unit cost figure.

17. Verna is confused because the terms apply to total cost rather than to per unit cost. Total fixed cost remains constant regardless of the level of production. Total variable cost increases or decreases as production increases or decreases. Verna is correct in her description of unit cost behavior. She is incorrect about the use of the terms, for the reasons above.

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SOLUTIONS TO EXERCISES - SERIES A - CHAPTER 2

EXERCISE 2-1A

Requirement	Fixed	Variable	Mixed
a.	x		
b.		x	
c.	x		
d.		x	
e.			x
f.		x	

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EXERCISE 2-2A

Requirement	Fixed	Variable	Mixed
a.	x		
b.			x
c.		x	
d.	x		
e.			x
f.		x	
g.	x		
h.	x		
i.		x	
j.		x	

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EXERCISE 2-3A

Total Fixed Cost:

Item	Cost
Depreciation	$ 80,000
Officers' salaries	190,000
Long-term lease	42,000
Property taxes	48,000
Total fixed	$360,000

Units Produced (a)	4,000	4,500	5,000
Total fixed cost (b)	$360,000	$360,000	$360,000
Fixed cost per unit (b ÷ a)	$90.00	$80.00	$72.00

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EXERCISE 2-4A

Units Produced (a)	4,000	8,000	12,000
Variable cost per unit (b)	$12.50	$12.50	$12.50
Total variable cost (a x b)	$50,000	$100,000	$150,000

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EXERCISE 2-5A

a.

	March	April
Units Produced (a)	300	600
Total rent cost (b)	$1,800	$1,800
Rent cost per unit (b ÷ a)	$6.00	$3.00
Total utility cost (c)	$600	$1,200
Utility cost per unit (c ÷ a)	$2.00	$2.00

b. Since the total rent cost remains unchanged when the number of units produced changes, it is a fixed cost. Since the total utility cost changes in direct proportion with changes in the number of units, it is a variable cost.

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EXERCISE 2-6A

a.

Number of Trophies	6,000	8,000	10,000	12,000
Total costs incurred				
Fixed	$ 60,000	$ 60,000	$ 60,000	$ 60,000
Variable	60,000	80,000	100,000	120,000
Total costs	$120,000	$140,000	$160,000	$180,000
Cost per unit				
Fixed	$10.00	$ 7.50	$ 6.00	$ 5.00
Variable	10.00	10.00	10.00	10.00
Total cost per trophy	$20.00	$17.50	$16.00	$15.00

b. The total cost per trophy declines as volume increases because the same amount of fixed cost is spread over an increasingly larger number of units of product.

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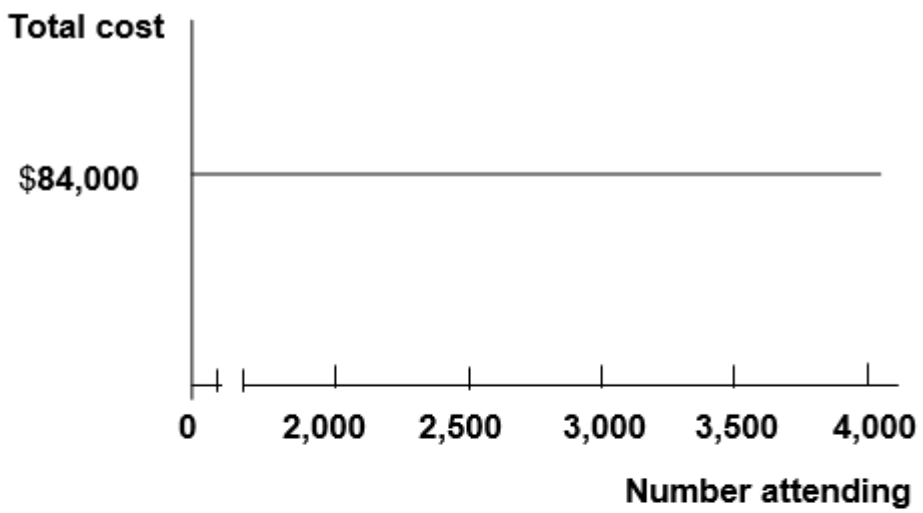
EXERCISE 2-7A

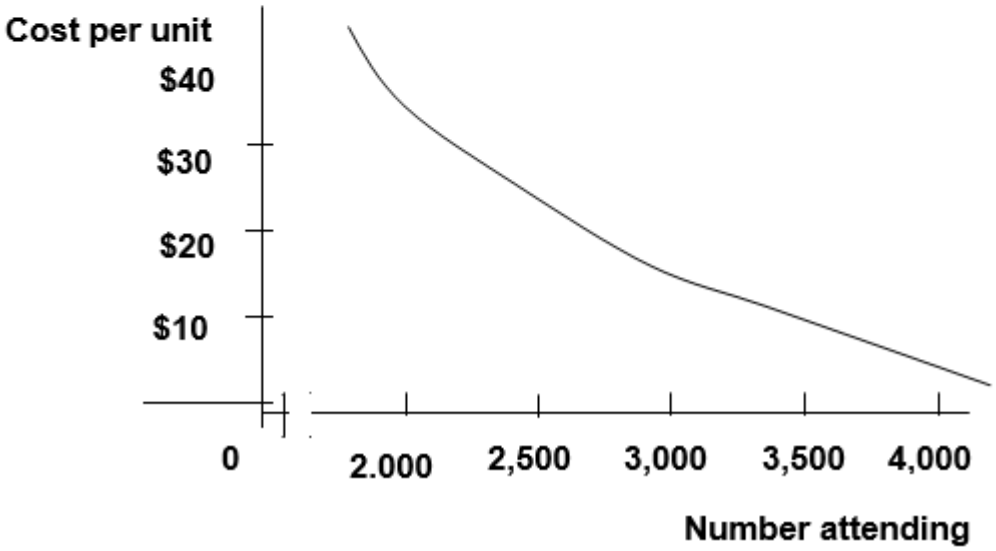
a.

Number Attending (a)	2,000	2,500	3,000	3,500	4,000
Total cost of concert (b)	$84,000	$84,000	$84,000	$84,000	$84,000
Cost per person (b) ÷ (a)	$42.00	$33.60	$28.00	$24.00	$21.00

b. **Since the cost of hiring a band remains at $84,000 regardless of the number attending, it is a fixed cost.**

c.





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EXERCISE 2-7A (continued)

d. Bell's major business risk is the uncertainty about whether it can generate enough revenue to cover the fixed cost. Bell must pay the $84,000 cost even if no one buys a ticket. Accordingly, there is a potential for Bell to experience a significant financial loss. Since the cost per ticket decreases as volume increases, Bell can sell tickets for less if the band attracts a large crowd. Also, lower ticket prices encourage higher attendance. Bell must set a price that encourages attendance and produces sufficient revenue to cover the fixed cost and provide a reasonable profit.

To a large extent, Bell's business risk is the result of its cost structure. To minimize the risk, Bell could possibly change that structure. For instance, Bell may want to negotiate with the band to set a flexible compensation scheme. The band may be paid a particular percentage of the revenue instead of a fixed fee. In other words, the cost structure could be changed from fixed to variable. In this arrangement, Bell's risk of suffering a loss is virtually eliminated. On the other hand, the variable cost structure does not allow Bell to benefit from operating leverage thereby limiting profitability. Therefore, there is a risk of lost profitability. Risk minimization does not mean risk elimination altogether.

Other business risks that may adversely affect Bell's profit include competition, unfavorable economy, security, and litigation.

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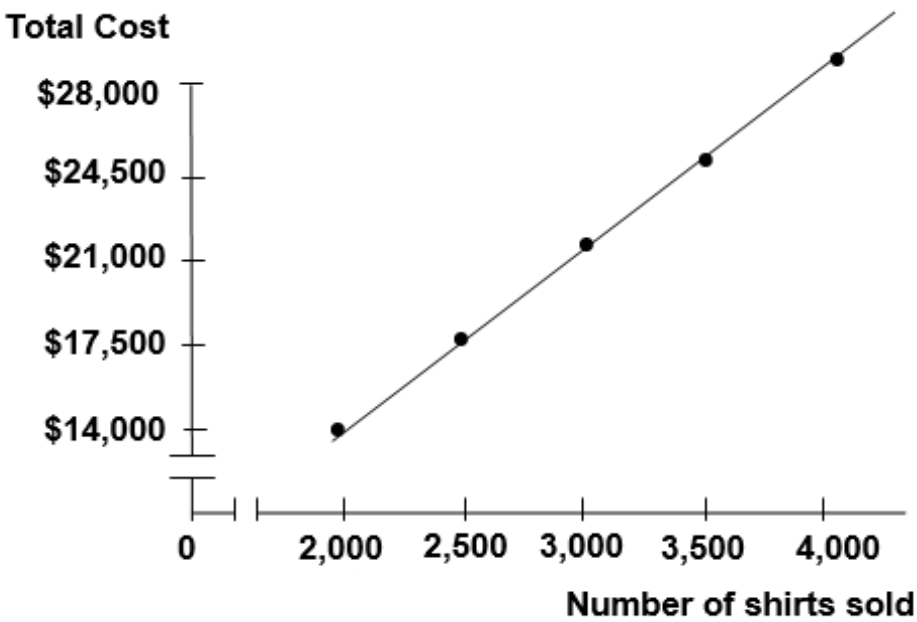
EXERCISE 2-8A

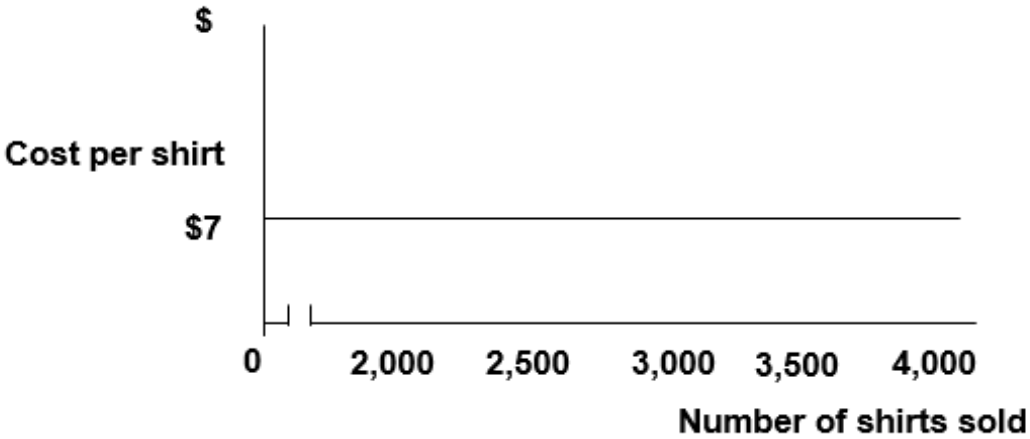
a.

Number shirts sold (a)	2,000	2,500	3,000	3,500	4,000
Total cost of shirts $7 x (a)	$14,000	$17,500	$21,000	$24,500	$28,000
Cost per shirt	$7	$7	$7	$7	$7

b. Since the total cost of shirts increases proportionately to the number of shirts sold, it is a variable cost.

c.





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EXERCISE 2-8A (continued)

d. Bell's major business risk is the uncertainty about whether it can generate a desirable profit. The cost and the revenue are both variable if Bell can return unsold shirts. As long as the selling price is greater than the cost per shirt, Bell will make a profit. However, it is impossible to know for sure how many shirts will be eventually sold. Bell should set a competitive price for quality T-shirts. Advertising may be necessary to attract customers. The ultimate goal is to generate the maximum profit.

Bell's other business risks that may adversely affect its profit include competition and unfavorable general economy.

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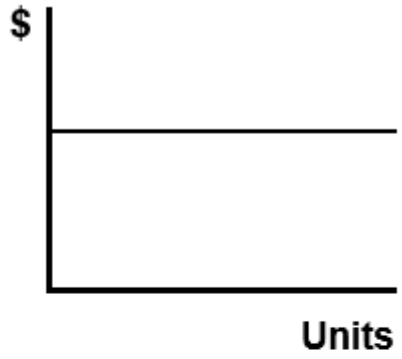
EXERCISE 2-9A

a. **Total fixed cost**



b. **Fixed cost per unit**

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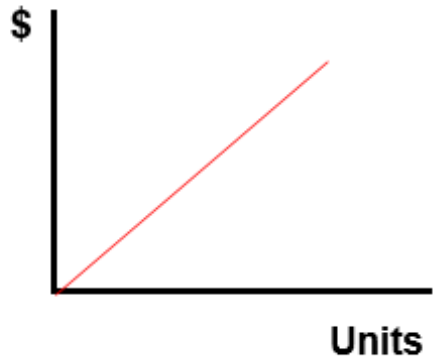
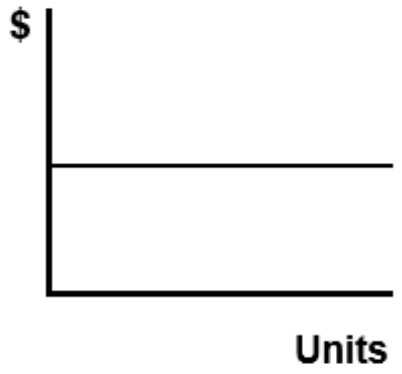
EXERCISE 2-10A

a. Total variable cost



b. Variable cost per unit



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EXERCISE 2-11A

Begin by calculating the fixed cost based on the March sales. Calculate the fixed cost by subtracting the variable cost from the total cost.

	March
Total costs incurred	$4,000
Less: Variable cost ($10 x 300)	3,000
Fixed cost	$1,000

The fixed portion of the mixed cost will remain at $1,000 for any volume of sales within the relevant range. Accordingly, this cost will be the same for all the months under consideration.

Month	April	May	June	July
Number of units	320	180	360	200
Total costs incurred				
Total variable cost	$3,200	$1,800	$3,600	$2,000
Total fixed cost	1,000	1,000	1,000	1,000
Total salary cost	$4,200	$2,800	$4,600	$3,000

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EXERCISE 2-12A

a. & b.

