Answer to Questions

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.**

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.**

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 it 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.

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 in-

crease 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.

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.

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 operations 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.

Exercise 2-1A

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

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	

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

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

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.

Exercise 2-6A

a.

Number of Units	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 unit	$20.00	$17.50	$16.00	$15.00

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

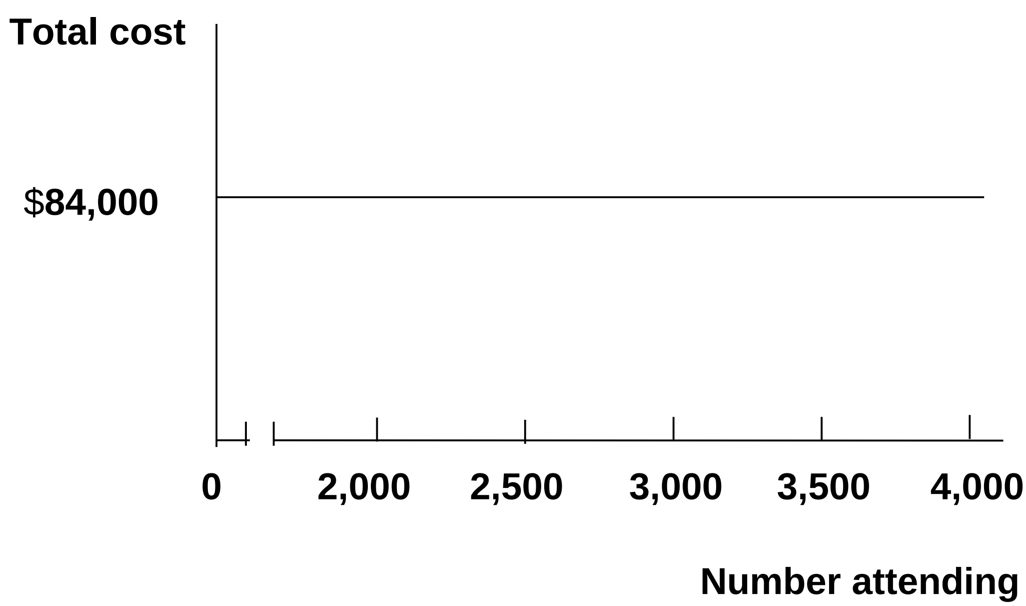
Exercise 2-7A

a.

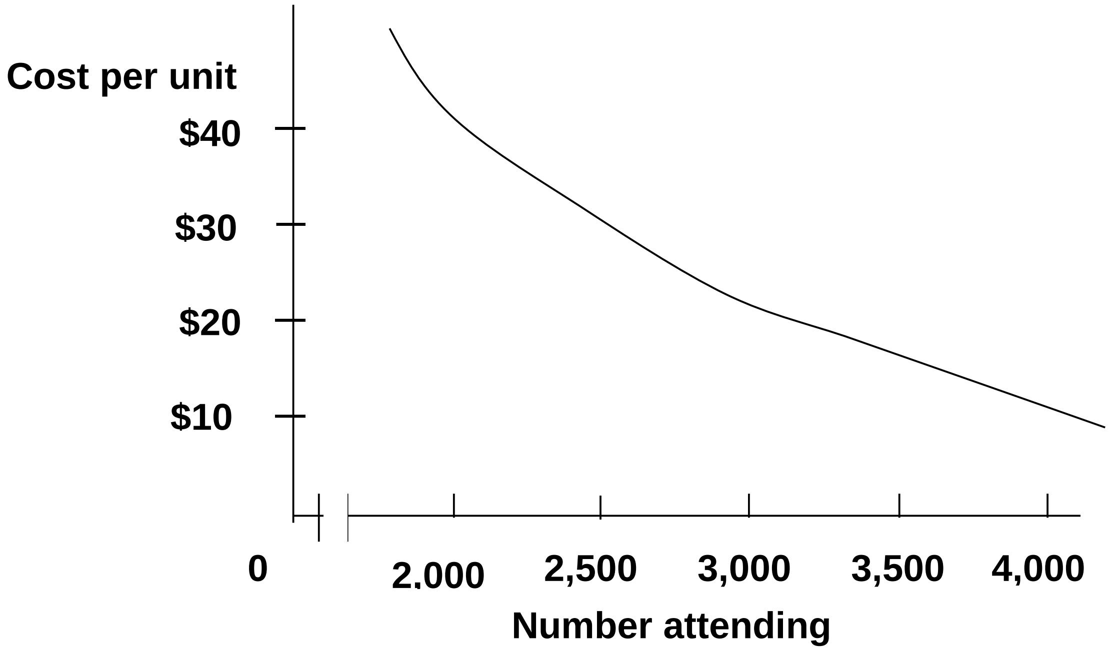
Number Attending (a)	2,000	2,500	3,000	3,500	4,000
Total cost of concert (b)	$84,000	$84,000	$84,000	$84,000	$84,000
Cost per person (b) ÷ (a)	$42.00	$33.60	$28.00	$24.00	$21.00

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

c.



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.