Income Statements	a.	b.
Company Name	Hill	Creek
Number of Customers (n)	400	400
Sales revenue (n x $120)	$48,000	$48,000
Variable cost (n x $140)		(56,000)
Contribution margin	48,000	(8,000)
Fixed cost	(28,000)	0
Net income (loss)	$20,000	$ (8,000)

c. The strategy of cutting prices increases Hill's revenue by $8,000 (i.e., $48,000 – $40,000). In other words, selling 400 units at $120 each produces more revenue (i.e., $48,000) than selling 200 units at $200 each (i.e., $40,000). Since Hill's costs are fixed, the entire $8,000 increase in revenue increases net income. In contrast, Creek's costs vary in relation to the number of units sold. Accordingly, the 200-unit increase in volume increases Creek's expenses by $28,000 (i.e., 200 units x $140). Since the price-cutting strategy produces a $10,000 decline in profitability (i.e., $8,000 of additional revenue less $28,000 in additional expenses), Creek's profit drops from a net income of $12,000 to a $8,000 loss.

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EXERCISE 2-13A

a.

Income Statement	
Sales Revenue (2,000 units x $125)	$250,000
Less: Variable costs	
Cost of goods sold (2,000 units x $65)	(130,000)
Sales commissions (10% of Sales)	(25,000)
Shipping and handling expenses (2,000 units x $1.00)	(2,000)
Contribution margin	93,000
Less: Fixed costs	
Administrative salaries	(30,000)
Advertising expense	(20,000)
Depreciation expense	(24,000)
Net income	$ 19,000

b.

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

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$$\text{Operating leverage} = \frac{\$93{,}000}{\$19{,}000} = 4.89 \text{ times (rounded)}$$

c. A 10 percent increase in sales revenue will produce a 48.90 percent increase in net income (i.e., 10 percent x 4.89 = 48.90 percent). Accordingly, net income would increase to $28,291 [i.e., $19,000 + ($19,000 x .489)].

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EXERCISE 2-14A

a.

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

$$\text{Operating leverage} = \frac{\$4{,}800}{\$3{,}200} = 1.5$$

b. (10% Change in rev. x 1.5 Oper. leverage) = 15% change in net inc.
15% x $3,200 = $480 change
Revised net income = $3,200 + $480 = $3,680

c.

Annual Income Statements			
Sales volume in units (a)	200	% Change	220
Sales revenue (a x $60)	$12,000	⇒ +10% ⇒	$13,200
Variable costs (a x $36)	(7,200)		(7,920)
Contribution margin	4,800		5,280
Fixed costs	(1,600)		(1,600)
Net income	$ 3,200	⇒ +15% ⇒	$ 3,680

($3,680 – $3,200) ÷ $3,200 = 15%

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EXERCISE 2-15A

The price charged should be the same for each month regardless of how many customers are served. Accordingly, the fixed cost must be averaged over the annual total number of campers. Using a cost-plus pricing strategy, the price would be set as follows: Price = Average fixed cost per camper + variable cost per camper + desired profit. The appropriate computations are shown below:

Computation of fixed cost per unit:

$$\text{Fixed rent cost per camper} = \frac{\$2{,}500 \times 12}{4{,}000} = \$7.50$$

Price = Fixed cost (rent) per camper + Variable cost per camper + $7.50
Price = $7.50 + $6 + $5.50
Price = $19

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EXERCISE 2-16A

a.

$$\text{Variable cost per unit} = \frac{\text{Change in total cost}}{\text{Change in volume}} = \frac{\$720{,}000 - \$450{,}000}{200 \text{ Units} - 100 \text{ Units}} = \$2{,}700$$

The fixed cost can be determined by the following formula. The computations shown below are based on the high point. Computations at the low point would produce the same result.

Fixed Cost = Total Cost – Variable Cost
Fixed Cost = $720,000 – (200 Units x $2,700)
Fixed Cost = $720,000 – $540,000
Fixed Cost = $180,000

b. Total cost = Fixed cost + (Variable cost per unit x Number of units)
Total cost = $180,000 + ($2,700 x 150) = $585,000

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c. The primary strength of the high-low method is that it is easy to compute. The primary weakness of the method is that it uses only two data points in the computation of the cost estimates. Accuracy can be affected if the two data points used are not representative of the underlying data set.

d. A visual fit scatter graph reveals data points that are not representative of the underlying data set. The management accountant can adjust for such outliers when drawing the line that determines the cost estimates.

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SOLUTIONS TO PROBLEMS - SERIES A - CHAPTER 2

PROBLEM 2-17A

Requirement	Fixed	Variable
a.		x
b.		x
c.		x
d.	x	
e.	x	
f.		x
g.		x
h.		x
i.	x	
j.		x
k.	x	
l.	x	
m.		x
n.	x	
o.	x	
p.		x
q.		x
r.	x	
s.	x	
t.	x	

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PROBLEM 2-18A

a.

No. of Houses Cleaned (a)	10	20	30
Total expected rental cost (b)	$600	$600	$600
Average per unit rental cost (b ÷ a)	$60	$30	$20

Type of Cost: Since the total rental cost remains constant at $600 regardless of the number of houses cleaned, it is a fixed cost.

b.

No. of Houses Cleaned (a)	10	20	30
Average per unit labor cost (b)	$50	$50	$50
Total labor cost (a x b)	$500	$1,000	$1,500

Type of Cost: Since the total labor cost increases proportionately with the number of houses cleaned, it is a variable cost.

c.

No. of Houses Cleaned (a)	10	20	30
Average per unit supplies cost (b)	$7	$7	$7
Total cost of supplies (a x b)	$70	$140	$210

Type of Cost: Since the total cost of supplies increases proportionately with the number of houses cleaned, supplies cost is a variable cost.

d.

No. of Houses Cleaned	10	20	30
Total expected rental cost	$ 600	$ 600	$ 600
Total labor cost	500	1,000	1,500
Total cost of supplies	70	140	210
Total cost	$1,170	$1,740	$2,310

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PROBLEM 2-18A (continued)

e. The amount of <u>total</u> cost shown below was determined in part d.

No. of Houses Cleaned (a)	10	20	30
Total cost (b)	$1,170	$1,740	$2,310
Cost per unit (b ÷ a)	$ 117	$87	$77

The decline in the cost per unit is caused by the fixed cost behavior that is applicable to the equipment rental.

f. Ms. Huffman means average cost per unit. It would be virtually impossible to determine actual cost per unit. Consider these questions. Exactly how much window cleaner was used in one house versus another? Did the maids stay in one house a few minutes longer than another? Obviously, it would not be practical to determine the exact cost of cleaning any specific house. The average cost is much easier to determine and more practical for pricing purposes.

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PROBLEM 2-19A

a. If a branch fails to process at least 60,000 transactions, the branch is closed. Branches that process more than 90,000 transactions are transferred out of the start-up division. Accordingly, the relevant range is 60,000 to 90,000 transactions.

b.

No. of Transactions (a)	60,000	70,000	80,000	90,000
Total teller cost (b)	$96,000	$96,000	$96,000	$96,000
Average per unit teller cost (b ÷ a)	$1.60	$1.37	$1.20	$1.07

Type of Cost: Since the total teller cost remains constant at $96,000 regardless of the number of transactions processed, it is a fixed cost.

c.

No. of Branches (a)	10	15	20	25
Teller costs per branch (b)	$96,000	$96,000	$96,000	$96,000
Total teller cost (a x b)	$960,000	$1,440,000	$1,920,000	$2,400,000

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Type of Cost: Since the total teller cost increases proportionately with the number of branches in operation, the cost is a variable cost.

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PROBLEM 2-20A

a.

Sales Volume in Units (a)	200	250	300	350	400
Total cost of software (a x $210)	$42,000	$52,500	$63,000	$73,500	$84,000
Total cost of booth rental	8,400	8,400	8,400	8,400	8,400
Total cost of sales (b)	$50,400	$60,900	$71,400	$81,900	$92,400
Average cost per unit (b ÷ a)	$252.00	$243.60	$238.00	$234.00	$231.00

The cost of booth space is fixed.

b.

Sales Volume	200	250	300	350	400
Average cost per unit (a)	$252.00	$243.60	$238.00	$234.00	$231.00
Price per package (a + $50)	$302.00	$293.60	$288.00	$284.00	$281.00

c.

Trade Shows Attended (a)	1	2	3	4	5
Cost of booth rental (a x $8,400)	$8,400	$16,800	$25,200	$33,600	$42,000

The cost of booth space is variable.

d. The additional cost is $30 ÷ 50 units = $0.60 per unit.
The cost would be treated as a variable cost for decision making purposes. While it is not purely proportional, its behavior pattern closely approximates a variable cost pattern.

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PROBLEM 2-21A

Part 1

a. Since the total cost remains constant at $6,000 regardless of how many students attend the course, the cost of instruction is a fixed cost.

b. c. and d.

Number of Students	18	% Change	20	% Change	22
Revenue ($700 per student)	$12,600	⇐(10%)⇐	$14,000	⇒+10%⇒	$15,400
Cost of instruction (fixed)	6,000		6,000		6,000
Profit	$ 6,600	⇐(17.5%)⇐	$ 8,000	⇒+17.5%⇒	$ 9,400

Percentage change in revenue: ± $1,400 ÷ $14,000 = ±10%
Percentage change in profit: ± $1,400 ÷ $8,000 = ±17.5%

e. Operating leverage caused the percentage increase in profitability to be greater than the percentage increase in revenue. Since the fixed costs have been covered and no variable costs exist, each additional dollar of revenue contributes directly to additional profitability.

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Part 2

f. Since the total cost changes proportionately with changes in the number of students, the cost of instruction is a variable cost.

g. h. and i.

Number of Students	18	% Change	20	% Change	22
Revenue ($700 per student)	$12,600	⇐(10%)⇐	$14,000	⇒+10%⇒	$15,400
Cost of instruction (Variable)	5,400		6,000		6,600
Profit	$ 7,200	⇐(10%)⇐	$ 8,000	⇒+10%⇒	$ 8,800

Percentage Change in Revenue: ±$1,400 ÷ $14,000 = ±10%
Percentage Change in Profit: ±$800 ÷ $8,000 = ±10%

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PROBLEM 2-21A (continued)

Part 2

j. Since costs as well as revenue change with changes in the number of students attending the course, the change in profit is proportional to the change in revenue.

Part 3

k.

Number of Students Completing the Course	18	20	22
Number of plaques available for sale (a)	18	20	20
Total cost of plaques (b=[20 x $30])	$600	$600	$600
Cost per unit (b ÷ a)	33.33	30	30

l. Since the plaques must be produced in advance, the total cost is incurred before any plaque is sold. Subsequently, the number of plaques sold does not affect the total cost. This is, therefore, a fixed cost.

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m. FTS faces the risk of preordering too few or too many plaques. When too many are ordered, the company will incur expenses due to waste. When too few are ordered, the company will miss the opportunity to earn additional profits. Also, FTS faces risk associated with incurring holding costs such as storage, maintenance, and interest.

n. A just-in-time inventory system would produce goods as needed to meet sales demand. Accordingly, there would be no risk of over or under production. Further, there would be no stockpiling of inventory; therefore, inventory holding costs such as storage, maintenance, and interest would be avoided.

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PROBLEM 2-22A

a.

University	Kenton		Denton
Tuition revenue (20 x $450)	$9,000		$9,000
Total cost of instruction	(5,000)	(20 x $250)	(5,000)
Net income	$4,000		$4,000

b.

University	Kenton
Tuition revenue (40 x $240)	$9,600
Total cost of instruction (fixed)	(5,000)
Net income	$4,600

c.

University		Denton
Tuition revenue	(40 x $240)	$ 9,600
Total cost of instruction (variable)	(40 x $250)	(10,000)
Net income (loss)		$ (400)

d. The strategy in Requirement b produced a profit because Kenton's cost of instruction is fixed. Accordingly, the increase in the number of students did not increase the total cost of instruction. In contrast, the cost of instruction for Denton is variable. As a result, when the number of students increased, the total cost of instruction increased as well. Since the increase in revenue was not sufficient to cover the increase in the cost of instruction, the strategy in Requirement c produced a loss.

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PROBLEM 2-22A (continued)

e.

University	Kenton		Denton
Tuition revenue (10 x $450)	$4,500		$ 4,500
Total cost of instruction	(5,000)	(10 x $250)	(2,500)
Net income (loss)	$ (500)		$ 2,000

f. When volume is insufficient to produce revenue that is above the level of fixed cost, the enterprise will produce a loss. This condition is demonstrated in Requirement e above. The loss could be avoided if the cost of instruction were variable. Accordingly, fixed costs are not always better than variable costs.

g. When the revenue per unit is below the variable cost per unit, the enterprise will incur additional losses for each unit produced and sold. This condition is depicted in Requirement c above. As demonstrated in Requirement b lower per unit revenue can be offset by increases in sales volume when costs are fixed. Accordingly, variable costs are not always better than fixed costs.

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PROBLEM 2-23A

a.

Company Name	Larson	Benson
Contribution margin	$72,000	$144,000
Divided by net income	÷ 48,000	÷ 48,000
Operating leverage	1.50	3.00

b.

Company Name	Larson	Benson
Variable cost per unit (a)	$16.00	$7.00
Sales revenue (8,000 units x 110% x $25)	$220,000	$220,000
Variable cost (8,000 units x 110% x a)	(140,800)	(61,600)
Contribution margin	79,200	158,400
Fixed cost	(24,000)	(96,000)
Net income	$55,200	$62,400
Percentage change *	15.00%	30.00%

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* Larson: ($55,200 – $48,000) ÷ $48,000 = 15.00%
Benson: ($62,400 – $48,000) ÷ $48,000 = 30.00%

c.

Company Name	Larson	Benson
Variable cost per unit (a)	$16.00	$7.00
Sales revenue (8,000 units x 90% x $25)	$180,000	$180,000
Variable cost (8,000 units x 90% x a)	(115,200)	(50,400)
Contribution margin	64,800	129,600
Fixed cost	(24,000)	(96,000)
Net income	$40,800	$33,600
Percentage change **	(15.00%)	(30.00%)

** Larson: ($40,800 – $48,000) ÷ $48,000 = (15.00%)
Benson: ($33,600 – $48,000) ÷ $48,000 = (30.00%)

PROBLEM 2-23A (continued)

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d. The following memo is just an example. Students can form different opinions from their analyses. However, the main focus of the analyses should be the risk and reward relationship as demonstrated by the data of the two investment opportunities.

Memorandum

TO: Mr. Arnold Vimka
FROM: John Doe
SUBJECT: Analysis and Recommendation Regarding Investment Opportunities
DATE: October 20, 20XX

I have evaluated the income statements of Larson and Benson. Even though both companies have the same amounts of sales and net income last year, the risk and reward structures of the two companies are quite different. From my analysis, Larson's operating leverage is 1.50 while Benson's is 3.00. The analytical data suggests that Benson's future income may be much more volatile than Larson's.

If the economy prospers in the long run, Benson will be the better choice for investment. Otherwise, Larson will be better. If we can't forecast future economic conditions with a reasonable degree of confidence, a conservative investor should choose Larson whereas an aggressive investor should choose Benson.

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PROBLEM 2-24A

a.

Day	M	Tu	W	Th	F	Sat	Sun
Total cost (a)	$1,980	$1,980	$1,980	$1,980	$1,980	$1,980	$1,980
No. people (b)	450	300	200	550	1,000	1,000	500
Per unit (a ÷ b)	$4.40	$6.60	$9.90	$3.60	$1.98	$1.98	$3.96

b.

Day	M	Tu	W	Th	F	Sat	Sun
Cost per unit	$4.40	$6.60	$ 9.90	$3.60	$1.98	$1.98	$3.96
Mark-up	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Ticket price	$7.40	$9.60	$12.90	$6.60	$4.98	$4.98	$6.96

c. A more rational pricing policy would base the computation of average cost on weekly totals. Total rental cost is $13,860 (i.e., $1,980 x 7 days). Total expected attendance for the week is 4,000. Average cost per ticket sold is $3.47 (i.e., $13,860 ÷ 4,000 tickets). Given a desired profit of $3.00 per ticket, the price would be set at $6.47 (i.e., $3.47 + $3.00).

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d. As indicated in Requirement b, prices based on daily attendance would vary from a low of $4.98 per ticket to a high of $12.90 per ticket. This pricing structure is unrealistic. It suggests that higher prices should be charged when demand is low. If implemented, the pricing policy would likely drive the small number of Wednesday night customers away. Very few people would be interested in $12.90 movie tickets.

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PROBLEM 2-25A

Using information from a single climb can distort the predictive value of the data because certain variables may not represent normal averages. For example, the most recent climb served 10 climbers. The average number of climbers that normally makes a trip could be larger or smaller than the number that made the most recent trip. While recent data is more relevant, it can be distorted if the time frame is too short to provide representative results. Similarly, data that is too old may not be representative. For example, the cost of equipment, salaries, and food is likely different today as compared to five years ago. Accordingly, the data drawn from the one-year average is likely to provide the best indication of future conditions. Additional factors to be considered for pricing strategies include market demand, competition, and the general economy.

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Memorandum

TO: John Doe, President
FROM: Jim Smith, Accountant
SUBJECT: Analysis and Recommendation Regarding the Use of per Unit Cost for Pricing Decisions
DATE: October 1, 20XX

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I have evaluated the Company's data about cost per climb over three different time periods: recent, one year, and five years. It is my recommendation that the cost per climb data over the one-year period be used for pricing decisions.

The recent climb data pertains to only 10 climbers, a small number that may not represent normal operation. The five-year climb data extends too far to the past periods that may not reflect the current costs of operations. The one-year climb data represents an appropriate base for our cost estimation of the coming year.

I suggest that you consider other factors such as future market demand, competition, and the general economy to adjust the cost estimate and devise a successful pricing strategy.

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PROBLEM 2-26A

a.

Month	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Revenue	$6,000	$6,800	$13,000	$21,000	$16,000	$16,500	$ 79,300
Service hours	120	136	260	420	320	330	1,586
Revenue/Hour	$50	$50	$50	$50	$50	$50	$50

b.

Month		Operating Costs		Service Hours		Variable Cost/Unit
Oct.	High	$11,200		420		
July	Low	4,300		120		
Difference		$6,900	÷	300	=	$23/hour

Fixed cost = $11,200 – ($23 x 420) = $1,540 or,
= $4,300 – ($23 x 120) = $1,540

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c. Contribution margin per hour = $50 – $23 = $27

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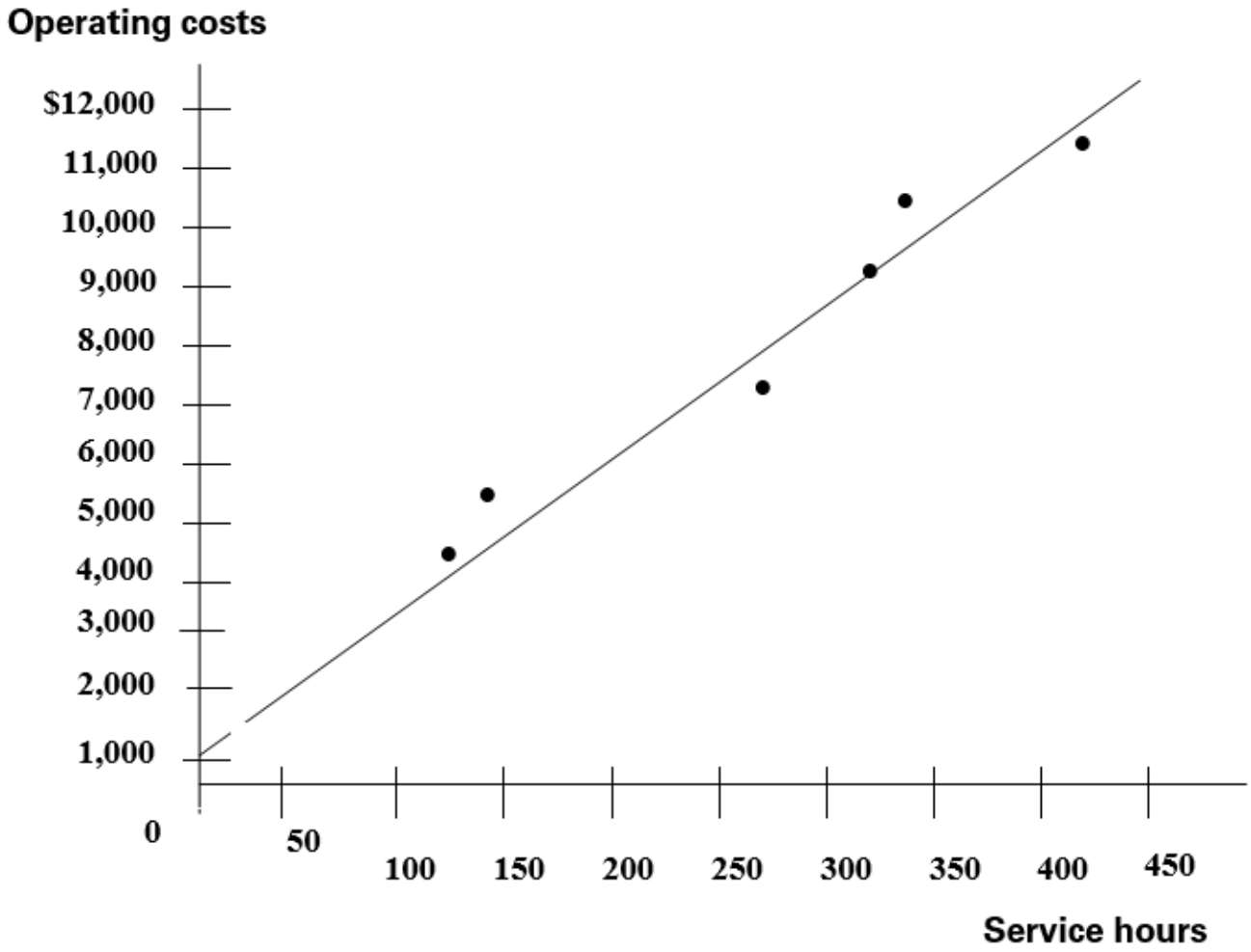
PROBLEM 2-26A (continued)

d.



e. The results of the two methods are very similar. In Requirement b, the high-low method relies on the relationship between the highest point and the lowest point to define the variable cost and the fixed cost. In Requirement d., the scatter graph method relies on human observation to fit a straight line among the six given points. As it turns out, the variable cost per unit (the slope of the straight line) determined in the scatter graph method is greater than that determined in the high-low method. The fixed cost determined in the scatter graph is $1,200 which is lower than $1,540 determined in the high-low method.

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PROBLEM 2-27A

a. (1)

Month	# of Cabinets Produced	Total Cost
December	400	$16,500
April	600	18,600
January	800	21,000
July	1,100	25,600
June	1,300	27,000
May	1,600	29,000
August	1,800	31,000
March	1,960	29,500
September	2,280	32,000
October	2,940	31,500
November	3,280	32,000
February	3,600	32,500

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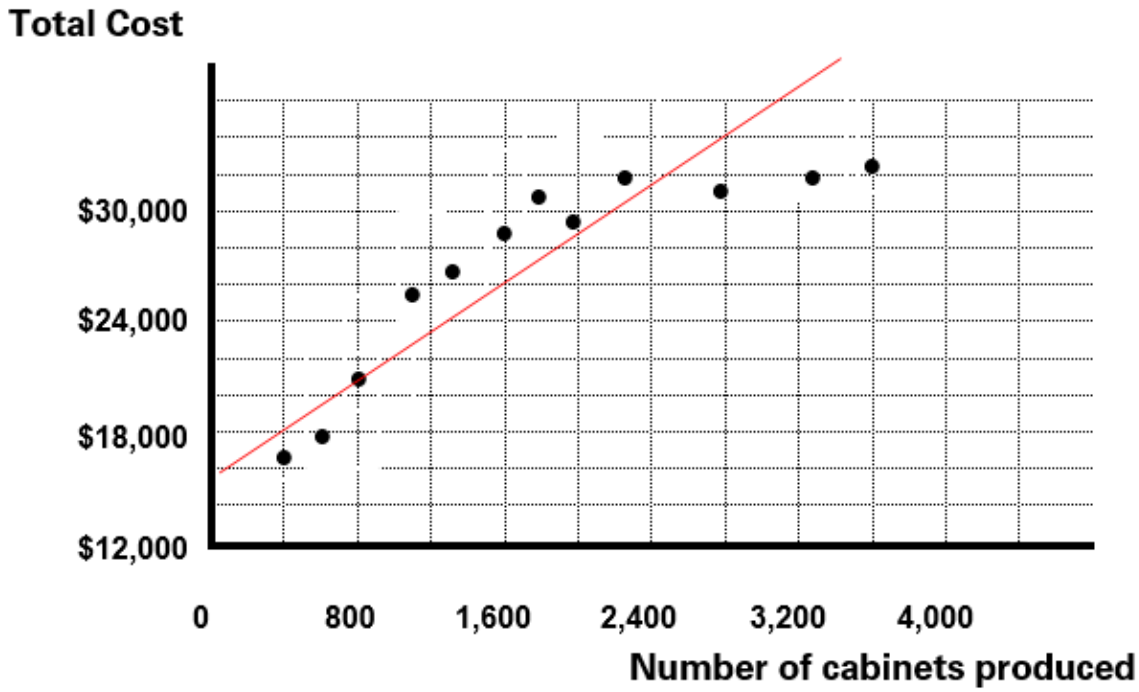
a. (2&3)



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PROBLEM 2-27A (continued)

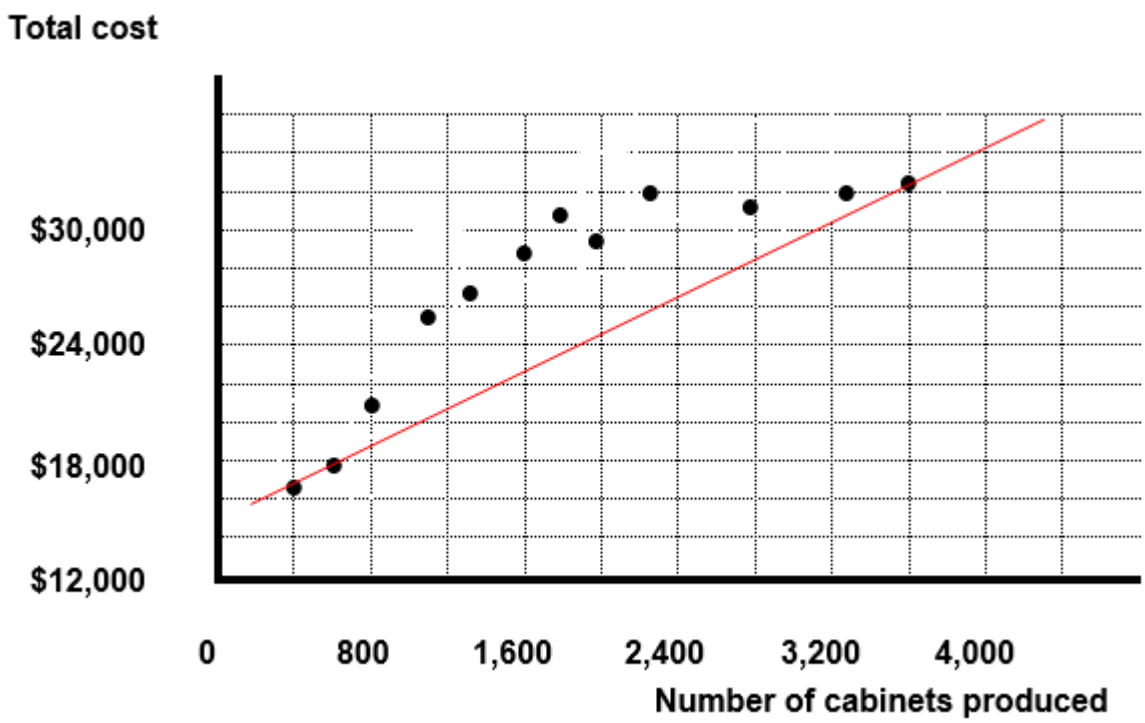
a. (4) The total cost of producing 2,000 units should be about $29,000.

b. (1)

	Total Cost	# of Cabinets *Produced*	
High	$32,500	3,600	
Low	16,500	400	
	$16,000 ÷	3,200	= $5 per cabinet (variable cost)

b. (2) Fixed cost = $32,500 – ($5 x 3,600) = $14,500

b. (3)



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PROBLEM 2-27A (cont.)

b. (4) Total cost = Fixed cost + (Variable cost per unit x Number of cabinets)

Total cost = $14,500 + ($5 x 2,000) = $24,500

c. Neither method is accurate. However, judging from the data distribution as displayed on the sketch, the high-low method greatly distorts the underlying data because the observations for high and low points are both outliers to the down side. In other words, the estimates determined by the high-low method would significantly understate the reality. Consequently, the scatter graph method is a better one.