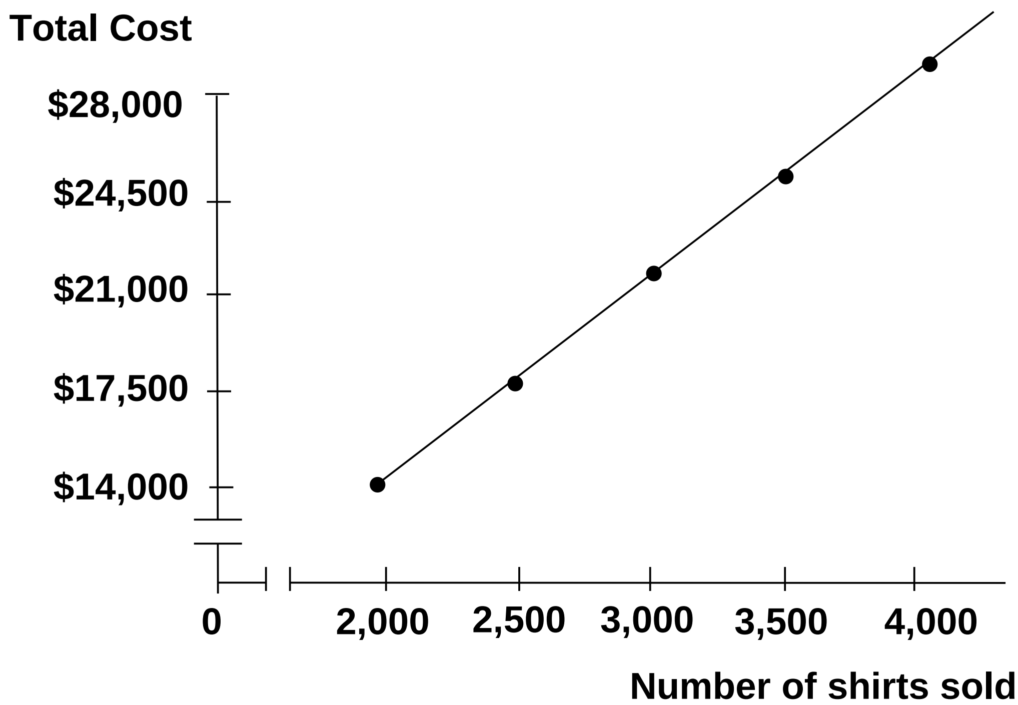
Exercise 2-8A

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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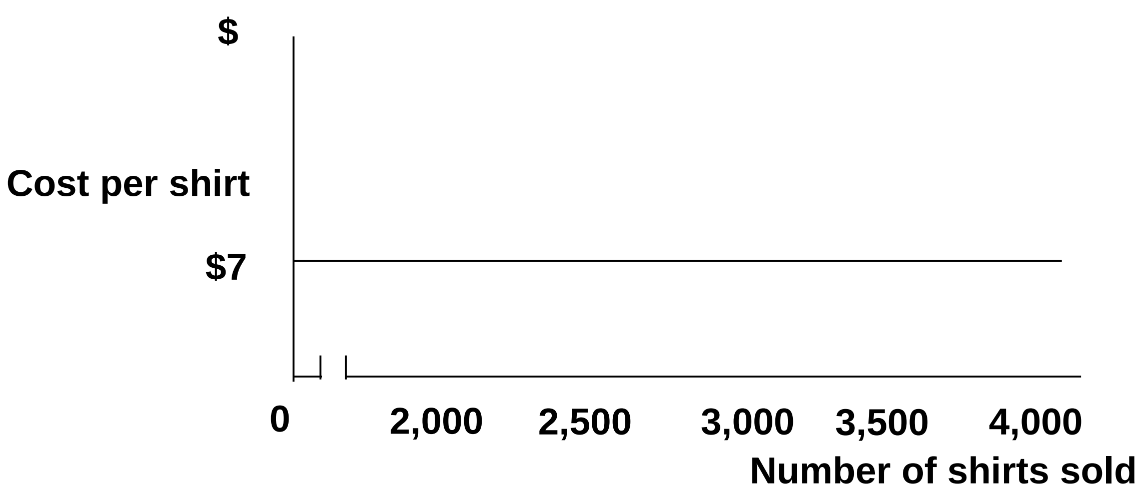


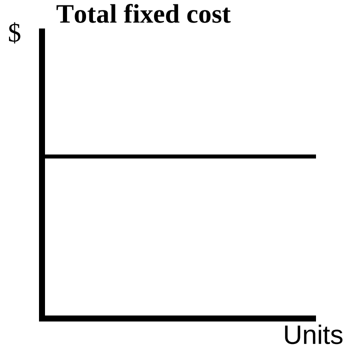
Exercise 2-8A (continued)

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.**

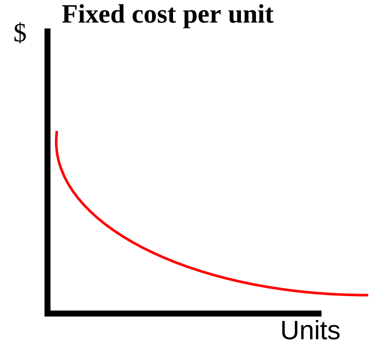
Bell's other business risks that may adversely affect its profit include competition and unfavorable general economy.

Exercise 2-9A

a. **Total fixed cost**

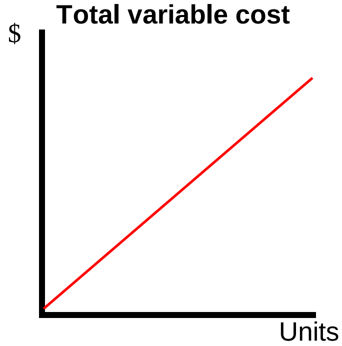


b. **Fixed cost per unit**

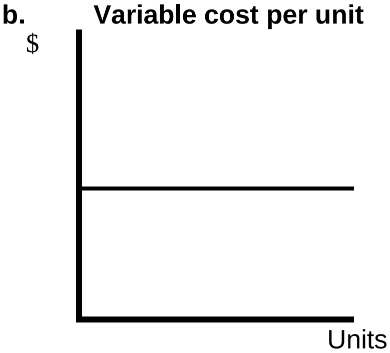


Exercise 2-10A

a. **Total variable cost**



b. **Variable cost per unit**



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 of 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

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)
Variable cost (n x $0)	0	
Contribution margin	48,000	(8,000)
Fixed cost	(28,000)	0
Net income	$20,000	$ (8,000)

Exercise 2-12A (continued)

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.

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.

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

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

Exercise 2-13A (continued)

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)].

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%

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

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

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 scattergraph 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.

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	

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.

Problem 2-18A (continued)

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

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.

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

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

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

Problem 2-20A (continued)

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.

Problem 2-21A

Part 1

a. Since the <u>total</u> 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.

Part 2

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

Problem 2-21A (continued)

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%

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 Attempting to Attend	18	20	22
Number of students accepted (a)	18	20	20
Total cost of workbooks (b=[20 x $30])	$600	$600	$600
Cost per student (b ÷ a)	33.33	30	30

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. **FTS 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, 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.**

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.

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

Problem 2-22A (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.

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%

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

Problem 2-23A (continued)

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%)

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, 2017

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.

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).

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.

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.

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, 2017

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.

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.

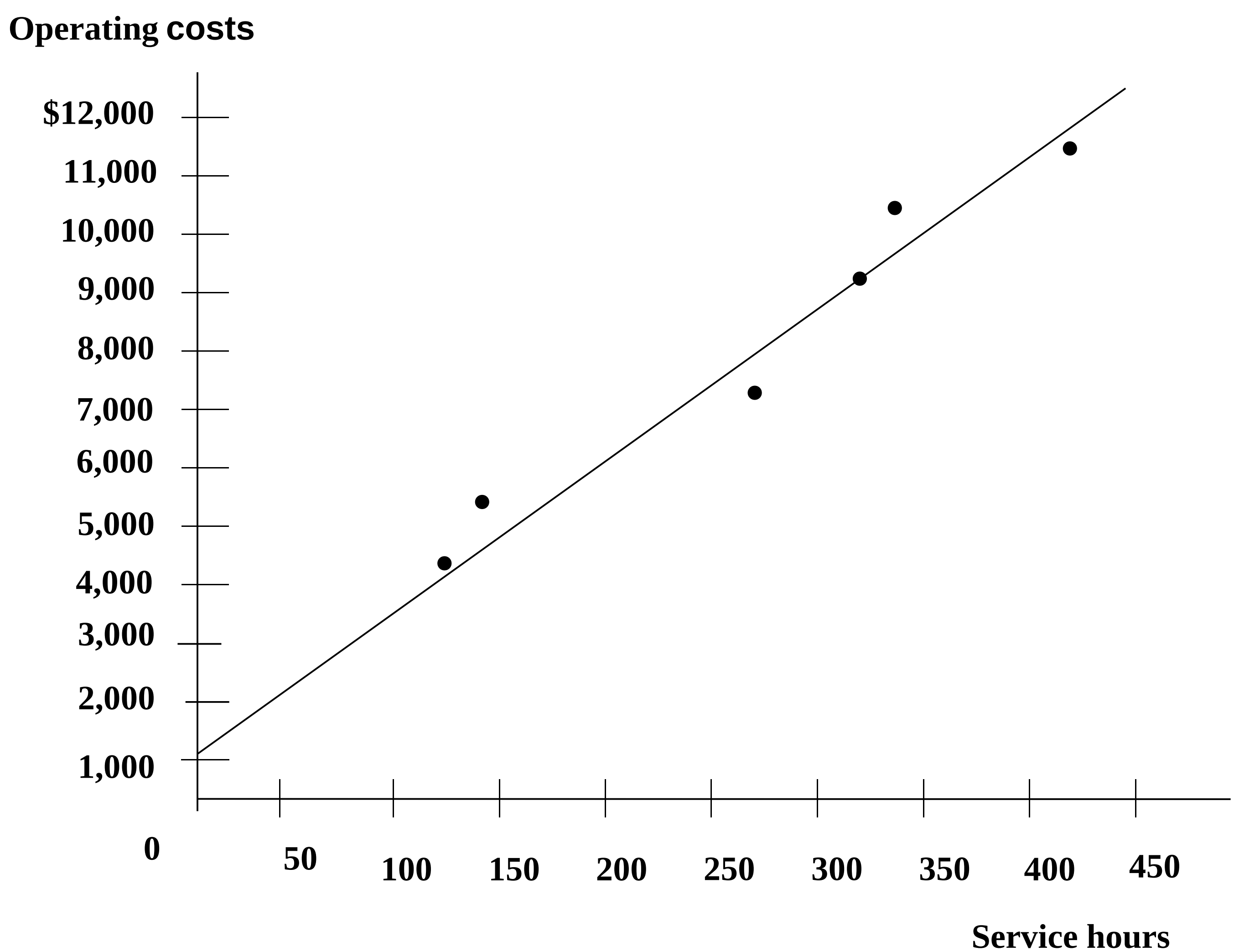
Month		Operating Costs		Service Hours		Variable Cost/Unit
Oct.	High	$11,200		420		
July	Low	4,300		120		
Difference		$6,900	÷	300	=	$23/hour