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PROBLEM 2-28A

a. Assume the following:

X = the number of professional hours
Y = the dollar amount office support cost

The algebraic equation should be as follows :

Y = a + bX

Where a represents the fixed cost and b represents the variable cost per professional hour.

b. The result of regression analysis follows:

Regression Statistics	
Multiple R	0.91155
R Square	0.83092
Adjusted R Square	0.82509
Standard Error	726.258
Observations	31

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	7.5E+07	7.5E+07	142.519	1E-12
Residual	29	1.5E+07	527451		
Total	30	9E+07			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	1142.01	409.633	2.7879	0.00927	304.22	1979.81	304.22	1979.81
X Variable 1	15.1942	1.27274	11.9382	1E-12	12.5911	17.7972	12.5911	17.7972

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PROBLEM 2-28A (continued)

RESIDUAL OUTPUT

Observation	*Predicted Y*	*Residuals*
1	4560.7	-319.7
2	2858.96	576.044
3	7022.16	-624.16
4	7402.02	-900.02
5	5062.11	-922.11
6	3360.36	7.6362
7	5320.41	-1500.4
8	6672.7	-276.7
9	4028.91	-82.908
10	8496	-307
11	4955.75	-449.75
12	6870.22	-126.22
13	5153.28	-508.28
14	3709.83	2363.17
15	6277.65	12.3526
16	7781.87	1331.13
17	3649.05	206.947
18	6581.53	-645.53
19	8298.47	316.526
20	8617.55	1021.45
21	6125.71	-157.71
22	6596.73	518.275
23	3785.8	-498.8
24	7128.52	386.478
25	7006.97	367.032
26	5381.19	-5.1905
27	5912.99	-128.99
28	5441.97	-15.967
29	4150.46	267.539
30	4575.9	-69.899
31	6323.23	164.77

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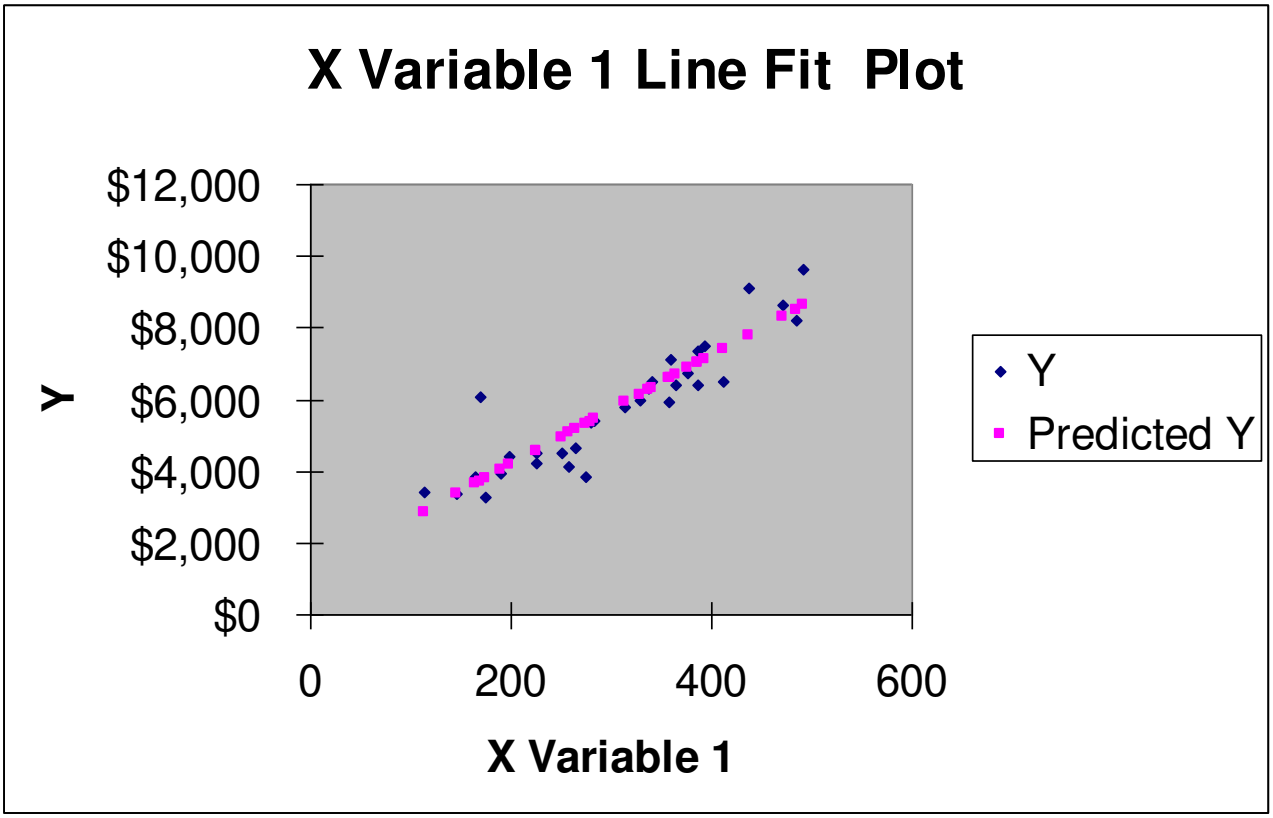
PROBLEM 2-28A (cont.)



Fixed cost = $1,142; Variable cost = $15.19 per professional hour

c. The R^2 statistic is 0.83092. This means that approximately 83% of the variation of the cost of office support (dependent variable) can be explained by variation in the number of professional hours (independent variable).

d. Total cost = Fixed cost + (Variable cost per professional hour x Number of professional hours)
Total cost = $1,142 + ($15.19 x 3,000) = $46,712

e. Factors other than professional hours (independent variable) may be affecting the cost of office support (dependent). Rather than limiting the analysis to a single independent variable, multiple regression enables the examination of the simultaneous effects of a number of independent variables.

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SOLUTIONS TO EXERCISES - SERIES B - CHAPTER 2

EXERCISE 2-1B

Requirement	Fixed	Variable	Mixed
a.	x		
b.	x		
c.			x
d.		x	
e.		x	
f.	x		

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EXERCISE 2-2B

Requirement	Fixed	Variable	Mixed
a.	x		
b.	x		
c.		x	
d.	x		
e.			x
f.		x	
g.	x		
h.			x
i.		x	
j.		x	

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EXERCISE 2-3B

Total Fixed Cost:

Item	Cost
Insurance	$ 26,000
Patent amortization	400,000
Depreciation	160,000
Property tax	14,000
Total fixed	$600,000

Units Produced (a)	10,000	20,000	50,000
Total fixed cost (b)	$600,000	$600,000	$600,000
Fixed cost per unit (b ÷ a)	$60	$30	$12

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EXERCISE 2-4B

Units Produced (a)	4,000	6,000	8,000
Variable cost per unit (b)	$9.00	$9.00	$9.00
Total variable cost (a x b)	$36,000	$54,000	$72,000

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EXERCISE 2-5B

a.

Units Produced (a)	January 1,000	February 500
Total depreciation cost (b)	$6,000	$6,000
Depreciation cost per unit (b ÷ a)	$6.00	$12.00
Total factory supplies cost (c)	$2,000	$1,000
Factory supplies cost per unit (c ÷ a)	$2.00	$2.00

b. Since the total depreciation cost remains unchanged when the number of units produced changes, it is a fixed cost. Since the total factory supplies cost changes in direct proportion to changes in the number of units, it is a variable cost.

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EXERCISE 2-6B

a.

Number of Chairs	2,000	3,000	4,000	5,000
Total costs incurred				
Fixed	$ 80,000	$ 80,000	$ 80,000	$ 80,000
Variable	20,000	30,000	40,000	50,000
Total costs	$100,000	$110,000	$120,000	$130,000
Per unit chair cost				
Fixed	$40.00	$26.67*	$20.00	$16.00
Variable	10.00	10.00	10.00	10.00
Total cost per chair	$50.00	$36.67	$30.00	$26.00

*Rounded

b. The total cost per chair decreases as the number of chairs produced increases because the same amount of fixed cost is spread over an increasingly larger number of chairs.

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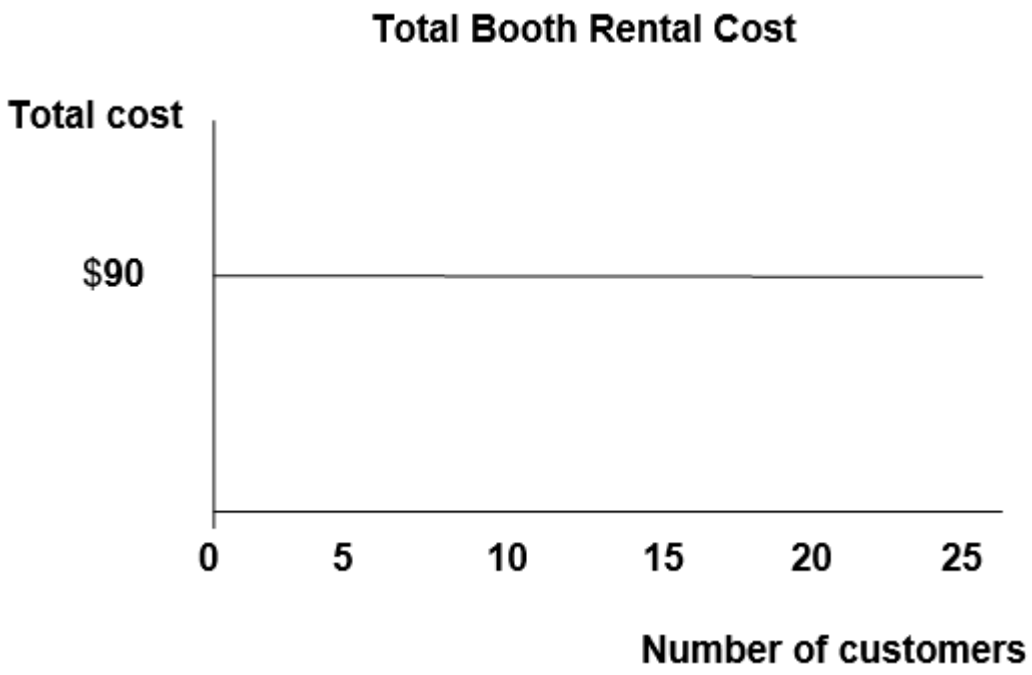
EXERCISE 2-7B

a.

Number of Customers (a)	5	10	15	20	25
Total rental cost (b)	$90	$90	$90	$90	$90
Cost per customer (b) ÷ (a)	$18.00	$9.00	$6.00	$4.50	$3.60

b. **Since the cost of renting the booth is $90 regardless of the number of customers, it is a fixed cost.**

c.



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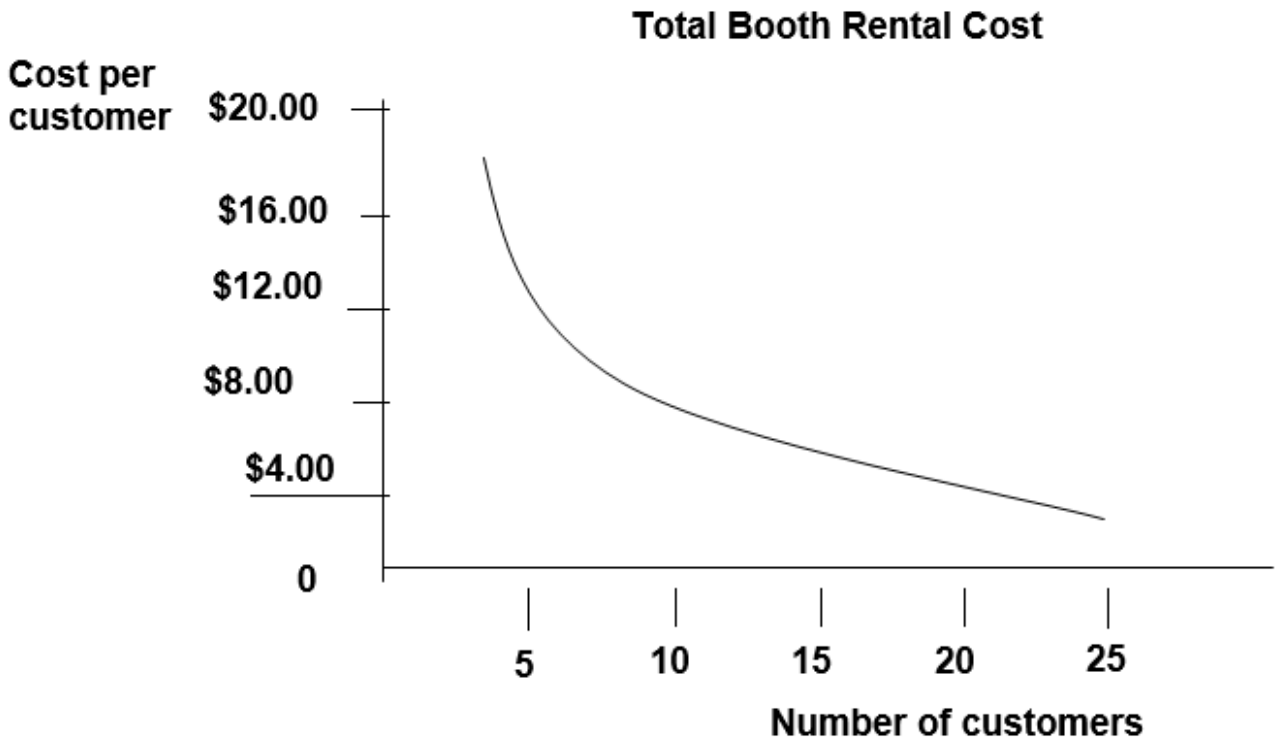
EXERCISE 2-7B (continued)

c.



d. Corder's major business risk is the uncertainty about whether he can generate enough revenue to cover the fixed cost. Corder must pay the $90 booth rental fee even if no one has their fortune told. Accordingly, there is a potential for Corder to experience a financial loss instead of income. Since the cost per fortune decreases as volume increases, Corder can sell fortunes for less if more people have their fortune told. Also, lower fortune prices encourage higher sales. Corder must set a price that encourages people to have their fortunes read but also produces sufficient revenue to cover the fixed cost of renting the booth and provide a reasonable profit.

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EXERCISE 2-7B (cont.)

d. To a large extent, Corder's business risk is the result of his cost structure. To minimize the risk, Corder could possibly change that structure. For instance, Corder may want to negotiate with the booth owner to set a flexible rental plan. The booth owner may be paid a particular percentage of the revenue instead of a fixed fee. In other words, the cost structure could be changed from fixed to variable. In this arrangement, Corder's risk of suffering a loss is virtually eliminated. On the other hand, the variable cost structure does not allow Corder to benefit from operating leverage thereby limiting profitability. Therefore, there is a risk of lost profitability. Risk minimization does not mean risk elimination altogether.

Other business risks include competition, economic downturns, theft of cash receipts, and potential litigation. Corder will also likely need to advertise his booth to inform prospective customers about the opportunity to have fortunes told in the evening.

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Since Corder's primary business risk results from the expected relationship between revenue and cost he could try to minimize that risk by changing that relationship. Perhaps he could negotiate a flexible cost scheme, offering to pay Molloy some percentage of revenue instead of a fixed booth rental amount. Such an arrangement would virtually eliminate Corder's risk of suffering a loss. It would not, however, ensure Corder his desired profit. Minimizing risk does not generally totally eliminate risk.

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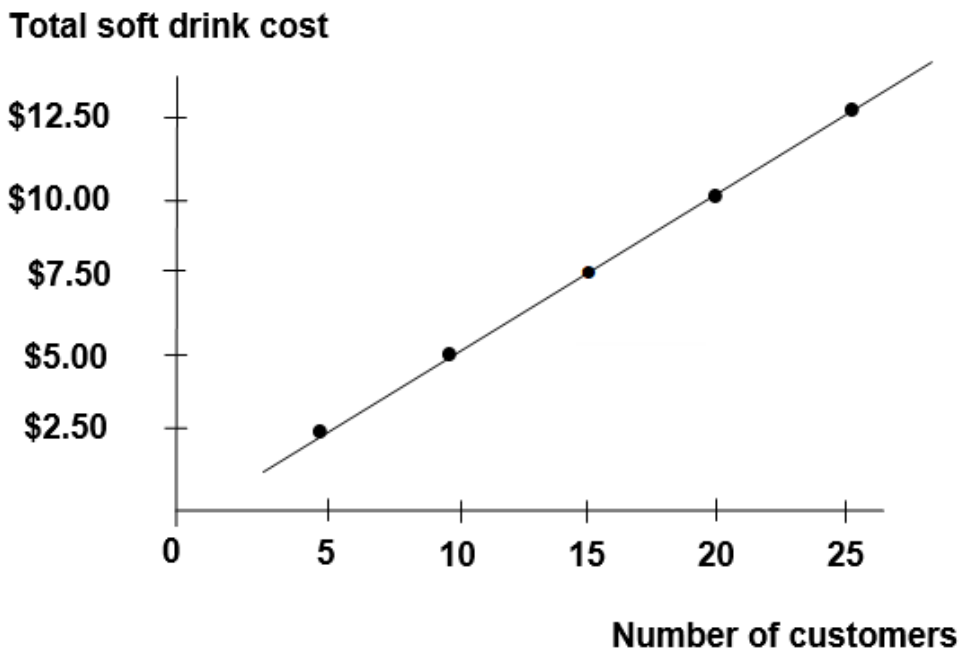
EXERCISE 2-8B

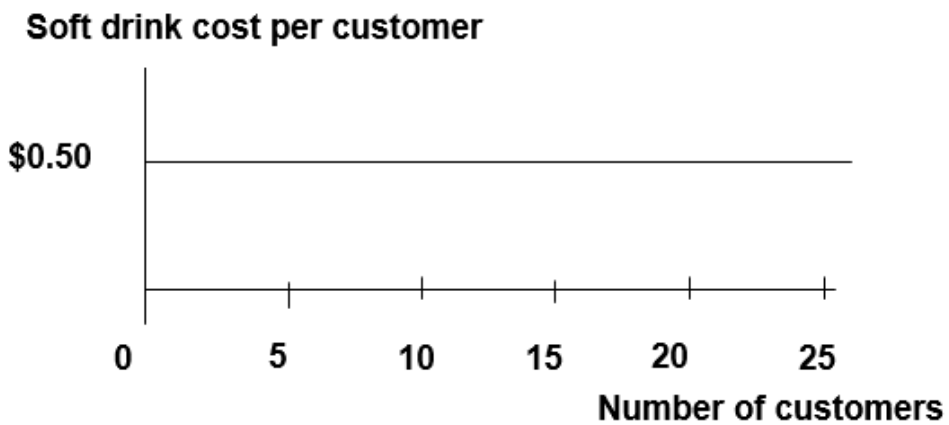
a.

Number of Customers (a)	5	10	15	20	25
Total soft drink cost $0.50 x (a)	$2.50	$5.00	$7.50	$10.00	$12.50
Soft drink cost per customer	$0.50	$0.50	$0.50	$0.50	$0.50

b. Since the total soft drink cost increases proportionately as the number of customers increases, it is variable.

c.





EXERCISE 2-8B (continued)

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d. Corder's major business risk is whether his business can generate a desired profit. The soft drink cost and the revenue are both variable. As long as the price he charges each customer is greater than the soft drink cost, Corder will make a profit. However, the number of customers he will serve is uncertain. Corder should set a competitive price for fortune reading. He may need to advertise to attract customers. His ultimate goal is to generate the maximum profit.

Corder's other business risks include competition and unfavorable economic conditions.

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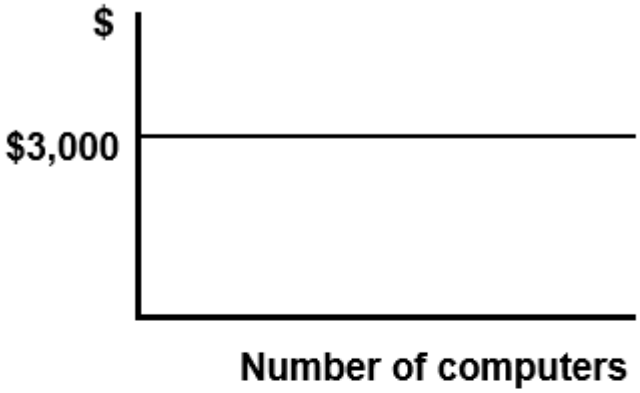
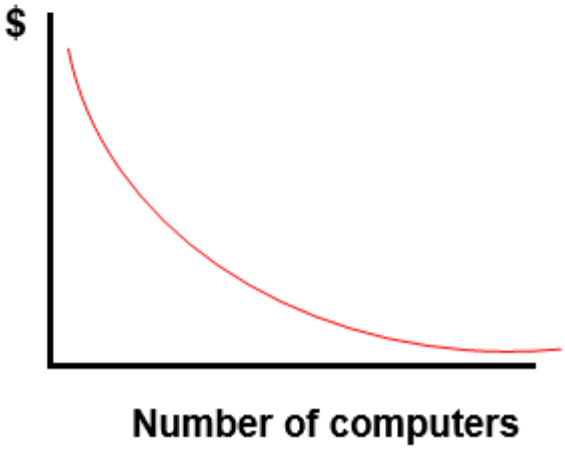
EXERCISE 2-9B

a. Total monthly rental cost



b. Rental cost per computer



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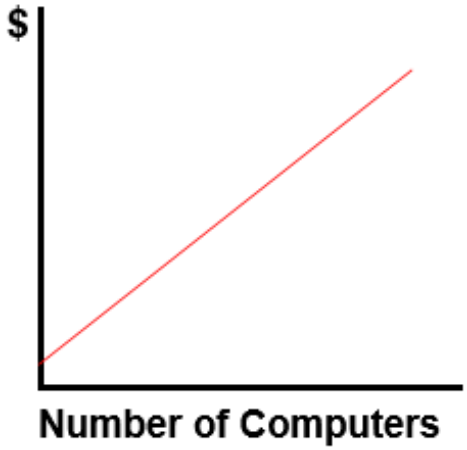
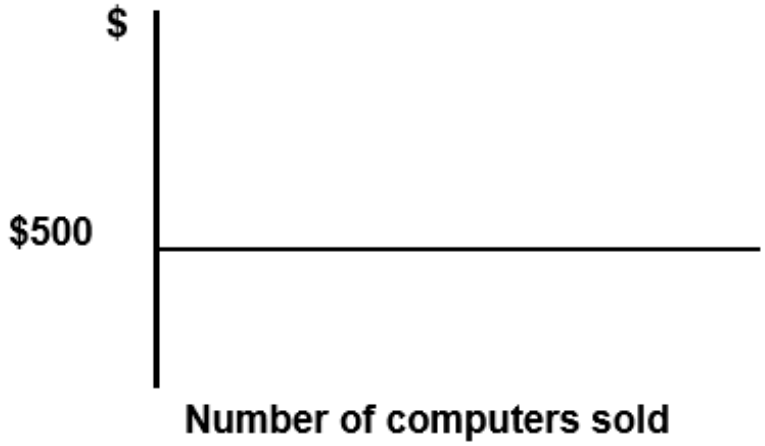
EXERCISE 2-10B

a. Total product cost



b. Product cost per computer



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EXERCISE 2-11B

$95 – ($0.50 x 100) = $45
The fixed portion of the mixed cost is, therefore, $45 for any level of activity within the relevant range of production. This cost is the daily base wage and it will be the same each day.

Day	Monday	Tuesday	Wednesday	Thursday
Number of hats woven	100	120	160	80
Total variable cost	$50	$ 60	$ 80	$40
Total fixed cost	45	45	45	45
Total wages cost	$95	$105	$125	$85

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EXERCISE 2-12B

a. & b.

Income Statements		
	a.	b.
Company	Standard	Variant
Number of customers (n)	300	300
Sales revenue (n x $85)	$25,500	$ 25,500
Variable cost: Variant (n x $90)		27,000
Variable cost: Standard (n x $0)	0	
Contribution margin	25,500	(1,500)
Fixed cost	(13,500)	0
Net income (loss)	$12,000	$ (1,500)

c. The price-cutting strategy increases each company's revenue by $1,500 ($25,500 – $24,000) because selling to 300 customers at $85 each ($25,500) produces more revenue than selling to 150 customers at $160 each ($24,000). Since Standard's costs are fixed, the entire $1,500 increase in sales revenue increases net income. In contrast, Variant's costs vary with the number of customers it serves. Increasing the number of customers by 150 increases Variant's costs by $13,500 (150 units x $90). The price-cutting strategy increases Variant's revenue by $1,500 and increases its costs by $13,500, resulting in a net decline in profitability of $12,000 ($1,500 of additional revenue less $13,500 in additional costs). Variant's projected results change from $10,500 of net income to $1,500 of net loss.

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EXERCISE 2-13B

Income Statement	
Sales revenue (2,400 units x $100)	$240,000
Less: Variable costs	
Cost of goods sold (2,400 units x $65)	(156,000)
Sales commissions (10% of sales revenue)	(24,000)
Shipping and handling expense (2,400 units x $1)	(2,400)
Contribution margin	57,600
Less: Fixed costs	
Administrative salaries expense	(15,000)
Advertising expense	(20,000)
Depreciation expense	(10,600)
Net income	$ 12,000

b.

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

$$\text{Operating leverage} = \frac{\$57{,}600}{\$12{,}000} = 4.8 \text{ times}$$

c. **A 10 percent increase in sales revenue will produce a 48 percent increase in net income (10 percent x 4.8 = 48 percent) Nagano's net income would increase to $17,760 [$12,000 + ($12,000 x 0.48)].**

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EXERCISE 2-14B

a.

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

$$\text{Operating leverage} = \frac{\$39{,}000}{\$13{,}000} = 3$$

b. (10% Change in revenue x 3 Operating leverage) = 30% change in net income

30% x $13,000 = $3,900 Change
Revised net income = $13,000 + $3,900 = $16,900

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c.

Annual Income Statements			
Sales volume in units (a)	1,000	% Change	1,100
Sales revenue (a x $89)	$89,000	⇒+10%⇒	$97,900
Variable costs (a x $50)	(50,000)		(55,000)
Contribution margin	39,000		42,900
Fixed cost	(26,000)		(26,000)
Net income	$ 13,000	⇒+30%⇒	$ 16,900

($16,900 – $13,000) ÷ $13,000 = 30%

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EXERCISE 2-15B

Century should charge the same amount per ticket throughout the year regardless of the number of patrons expected in a given month. Using a cost-plus pricing strategy, Century would set the ticket price as follows: Price = Average fixed cost per patron + Variable cost per patron + Desired profit per patron. The fixed cost must be averaged over the annual total number of patrons. The computations are shown below:

Computation of average fixed cost per patron:

$$\text{Fixed cost per patron} = \frac{\$4{,}000 \times 12}{40{,}000 \text{ patrons}} = \$1.20$$

Price = Fixed cost per patron + Variable cost per patron + $3.00
Price = $1.20 + $1.00 + $3.00
Price = $5.20

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EXERCISE 2-16B

a.

$$\text{Variable cost per gallon} = \frac{\text{Change in total cost}}{\text{Change in volume}} = \frac{\$82{,}000 - \$46{,}000}{50{,}000 - 20{,}000} = \$1.20$$

The fixed cost can be determined by the following formula. The computations shown below are based on the high point. Computations at the low point would produce the same result.

Fixed cost = Total cost – Variable cost
Fixed cost = $82,000 – (50,000 gallons x $1.20)
Fixed cost = $82,000 – $60,000
Fixed cost = $22,000

b. **Total cost = Fixed cost + (Variable cost per unit x Number of units)**
Total cost = $22,000 + ($1.20 x 40,000) = $70,000

c. **If the high and/or low points are not representative of the underlying data set, the estimates will be inaccurate.**

d. **Regression analysis includes a statistic (R^2) that represents the percentage of the variation in the dependent variable (total monthly cost) that is explained by variation in the independent variable (number of gallons). If the R^2 is low, multiple regression analysis can be employed to examine the simultaneous effects of a number of independent variables thereby offering the opportunity for improved accuracy by expanding the explanatory base (set of independent variables).**

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SOLUTIONS TO PROBLEMS - SERIES B - CHAPTER 2

PROBLEM 2-17B

Requirement	Fixed	Variable
a.	x	
b.	x	
c.		x
d.	x	
e.	x	
f.		x
g.		x
h.	x	
i.	x	
j.		x
k.	x	
l.	x	
m.	x	
n.		x
o.	x	
p.		x
q.	x	
r.		x
s.		x
t.	x	

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PROBLEM 2-18B

a.