Fixed cost = $11,200 – ($23 x 420) = $1,540 or,
= $4,300 – ($23 x 120) = $1,540

c. Contribution margin per hour = $50 – $23 = $27

Problem 2-26A (continued)

d.



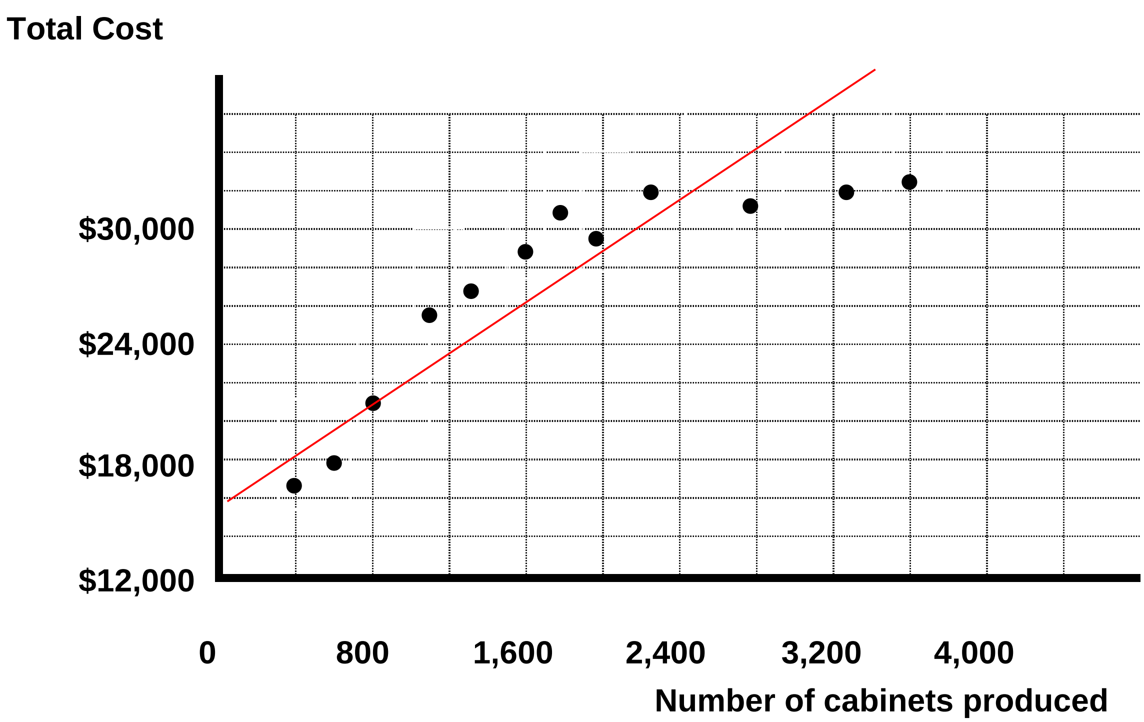
e. **The results of the two methods are very similar. In Requirement b, the high-low method relies on the relationship between the highest point and the lowest point to define the variable cost and the fixed cost. In Requirement d., the scattergraph method relies on human observation to fit a straight 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 greater than that determined in the high-low method. The fixed cost determined in the scattergraph is $1,200 which is lower than $1,540 determined in the high-low method.**

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

a (2&3).



Problem 2-27A (continued)

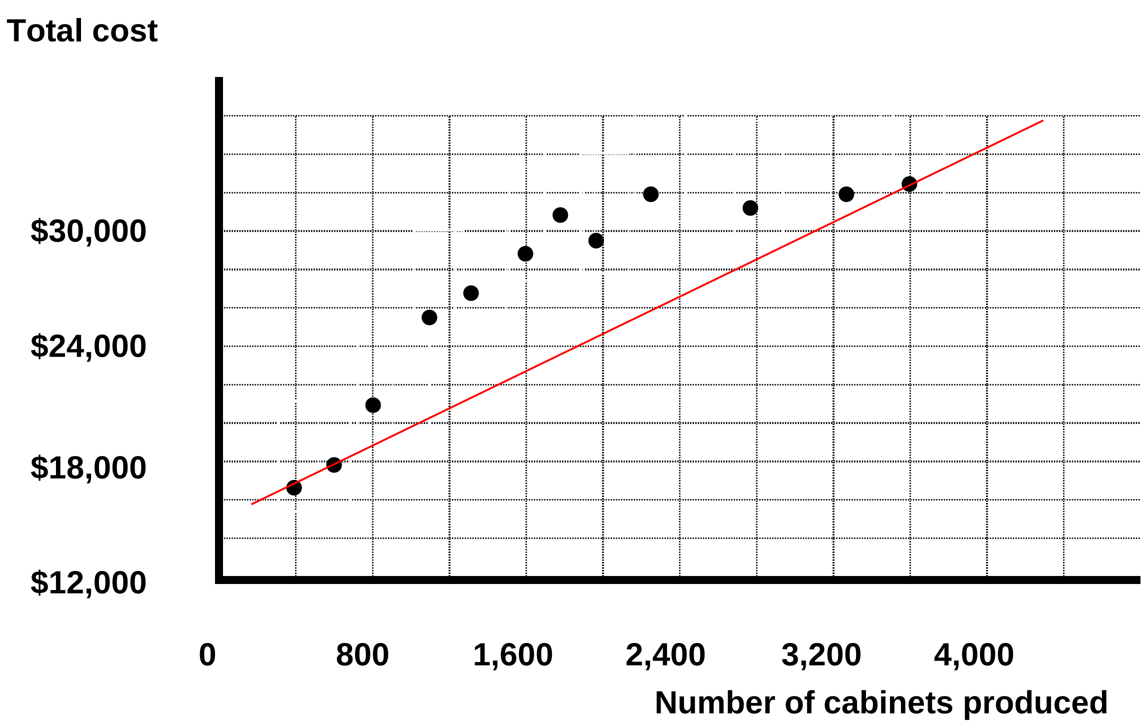
a (4). The total cost of producing 2,000 units should be about $29,000.

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).



Problem 2-27A (continued)

b (4). Total cost = Fixed cost + (Variable cost per unit x Number of cabinets)
Total cost = $14,500 + ($5x 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.

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			

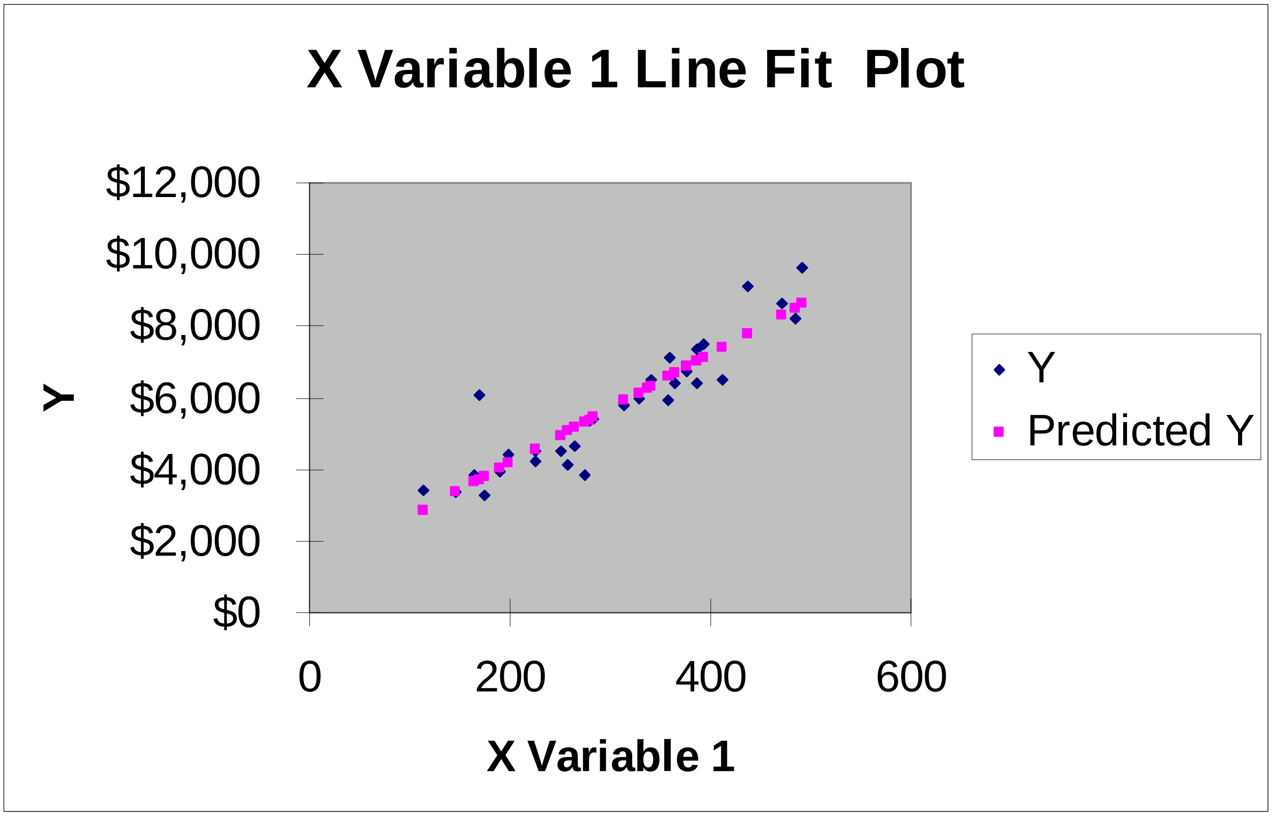
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	1142.01	409.633	2.7879	0.00927	304.22	1979.81	304.22	1979.81
X Variable 1	15.1942	1.27274	11.9382	1E-12	12.5911	17.7972	12.5911	17.7972

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

Problem 2-28A (continued)



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.**

Exercise 2-1B

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

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	

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

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

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 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.

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.

Exercise 2-7B

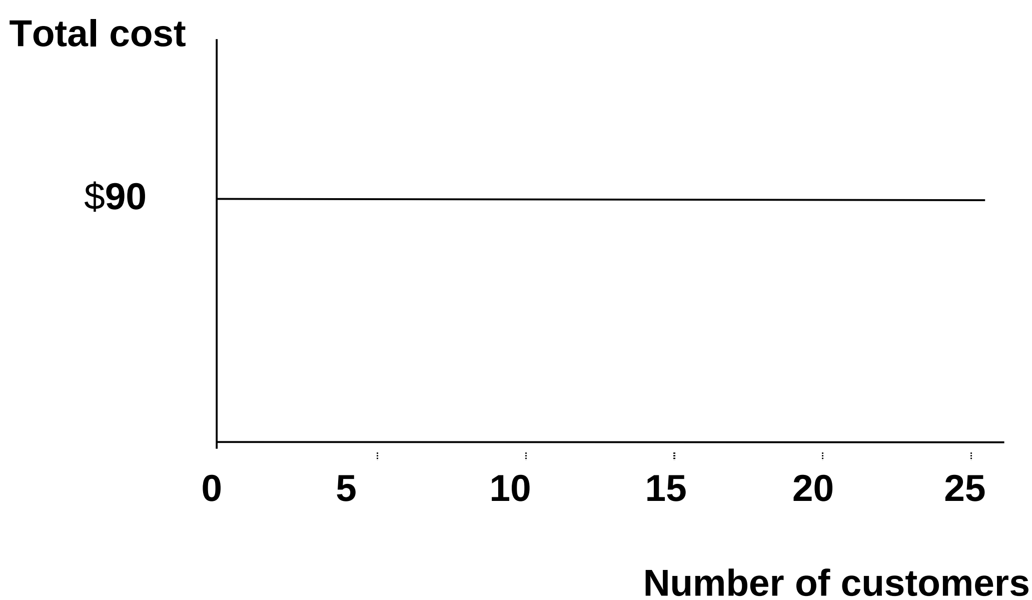
a.