Number of Lawn Services (a)	40	50	60
Total expected monthly depreciation cost (b)	$1,875	$1,875	$1,875
Average per unit depreciation cost (b ÷ a)	$46.88*	$37.50	$31.25

*Rounded

Depreciation per month = $90,000 x 1/4 x 1/12 = $1,875

Type of cost: Since the total depreciation cost remains constant at $1,875 regardless of the number of lawn services, it is a fixed cost.

b.

Number of Lawn Services (a)	40	50	60
Average per unit labor cost (b)	$20	$20	$20
Total labor cost (a x b)	$800	$1,000	$1,200

Type of cost: Since the total labor cost increases proportionately with the number of lawn services, it is a variable cost.

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c.

Number of Lawn Services (a)	40	50	60
Average per unit materials cost (b)	$ 10	$ 10	$ 10
Total cost of materials (a x b)	$400	$500	$600

Type of cost: Since the total cost of materials increases proportionately with the number of lawn services, it is a variable cost.

d.

Number of Lawn Services (a)	40	50	60
Total expected depreciation cost	$ 46.88	$37.50	$31.25
Total labor cost	800.00	1,000.00	1,200.00
Total cost of materials	400.00	500.00	600.00
Total cost	$1,246.88	$1,537.50	$1,831.25

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PROBLEM 2-18B (continued)

e. The amount of <u>total</u> cost shown below was determined in Requirement d.

Number of Lawn Services (a)	40	50	60
Total cost (b)	$1,246.88	$1,537.50	$1,831.25
Cost per unit (b ÷ a)	$31.17*	$30.75	$30.52

***Rounded**

The decline in the cost per lawn service is caused by the fixed cost behavior that is applicable to the equipment depreciation.

f. Mr. Quill means average cost per unit. It would be virtually impossible to determine actual cost per unit. For instance, exactly how much pesticide was used in one lawn versus another? Did the service person work on one lawn a few minutes longer than another? Obviously, it would not be practical to determine the exact cost of servicing any specific lawn. The average cost is much easier to determine and more practical for pricing purposes.

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PROBLEM 2-19B

a. **If a branch fails to process at least 3,000 tax returns, the branch is closed. Branches that process more than 5,000 tax returns are transferred out of the Development Department. Accordingly, the relevant range is 3,000 to 5,000 tax returns.**

b.

Number of Tax Returns (a)	3,000	4,000	5,000
Total payroll cost (b)	$240,000	$240,000	$240,000
Average per unit payroll cost (b ÷ a)	$80.00	$60.00	$48.00

Type of Cost: Since the total payroll cost remains constant at $240,000 regardless of the number of tax returns filed, it is a fixed cost.

c.

Number of Branches (a)	20	30	40
Payroll cost per branch (b)	$ 240,000	$ 240,000	$ 240,000
Total payroll cost (a x b)	$4,800,000	$7,200,000	$9,600,000

Type of cost: Since the total payroll cost increases proportionately with the number of branches in operation, the cost is a variable cost.

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PROBLEM 2-20B

a.

Sales Volume in cameras (a)	100	200	300	400	500
Total cost of cameras (a x $150)	$15,000	$30,000	$45,000	$60,000	$75,000
Total cost of store rental	6,000	6,000	6,000	6,000	6,000
Total cost of sales (b)	$21,000	$36,000	$51,000	$66,000	$81,000
Average cost per camera (b ÷ a)	$210.00	$180.00	$170.00	$165.00	$162.00

b.

Sales Volume in cameras	100	200	300	400	500
Average cost per unit (a)	$210	$180	$170	$165	$162
Price per package (a + $30)	$240	$210	$200	$195	$192

c.

Shopping Malls (a)	1	2	3	4	5
Total cost of store rental (a x $6,000)	$6,000	$12,000	$18,000	$24,000	$30,000

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Type of cost: Since the <u>total</u> rental cost increases proportionately with the number of stores in operation, it is a variable cost.

d. The additional cost is $150 ÷100 units = $1.50 per camera sold. The cost would be treated as a variable cost for decision making purposes. While it is not purely proportional, its behavior pattern closely approximates a variable cost pattern.

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PROBLEM 2-21B

Part 1

a. Since the total cost remains constant at $5,000 regardless of how many CFE candidates attend the course, the cost of instruction is a fixed cost.

b. c. & d.

Number of Candidates	45	% Change	50	% Change	55
Revenue ($400 per candidate)	$18,000	⇐(10%)⇐	$20,000	⇒+10%⇒	$22,000
Cost of instruction (fixed)	5,000		5,000		5,000
Gross profit	$13,000	⇐(13%)⇐	$15,000	⇒+13%⇒	$17,000

Percentage change in revenue: ±$2,000 ÷ $20,000 = ±10%
Percentage change in profit: ±$2,000 ÷ $15,000 = ±13% (rounded)

e. Operating leverage caused the percentage change in profitability to be higher than the percentage change in revenue. Since the fixed costs have been covered and no variable costs exist, each additional dollar of revenue contributes directly to additional profitability and vice versa.

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Part 2

f. Since the total cost changes proportionately with changes in the number of candidates, the cost of instruction is a variable cost.

g. h. and i.

Number of Candidates	45	% Change	50	% Change	55
Revenue ($400 per candidate)	$18,000	⇐(10%)⇐	$20,000	⇒+10%⇒	$22,000
Cost of instruction (variable)	4,500		5,000		5,500
Gross profit	$13,500	⇐(10%)⇐	$15,000	⇒+10%⇒	$16,500

Percentage change in revenue: ±$2,000 ÷ $20,000 = ±10%
Percentage change in profit: ±$1,500 ÷ $15,000 = ±10%

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PROBLEM 2-21B (continued)

Part 2 (cont.)

j. Since costs as well as revenue change in direct proportion to changes in the number of CFE candidates attending the course, the change in profit is proportional to the change in revenue.

Part 3

k.

Number of Candidates Attempting to Attend	45	50	55
Number of candidates accepted (a)	45	50	50
Total cost of workbooks [b = (50 x $32)]	$1,600	$1,600	$1,600
Cost per candidate (b ÷ a)	35.56	32.00	32.00

l. Since the workbooks must be produced in advance, the total cost is incurred before any workbook is sold. Subsequently, the number of workbooks sold does not affect the total cost. This is, therefore, a fixed cost.

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m. CFEs R Us faces the risk of producing too many or too few workbooks. When too many are produced, the company will incur expenses due to waste. When too few are produced, the company will miss the opportunity to earn additional profits. Also, CFEs R Us faces the risk associated with the incursion of costs such as storage, maintenance, and interest.

n. A just-in-time inventory system would produce goods as needed to meet sales demand. Accordingly, there would be no risk of over or under production. Further, there would be no stockpiling of inventory; therefore, inventory holding costs such as storage, maintenance, and interest would be avoided.

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PROBLEM 2-22B

a.

Club	Canton		Tobin
Tuition revenue (40 x $200)	$8,000		$8,000
Total cost of instruction (Fixed)	(4,800)	(40 x $120)	(4,800)
Net income	$3,200		$3,200

b.

Club	Canton
Tuition revenue (80 x $112)	$8,960
Total cost of instruction (fixed)	4,800
Net income	$4,160

c.

Club		Tobin
Tuition revenue	(80 x $112)	$8,960
Total cost of instruction (variable)	(80 x $120)	(9,600)
Net loss		$ (640)

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d. The strategy in Requirement b produced a profit because Canton's cost of coaching was fixed. Accordingly, the increase in the number of students did not increase the total cost of coaching. In contrast, the cost of coaching for Tobin was variable. As a result, when the number of students increased, the total cost of coaching increased as well. Since the increase in revenue was not sufficient to cover the increase in the cost of coaching, the strategy in Requirement c produced a loss.

e.

Club		Canton		Tobin
Tuition revenue	(20 x $200)	$4,000		$4,000
Total cost of instruction	(fixed)	(4,800)	(20 x $120)	(2,400)
Net income (loss)		$(800)		$1,600

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PROBLEM 2-22B (continued)

f. When volume is insufficient to produce revenue that is above the level of fixed cost, the enterprise will produce a loss. This condition is demonstrated in Requirement e above. The loss could be avoided if the cost of instruction were variable. Accordingly, fixed costs are not always better than variable costs.

g. When the revenue per unit is below the variable cost per unit, the enterprise will incur additional losses for each unit produced and sold. This condition is depicted in Requirement c above. As demonstrated in Requirement b, lower per unit revenue can be offset by increases in sales volume when costs are fixed. Accordingly, variable costs are not always better than fixed costs.

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PROBLEM 2-23B

a.

Company Name	Cook	Penn
Contribution margin	$72,000	$136,000
Divided by net income	÷ 32,000	÷ 32,000
Operating leverage	2.25	4.25

b.

Company Name	Cook	Penn
Variable cost per unit (a)	$16	$8
Sales revenue (8,000 units x $25 x 110%)	$220,000	$220,000
Variable cost (8,000 units x a x 110%)	(140,800)	(70,400)
Contribution margin	$ 79,200	$149,600
Fixed cost	(40,000)	(104,000)
Net income	$ 39,200	$ 45,600
Percentage change *	22.5%	42.5%

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*Cook: $39,200 – $32,000 = $7,200; $7,200 ÷ $32,000 = 22.5%
Penn: $45,600 – $32,000 = $13,600; $13,600 ÷ $32,000 = 42.5%

c.

Company Name	Cook	Penn
Variable cost per unit (a)	$16	$8
Sales revenue (8,000 units x 90% x $25)	$180,000	$180,000
Variable cost (8,000 units x 90% x a)	(115,200)	(57,600)
Contribution margin	$ 64,800	$122,400
Fixed cost	(40,000)	(104,000)
Net income	$ 24,800	$ 18,400
Percentage change **	(22.5%)	(42.5%)

** Cook: $24,800 – $32,000 = $(7,200); $(7,200) ÷ $32,000 = (22.5%)
Penn: $18,400 – $32,000 = $(13,600); $(13,600) ÷ $32,000 = (42.5%)

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PROBLEM 2-23B (continued)

d. The following memo is just an example. Students can form different opinions from their analyses. However, the main focus of the analyses should be the risk and reward relationship as demonstrated by the data of the two investments.

Memorandum

TO: Ms. June Wade
FROM: John Doe
SUBJECT: Analysis and Recommendation Regarding Investments
DATE: October 23, 20XX

I have evaluated the income statements of Cook and Penn. Even though both companies had the same amounts of sales and net income last year, the risk and reward structures of the two companies are quite different. From my analysis, Cook's operating leverage is 2.25 while Penn's is 4.25. The analytical data suggests that Penn's future income may be much more volatile than Cook's.

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If the economy prospers in the long run, Penn will be the better choice for investment. Otherwise, Cook will be better. If we can't forecast future economic conditions with a reasonable degree of confidence, a conservative investor should choose Cook whereas an aggressive investor should invest in Penn.

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PROBLEM 2-24B

a.

Day	M	Tu	W	Th	F	Sat	Sun
Total cost (a)	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000
No. people (b)	400	350	300	500	800	1,250	1,400
Per unit (a ÷ b)	$7.50	$8.57	$10.00	$6.00	$3.75	$2.40	$2.14

b.

Day	M	Tu	W	Th	F	Sat	Sun
Per unit cost	$7.50	$ 8.57	$10.00	$6.00	$3.75	$2.40	$2.14
Mark-up	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Ticket price	$9.50	$10.57	$12.00	$8.00	$5.75	$4.40	$4.14

c. A more rational pricing policy would base the computation of average cost on weekly totals. Total contract cost is $21,000 (i.e., $3,000 x 7 days). Total expected attendance for the week is 5,000. Average cost per ticket sold is $4.20 (i.e., $21,000 ÷ 5,000 tickets). Given a desired profit of $2.00 per ticket, the price would be set at $6.20 (i.e., $4.20 + $2.00).

d. As indicated in Requirement b, prices based on daily attendance would vary from a low of $4.14 per ticket to a high of $12.00 per ticket. This pricing structure is unrealistic. It suggests that higher prices should be charged when demand is low. If implemented, the pricing policy would likely drive the small number of Wednesday customers away. Very few people would be interested in $12.00 circus tickets if the same tickets were available for much less the day before or after.

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PROBLEM 2-25B

Using information from a single recent tour can distort the predictive value of the data because certain variables may not represent normal averages. For example, the most recent tour served 32 tourists. The average number of tourists that normally makes a trip could be larger or smaller than the number that made the most recent trip. While recent data is more relevant, it can be distorted if the time frame is too short to provide representative results. Similarly, data that is too old may not be representative. For example, the cost of equipment, salaries, and food is likely different today as compared to ten years ago. Accordingly, the data drawn from the one-year average is likely to provide the best indication of future conditions. Additional factors to be considered for pricing strategies include market demand, competition, and the general economy.

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Memorandum

TO: Dan Silva, President
FROM: John Doe, Accountant
SUBJECT: Analysis and Recommendation Regarding the Use of Per Unit Cost for Pricing Decisions
DATE: October 1, 20XX

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I have evaluated the Company's data about cost per tour over three different time periods: recent, one year, and ten years. It is my recommendation that the cost per tour data over the one-year period be used for pricing decisions.

The recent tour data includes only 32 tourists, a small number that may not represent normal operations. The ten-year tour data extends too far to past periods that may not reflect the current costs of operations. The one-year tour data represents an appropriate base for our cost estimation for the coming year.

I suggest that you consider other factors such as future market demand, competition, and the general economy to adjust the cost estimate and devise a successful pricing strategy.

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PROBLEM 2-26B

a.

Month	Jan.	Feb.	Mar.	Apr.	May	June	Total
Revenue	$8,000	$10,000	$14,000	$18,000	$20,000	$22,000	$ 92,000
Service hours	80	100	140	180	200	220	920
Revenue/Hour	$100	$100	$100	$100	$100	$100	$100

b.