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

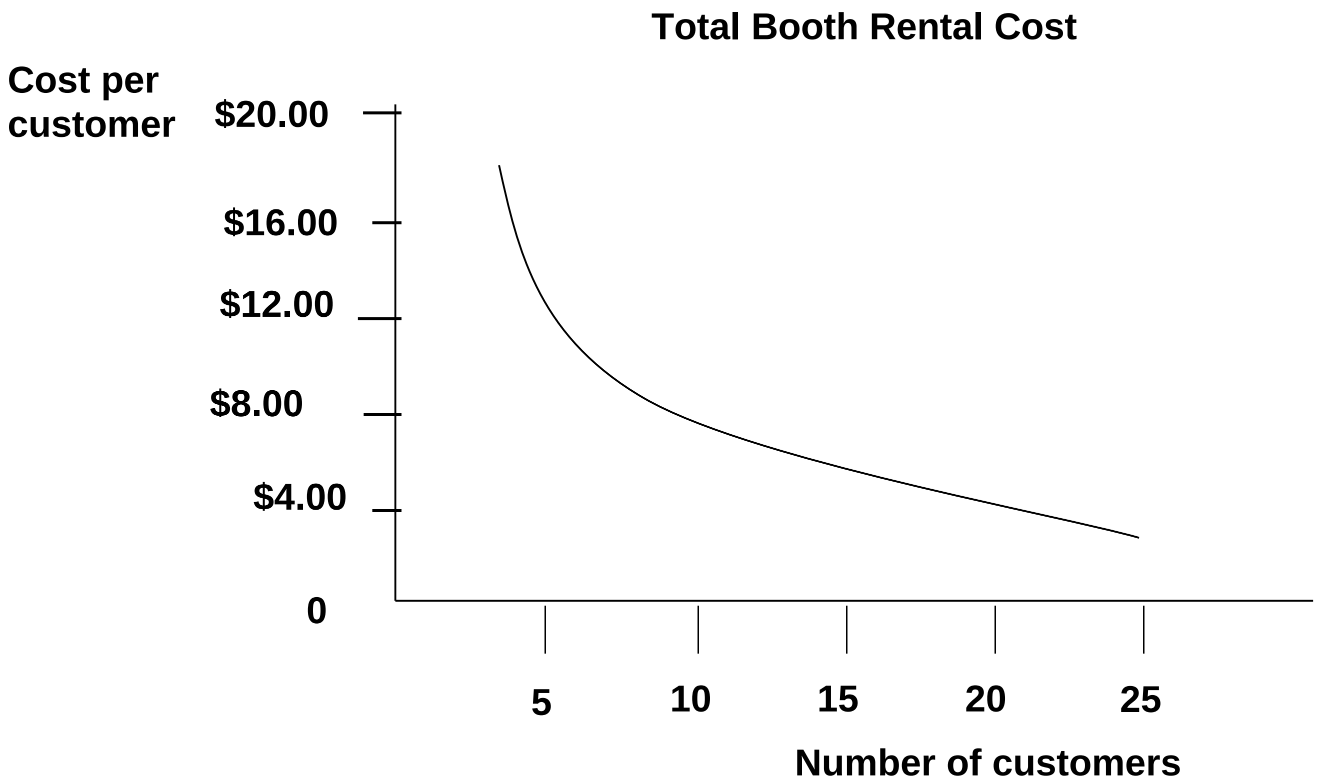
b. Since the cost of renting the booth is $90 regardless of the number of customers, it is a fixed cost.

c.

Total Booth Rental Cost



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 ticket decreases as volume increases, Corder can sell tickets for less if more people have their fortune told. Also, lower ticket 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 (continued)

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.

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.

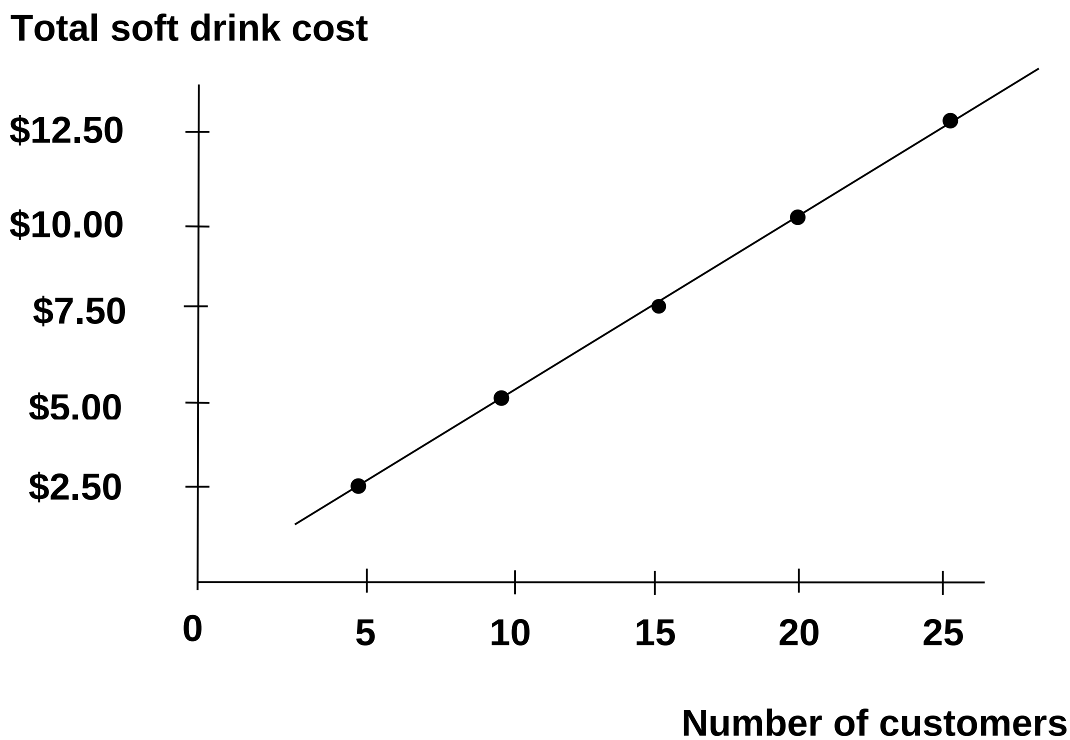
Exercise 2-8B

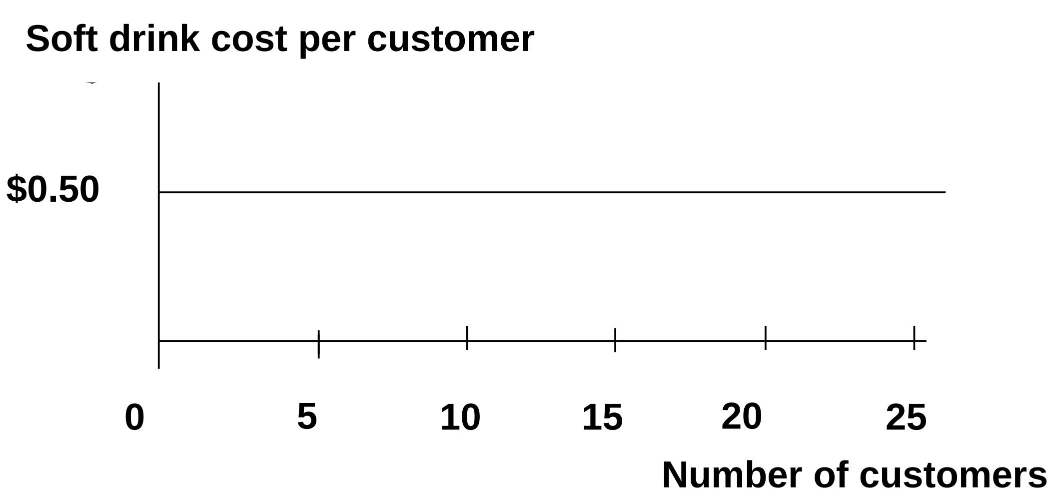
a.

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.



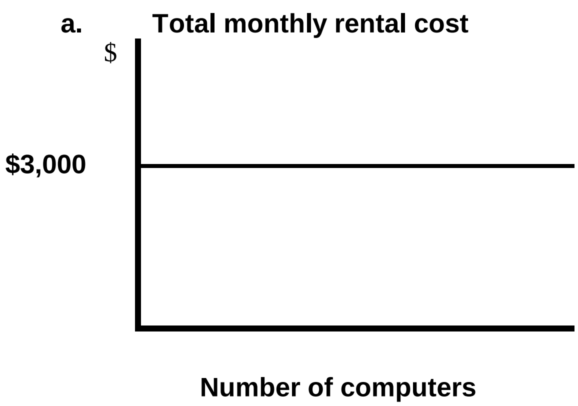


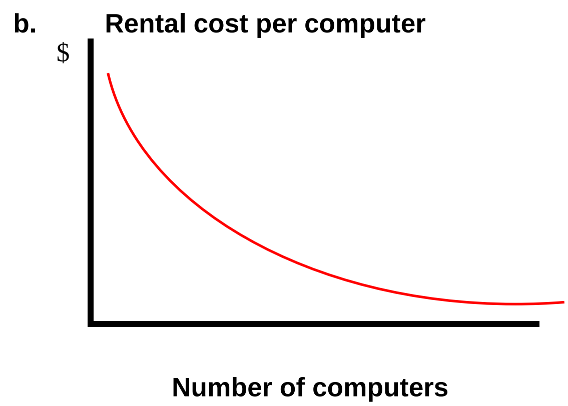
Exercise 2-8B (continued)

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.

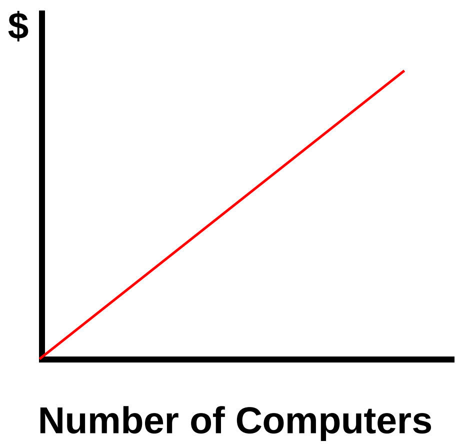
Exercise 2-9B



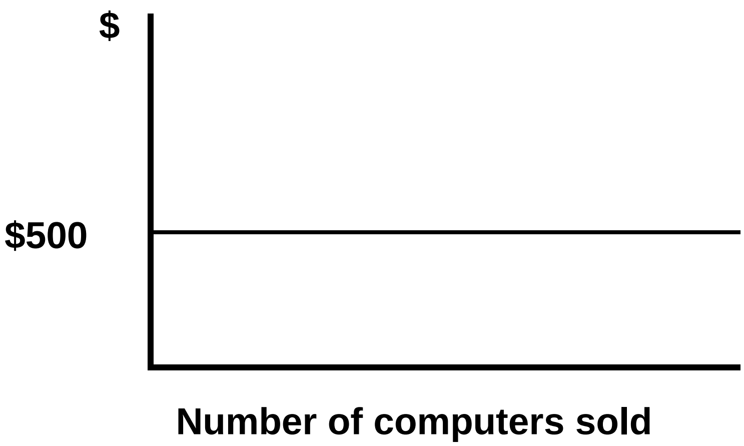


Exercise 2-10B

a. Total product cost



b. Product cost per computer



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

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.

Exercise 2-13B

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.

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

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

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)].

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

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	49,000		42,900
Fixed cost	(26,000)		(26,000)
Net income	$ 13,000	⇒+30%⇒	$ 16,900

($16,900 – $13,000) ÷ $13,000 = 30%

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

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).**

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	

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 (continued)

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

e. The amount of total 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.

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 <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.

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

Problem 2-20B (continued)

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

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.

Problem 2-21B

Part 1

a. Since the <u>total</u> 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. and 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 (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

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 (continued)

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.

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)

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.

Problem 2-22B (continued)

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.

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%

*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%

Problem 2-23B (continued)

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%)

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, 2018

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.

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.

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.**

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.

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, 2018

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.

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

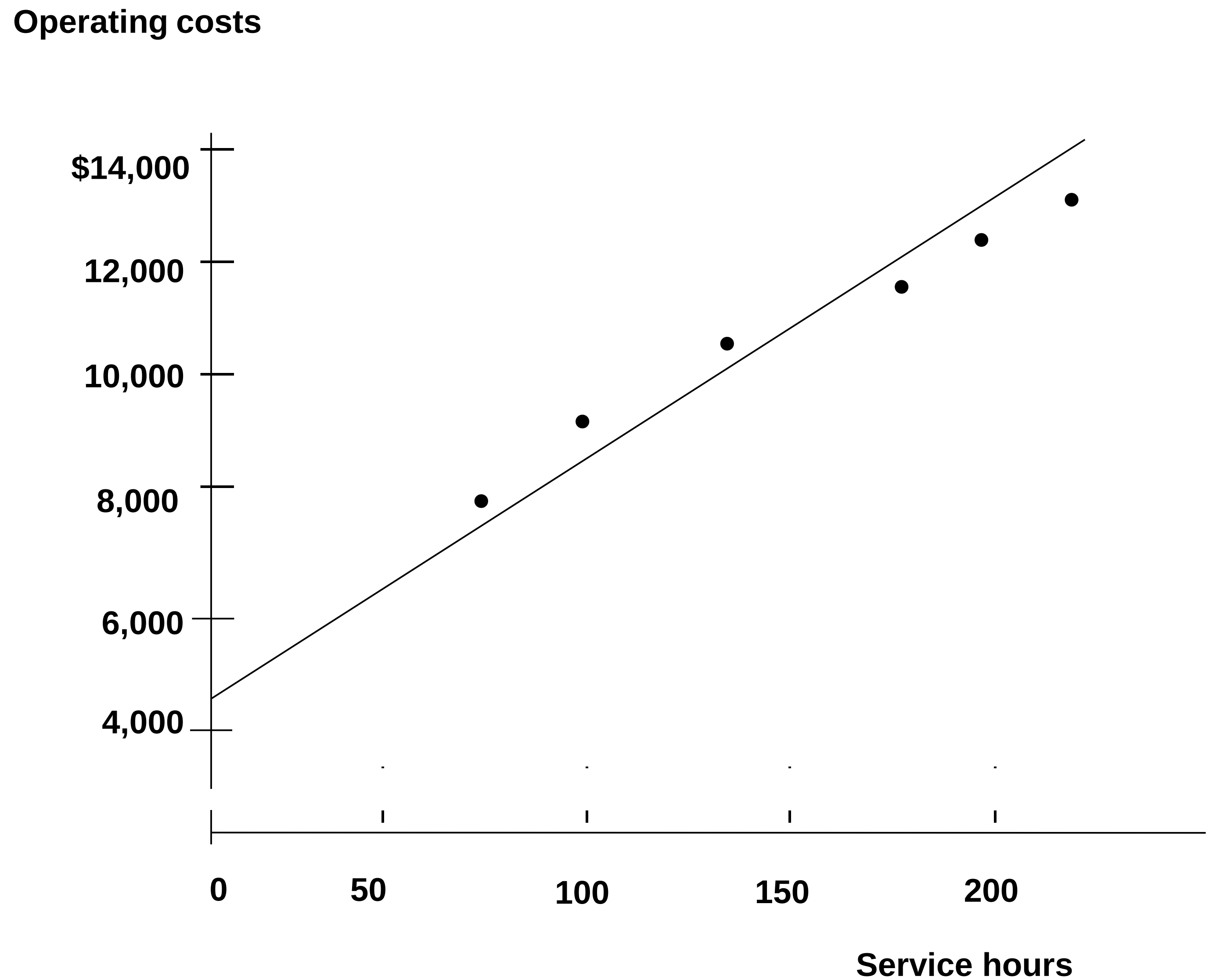
Fixed cost = $11,600 – ($30 x 220) = $5,000 or,

= $7,400 – ($30 x 80) = $5,000

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

Problem 2-26B (continued)

d.