Month		Operating Costs		Service Hours		Variable Cost/Unit
June	High	$11,600		220		
Jan.	Low	7,400		80		
Difference		$4,200	÷	140	=	$30/hour

Fixed cost = $11,600 – ($30 x 220) = $5,000 or,

= $7,400 – ($30 x 80) = $5,000

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c. Contribution margin per hour = $100 – $30 = $70

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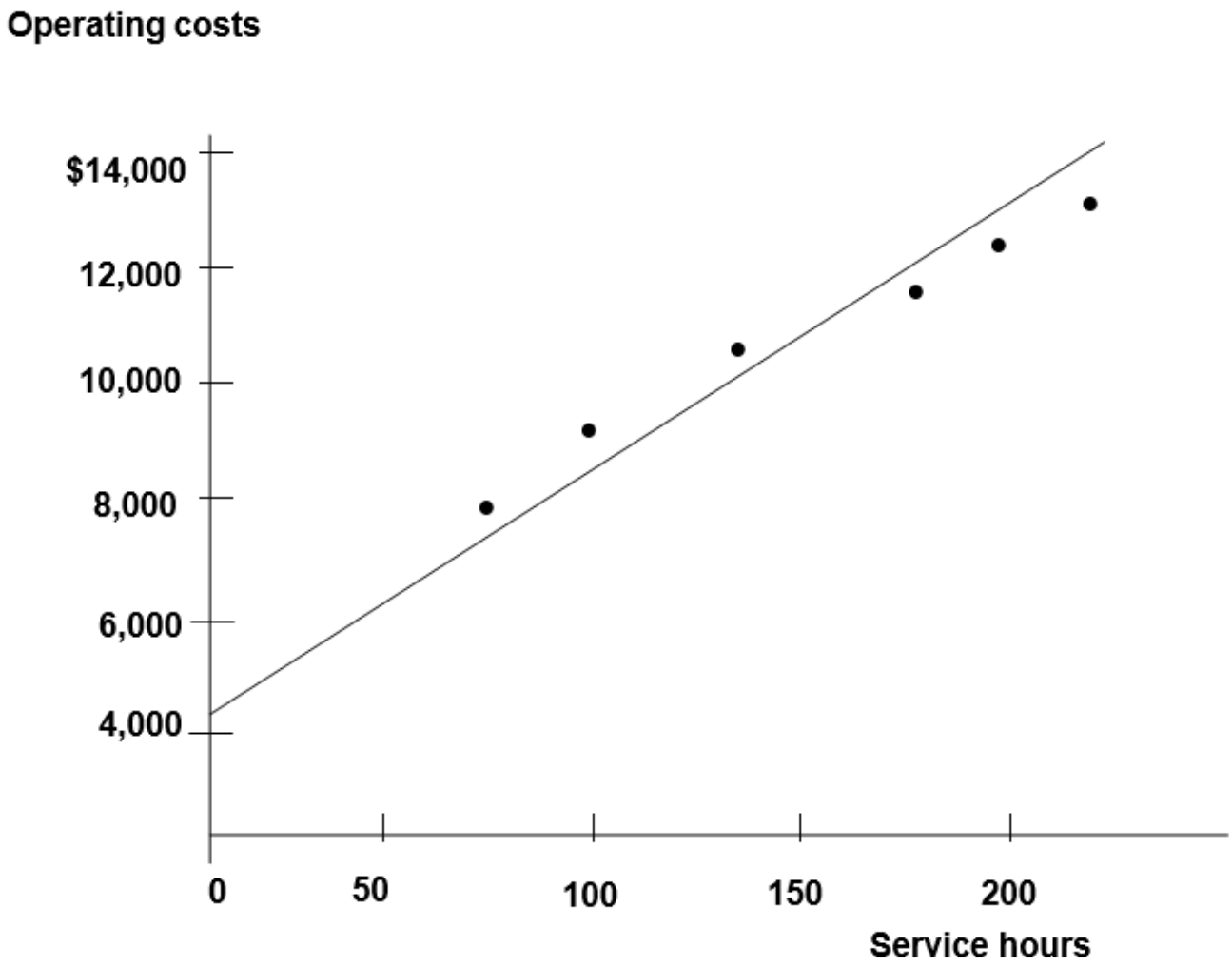
PROBLEM 2-26B (continued)

d.



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PROBLEM 2-26B (cont.)

e. The results of the two methods are very similar. In b, the high-low method relies on the relationship between the highest point and the lowest point to define the variable cost and the fixed cost. In d, the scatter graph method relies on human observation to fit a straight line among the six given points. As it turns out, the variable cost per unit (the slope of the straight line) determined in the scatter graph method is less than that determined in the high-low method. The fixed cost determined in the scatter graph is about $4,600, which is less than $5,000 as determined in the high-low method.

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PROBLEM 2-27B

a. (1)

Month	# of Frames Produced	Total Cost
December	800	$33,000
April	1,200	37,200
January	1,600	42,000
July	2,200	51,200
June	2,600	54,000
May	3,200	58,000
August	3,600	62,000
March	3,920	59,000
September	4,560	64,000
October	5,880	63,000
November	6,560	64,000
February	7,200	65,000

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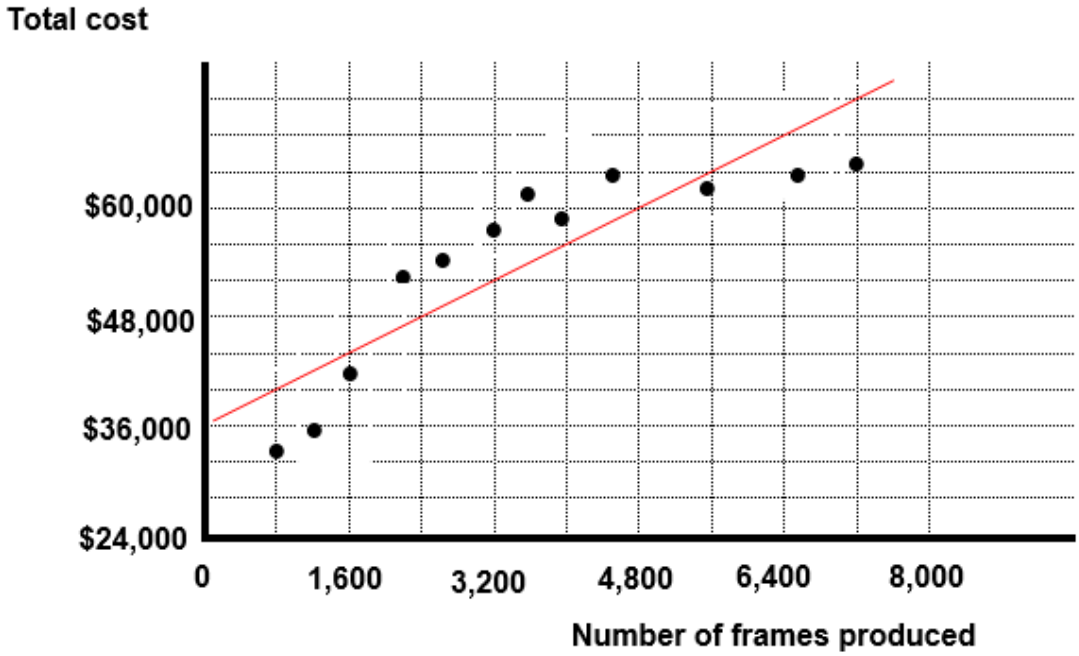
a. (2 & 3)



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PROBLEM 2-27B (continued)

a. (4) The total cost of producing 4,000 frames should be about $56,000.

b. (1)

	Total Cost		# of Frames Produced		
High	$65,000		7,200		
Low	33,000		800		
	$32,000	÷	6,400	=	$5 per frame (variable cost)

b. (2) Fixed cost = $65,000 – ($5 x 7,200) = $29,000

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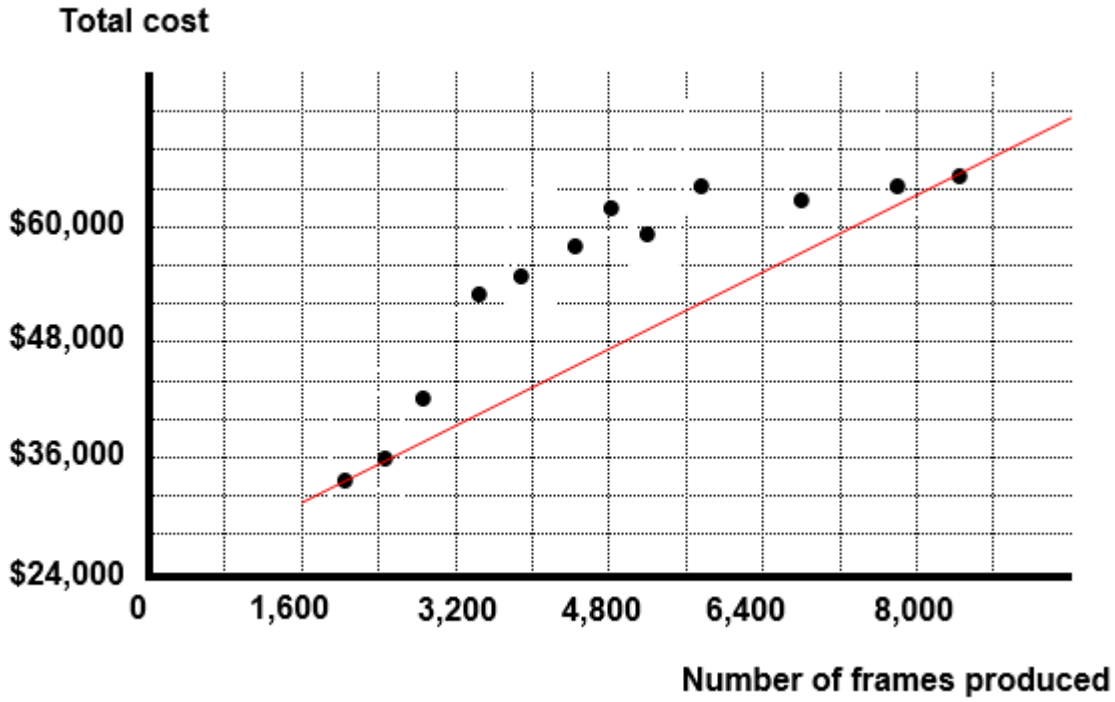
b. (3)



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PROBLEM 2-27B (cont.)

b. (4) Total cost = Fixed cost + (Variable cost per frame x Number of frames)

Total cost = $29,000 + ($5 x 4,000) = $49,000

c. A third method that could be used is regression analysis. The regression method produces statistics that help in determining the reliability of the cost estimates. Multiple regression can be used to evaluate the simultaneous effect of a number of independent variables as opposed to being limited to a single variable analysis.

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PROBLEM 2-28B

a. Assume the following:

X = the number of machine hours
Y = the dollar amount supplies cost

The algebraic equation should be as follows:

Y = a + bX

Where a represents the fixed cost and b represents the variable cost per machine hour.

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b. The result of regression analysis follows:

Regression Statistics	
Multiple R	0.95883
R Square	0.91936
Adjusted R Square	0.91667
Standard Error	339.596
Observations	32

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ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	3.9E+07	3.9E+07	342.002	6E-18
Residual	30	3459755	115325		
Total	31	4.3E+07			

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PROBLEM 2-28B (continued)

b.

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%
Intercept	1001.66	153.295	6.53425	3.2E-07	688.596	1314.73	688.596
X Variable 1	36.8204	1.99101	18.4933	6E-18	32.7542	40.8865	32.7542

RESIDUAL OUTPUT

Observation	Predicted Y	Residuals
1	4168.21	-349.21
2	3652.73	-42.73
3	3910.47	5.52774
4	3284.53	-369.53
5	4352.32	-25.317
6	2548.12	-334.12
7	2364.02	-258.02
8	2216.74	173.264
9	1848.53	258.468
10	4536.42	331.582
11	4462.78	558.222
12	4352.32	458.683
13	3652.73	-72.73
14	3210.89	-410.89
15	2769.04	-500.04
16	2953.14	-205.14
17	3358.17	497.833
18	4241.86	37.1446
19	5751.49	-118.49
20	6046.05	-748.05
21	6303.8	417.205
22	2364.02	83.9826
23	3063.6	464.396
24	2805.86	31.1383
25	1443.51	-84.509
26	3100.42	195.576
27	2989.96	482.037
28	3394.99	-130.99
29	3836.83	88.1684
30	4131.39	-129.39
31	4389.14	193.863
32	4020.93	-497.93

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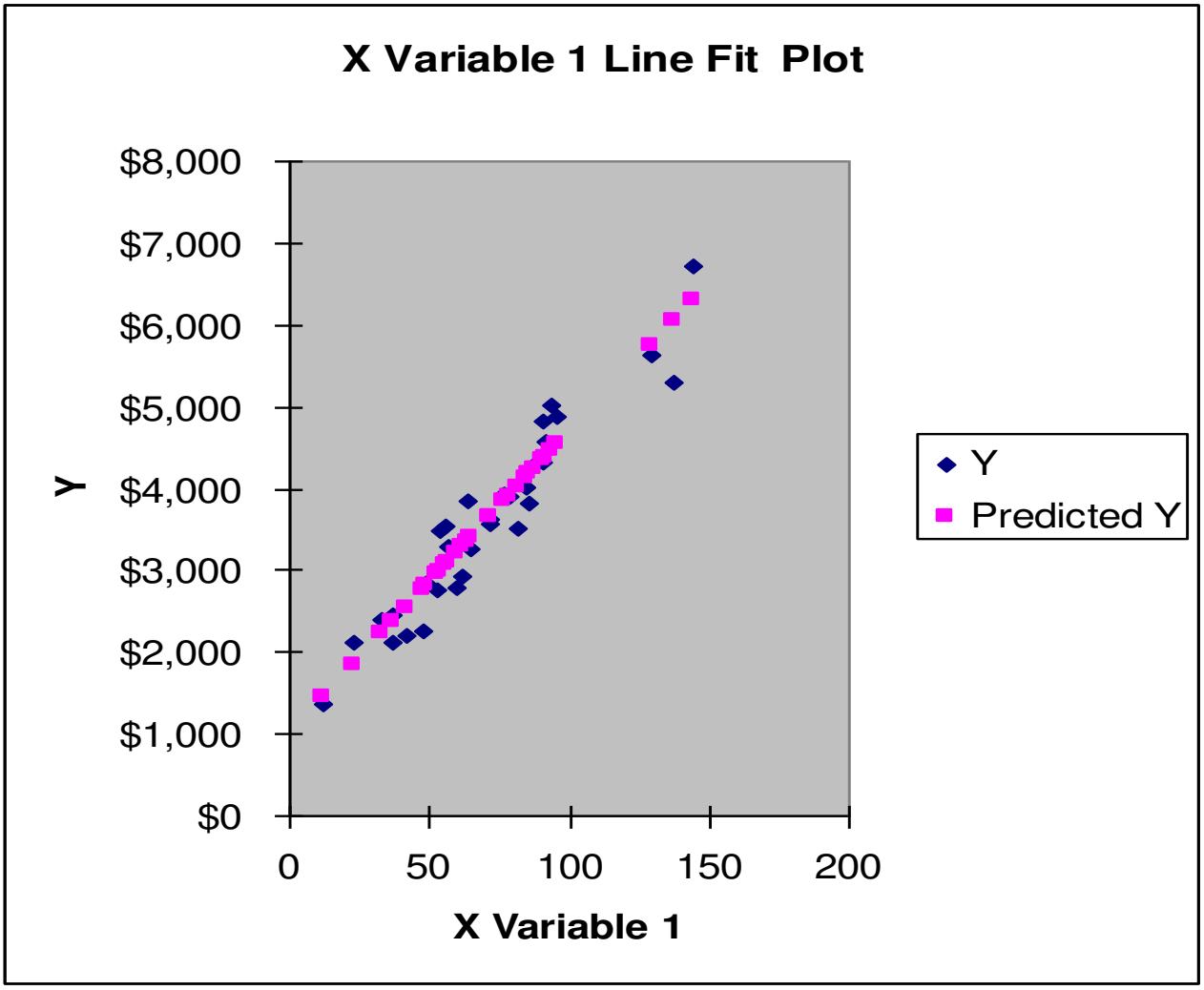
PROBLEM 2-28B (cont.)