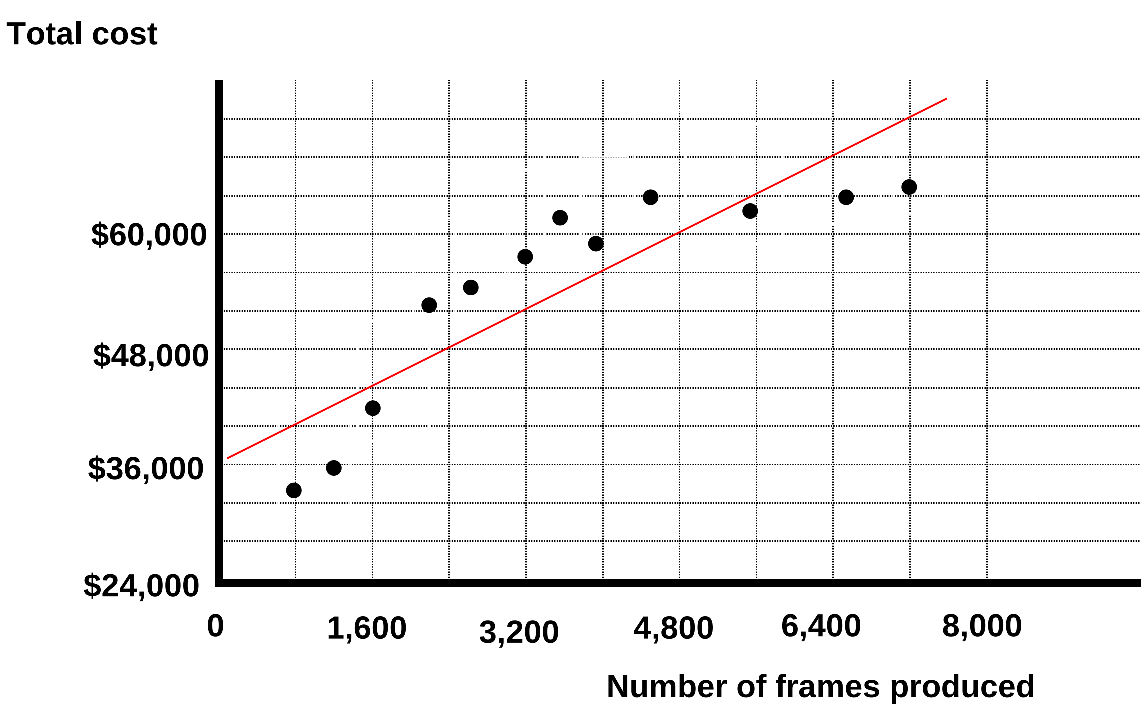
e. The results of the two methods are very similar. In b, the high-low method relies on the relationship between the highest point and the lowest point to define the variable cost and the fixed cost. In d, the scattergraph method relies on human observation to fit a straight line among the six given 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.

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

a (2 & 3).



Problem 2-27B (continued)

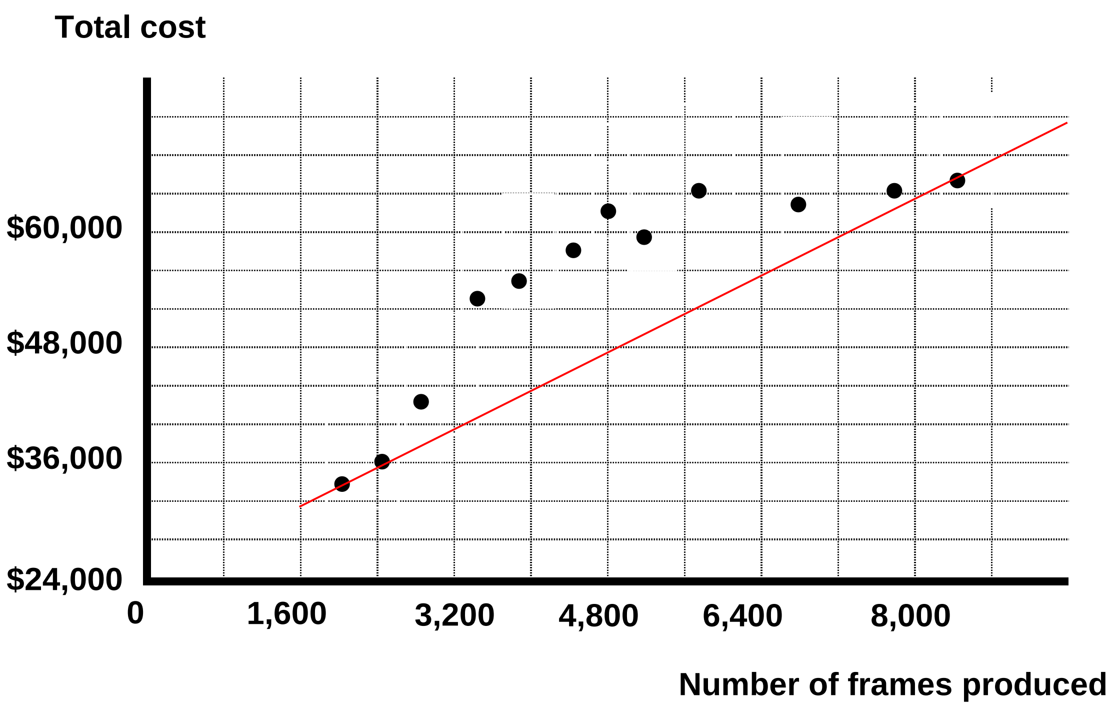
a (4). The total cost of producing 4,000 frames should be about $56,000.

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

b (3).



Problem 2-27B (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 simultaneously effect of a number independent variables as opposed to being limited to a single variable analysis.

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.

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

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			

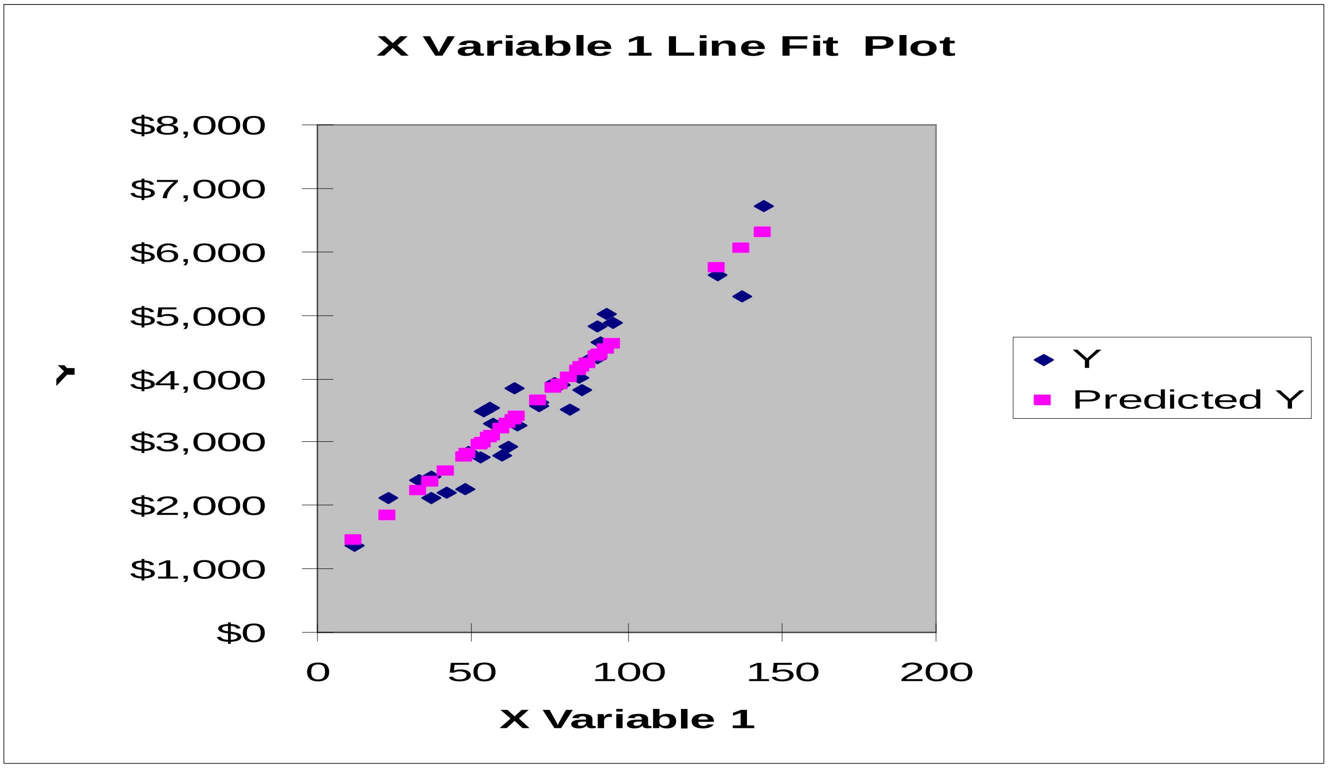
Problem 2-28B (continued)