Fixed cost = $1,002 (rounded)
Variable cost per machine hour = $36.82 (rounded)

c. The R^2 statistic is 0.91936. This means that approximately 92% of the variation of the cost of supplies (dependent variable) can be explained by variation in the number of machine hours (independent variable).

d. Outliers in the data set can skew the cost estimates. A visual fit scattergraph highlights the outliers so that analysts can adjust for their impact.

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PROBLEM 2-28B (cont.)

e. Total cost = $1,002 + ($36.82 x 100) = $4,684

Total cost = Fixed cost + (Variable cost per machine hour x Number of machine hours)

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SOLUTIONS TO ANALYZE, THINK, COMMUNICATE - CHAPTER 2

ATC 2-1

a. Delta experienced a 5.8% increase in revenue ([$47,007– $44,438] ÷ $44,438). This increase in revenue produced a 25.7% increase in operating income ([$6,618 – $5,264] ÷ $5,264), suggesting that the company experienced operating leverage. Home Depot experienced a 1.9% increase in revenue ([$110,225– $108,203] ÷ $108,203) that produced a 2.0% increase in operating income ($15,843 – $15,530] ÷ $15,530). The change in income relative to the change in revenue is much higher for Delta [25.7% ÷ 5.8% = 4.43] than for Home Depot, [2.0% ÷ 1.9% = 1.05]. This shows that for this fiscal year, Delta's operating leverage is higher than Home Depot's.

b. Many rational explanations are possible. However, the student's answer should in some fashion make note of the fact that Delta must have a higher portion of fixed costs versus variable costs than Home Depot. A logical explanation is that Delta has a lot of fixed cost compared to its variable costs. The cost of an airplane is much higher than the cost of food served to a passenger, and the sized of the flight crew is not based on the number of passengers on a particular flight. A high percent of Home Depot's expenses consists of cost of goods sold, which are variable in relation to sales.

c. If each company experienced a 5% increase in revenues, an investor should expect Delta to have the greatest percentage increase in operating income, assuming neither company experiences a significant increase in fixed costs.

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ATC 2-2 Group Assignment

a.

Revenue ($28 x 500)	$14,000
Cost of speaker*	10,000
Net income	$ 4,000

*With an audience of 500, the cost of the speaker is the same whether a fixed fee ($10,000) is paid or a fee of $20 per ticket sold is paid ($20 x 500 = $10,000).

b. Group Task (1) Assuming growth of 10% in revenue and speaker's fee is fixed at $10,000.

Revenue	$14,000	x 1.10 =	$15,400
Cost of speaker	10,000		10,000
Net income	$ 4,000		$ 5,400

Growth in net income is 35% [($5,400 – $4,000) / $4,000]

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Group Task (2) Assuming a decline of 10% in revenue and speaker's fee is fixed at $10,000.

Revenue	$14,000	x 0.90 =	$12,600
Cost of speaker	10,000		10,000
Net income	$ 4,000		$ 2,600

Decline in net income is 35% [($2,600 – $4,000) / $4,000]

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ATC 2-2 Group Assignment (continued)

Group Task (3) Assuming growth of 10% in revenue and speaker's fee is variable at $20 per unit (500 x 1.10 x $20 = $11,000):

Revenue	$14,000	x 1.10 =	$15,400
Cost of Speaker	10,000		11,000
Net Income	$ 4,000		$ 4,400

Growth in net income is 10% [($4,400 – $4,000) / $4,000]

Group Task (4) Assuming a decline of 10% in revenue, speaker's fee is variable at $20 per unit (500 x 0.90 x $20 = $9,000):

Revenue	$14,000 x	0.90 =	$12,600
Cost of speaker	10,000		9,000
Net income	$ 4,000		$ 3,600

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Decline in net income is 10% [($3,600 – $4,000) / $4,000]

c. In-class assignment requiring no written solution.

d.

(1) A fixed cost structure provides greater growth potential in profitability due to operating leverage.

(2) A fixed cost structure faces the greater risk of declining profitability due to operating leverage.

(3) A fixed cost structure should be used if volume of sales is expected to increase.

(4) A variable cost structure should be used if volume of sales is expected to decline.

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ATC 2-3

a. Change in sales from 2018 to 2020:	**$ 32,655***
Sales of 2018	**$110,360**
= % increase in sales	**29.6%**

*** ($143,015 - $110,360 = $32,655)**

Change in earnings from continuing operations from 2018 to 2020:	**$17,901***
Earnings from continuing operations of 2018	**$35,058**
= % decrease in operating earnings	**51.1%**

*** ($52,959 - $35,058 = $17,901)**

b. Fixed costs would best explain why the percentage increase in income was greater than the percentage increase in sales.

c. Research and development costs should not vary with the number of units produced and sold. Therefore, these costs would be considered fixed in the context of the number of units sold.

d. Research and development costs probably would vary with the number of new products being developed. Therefore, these costs would be considered variable in the context of the number of products developed. (In reality, these cost probably would be mixed, but the way the question is worded, "variable" is an acceptable answer.)

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ATC 2-4 Writing Assignment

The memo should give recognition to the use of an average cost that is based on annual expectations rather than monthly expectations. The average annual fixed cost per visit is $12.80 per visit [($300 rent + $180 other) x 12 ÷ 450 visits = $12.80). Total cost per visit amounts to $22.80 ($12.80 fixed + $10 variable). A price of $22.80 would spread all costs evenly throughout the year. While Dr. Sterling may lose money in the months of low volume she will earn enough in the months of high volume to break even. As a result, service for the year will be provided at cost.

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ATC 2-5 Ethical Dilemma

a.

Accounting period	Year 1	Year 2
Amount of Scientific seed sold in pounds(a)	2,400,000	1,300,000
Royalty per pound (b)	$0.50	$0.50
Total royalty paid (a x b)	$1,200,000	$650,000

Total cost savings:	
Year 1 royalty payment	$1,200,000
Less: Year 2 royalty payment	650,000
Royalty cost savings	550,000
Less: cost of ad campaign	100,000
Total savings for World Agra	$ 450,000

World Agra's sales revenue remained the same in the second year after Mr. Borrough's new policy. However, World Agra paid $550,000 less royalty to Scientific Associates after spending $100,000 on the ad campaign. These events increased World Agra's net income by $450,000.

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b. World Agra's customers and society in general suffered from the move to promote the Bio Labs seed. The Scientific Associates seed would have produced greater yields and better flavor.

c. While it could be argued that Mr. Borrough's actions violated some of the ethical standards such as engaging in activities that would discredit the profession, it is highly unlikely that such argument would prevail if he were charged with an ethics violation. Mr. Borrough acted in the financial interest of his company and his conduct did not blatantly violate any of the standards of ethical conduct. While he may have pushed the envelope, Mr. Borrough's behavior would most likely be viewed as in compliance with contemporary ethical standards.

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ATC 2-5 Ethical Dilemma (continued)

d. (This requirement asks for the opinion of the respondent. There is no right or wrong response.)

e. The Sarbanes-Oxley Act requires public companies to set up a code of ethics. Mr. Borrough's action may have violated the company's code of ethics and, in turn, may have infringed the law. However, the unethical behavior is not a criminal offense under the law.

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ATC 2-6

Screen capture of cell values:

Microsoft Excel - ch02-working.xls

	A	B	C	D	E	F	G	H	I	J	K	L
1	ATC 2-6					Name:						
2												
3			Rental		Miles							
4			Cost		Driven							
5		High	$ 1,500		1,000							
6		Low	1,380		600							
7		Difference	$ 120		400							
8												
9		Variable cost per mile =			Change in total cost/Change in miles							
10		Variable cost per mile =			$ 0.30 per mile							
11												
12		Fixed cost =	Total cost - Variable cost									
13		Fixed cost =	$ 1,200									
14												
15												
16		Predicted cost =	$ 1,200 +		$ 0.30 per mile x predicted milaege							
17												
18	If predicted mileage is:		700									
19												
20		Predicted cost =	$ 1,410									
21												
22												
23												
24												
25												
26												
27												
28												

Sheet1 / Sheet2 / Sheet3

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ATC 2-6 (continued)

Screen capture of cell formulas:

Microsoft Excel - ch02-working.xls

	A	B	C	D	E	F
1	ATC 2-6					Name:
2						
3			Rental		Miles	
4			Cost		Driven	
5		High	1500		1000	
6		Low	1380		600	
7		Difference	=C5-C6		=E5-E6	
8						
9		Variable cost per mile =			Change in total cost/Change in miles	
10		Variable cost per mile =			=C7/E7	per mile
11						
12		Fixed cost =	Total cost - Variable cost			
13		Fixed cost =	=E10*-E5+C5			
14						
15						
16		Predicted cost =	=C13	+	=E10	per mile x predicted milaege
17						
18	If predic		700			
19						
20		Predicted cost =	=C18*E16+C16			
21						
22						
23						
24						
25						
26						
27						
28						

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ATC 2-7

Screen capture of cell values:

Microsoft Excel - ch02-mastering.xls

ATC 2-7 Name:

Contribution Margin Format Income Statement

Sales revenue	(	9,000	x	$75	)		$675,000
Variable expenses							
Cost of goods sold	(	9,000	x	$50	)	$450,000	
Sales commissions	(	9,000	x	$ 2	)	18,000	
Shipping expenses	(	9,000	x	$ 3	)	27,000	495,000
Contribution margin							$180,000
Fixed expenses							
Administrative salaries						$ 70,000	
Advertising						20,000	
Rent						30,000	120,000
Net income							$ 60,000

Operating leverage 3.00

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ATC 2-7 (continued)

Screen capture of cell formulas:

Microsoft Excel - ch02-mastering.xls

	A	B	C	D	E	F	G	H	I	J	K	L
1	ATC 2-7								Name:			
2												
3												
4		**Contribution Margin Fo**										
5												
6		Sales revenue		(	9000	x	75	)			=E6*G6	
7		Variable expenses										
8			Cost of goods sold	(	=E6	x	50	)	=E8*G8			
9			Sales commissions	(	=E6	x	2	)	=E9*G9			
10			Shipping expenses	(	=E6	x	3	)	=E10*G10		=SUM(I8:I10)	
11		Contribution margin									=K6-K10	
12		Fixed expenses										
13			Administrative salaries						70000			
14			Advertising						20000			
15			Rent						30000		=SUM(I13:I15)	
16		Net income									=K11-K15	
17												
18												
19		Operating leverage									=K11/K16	
20												
21												
22												
23												
24												
25												
26												
27												
28												

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SOLUTION TO COMPREHENSIVE PROBLEM - CHAPTER 2

Requirement a

Review the accounting events experienced by Magnificent Modems, Inc. during its Year 1 accounting period. Identify each cost incurred by the company as (1) fixed versus variable relative to the number of units produced and sold; and (2) product versus general, selling and administrative (G, S, and A).

The solution for the first item is shown as an example below.

Cost Item	Fixed	Variable	Product	S, G, & A
Depreciation on manufacturing equipment	X		X	
Direct materials		X	X	
Direct labor		X	X	
Manufacturing supplies		X	X	
Rent on manufacturing facility	X		X	
Sales commissions		X		X
Depreciation on administrative equipment	X			X
Administrative costs (rent and Salaries)	X			X

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COMPREHENSIVE PROBLEM (continued)

Requirement b

Replace the question marks in the following table to indicate the product cost per unit assuming levels of production of 5,000, 6,000, 7,000 and 8,000. Use the power of Excel to perform the division necessary to determine the cost per unit amounts shown in the bottom row of the table.

Cost of goods sold*			$455,000	$524,000	$593,000	$662,000	
Divided by number of units			5,000	6,000	7,000	8,000	
Cost per unit			$91	$87.33	$84.71	$82.75	(rounded)

*Fixed cost of goods sold = $60,000 (Depreciation on manuf. equip.) + $50,000 (Rent on manuf. facility) = $110,000

Variable cost / unit = ($455,000 – $110,000) ÷ 5,000 = $69 / unit

Cost of goods sold at 6,000 units = $69 x 6,000 + $110,000 = $524,000
Cost of goods sold at 7,000 units = $69 x 7,000 + $110,000 = $593,000
Cost of goods sold at 8,000 units = $69 x 8,000 + $110,000 = $662,000

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