	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

Problem 2-28B (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 (indepen-den + 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.

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)

ATC 2-1

a. Kroger experienced a 10.3% (i.e., [$108,465– $98,375] ÷ $98,375) increase in revenue. This increase in revenue produced a 15.1% (i.e., [$3,137 – $2,725] ÷ $2,725) change (increase) in operating income, suggesting that the company has a small level of operating leverage. In contrast Caterpillar experienced a 0.8% (i.e., [$55,184– $55,656] ÷ $55,656) change (decrease) in revenue that produced a 5.3% (i.e., [$5,328 – $5,628] ÷ $5,628) decrease in operating income. Given that the change in income relative to the change in revenue is much more dramatic for Caterpillar than for Kroger, Caterpillar's operating leverage is higher than Kroger's. In this situation, the higher level of operating leverage was a disadvantage for Caterpillar.

b. Many rational explanations are possible. However, the student's answer should in some fashion make note of the fact that Caterpillar must have a higher portion of fixed costs versus variable costs than Kroger. A logical explanation is that Caterpillar is a company whose costs include a significant amount of property, plant and equipment, as well as research and development, which are fixed in relation to sales, whereas a high percent of Kroger's expenses consist 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 Caterpillar to have the greatest percentage increase in operating income.

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]

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]

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

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.

ATC 2-3

a. Change in sales from 2013 to 2014: $ 221.2*
Sales of 2013 $3,056.5

= % increase in sales 7.2%

* ($3,277.7 - $3,056.5 = $221.2)

Change in earnings from continuing operations
from 2013 to 2014: $ 98.5*
Earnings from continuing operations of 2013 $586.2

= % decrease in operating income 16.8%

* ($684.7 - $586.2 = $98.5)

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.)

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.

ATC 2-5 Ethical Dilemma

a.

Accounting period	2014	2015
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:	
2014 royalty payment	$1,200,000
Less: 2015 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.

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.

d. (This requirement asks for the opinion of the respondent. There is no right or wrong response.)

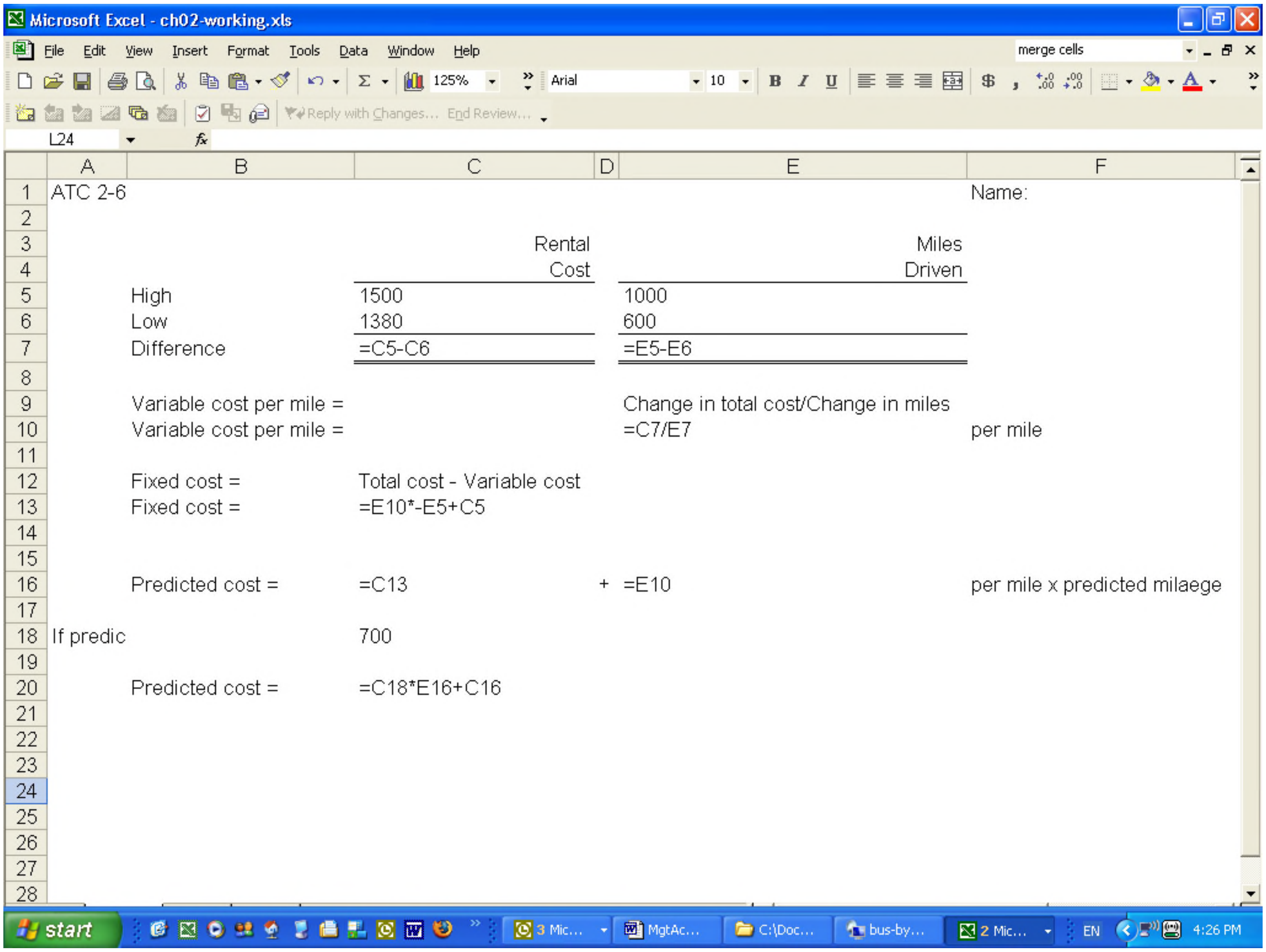
e. The Sarbanes-Oxley Act requires public companies to set up a code of ethics. Mr. Borrough's action may have violated the company's code of ethics and, in turn, may have infringed the law. However, the unethical behavior is not a criminal offense under the law.

ATC 2-6
Screen capture of cell values:

Microsoft Excel - ch02-working.xls

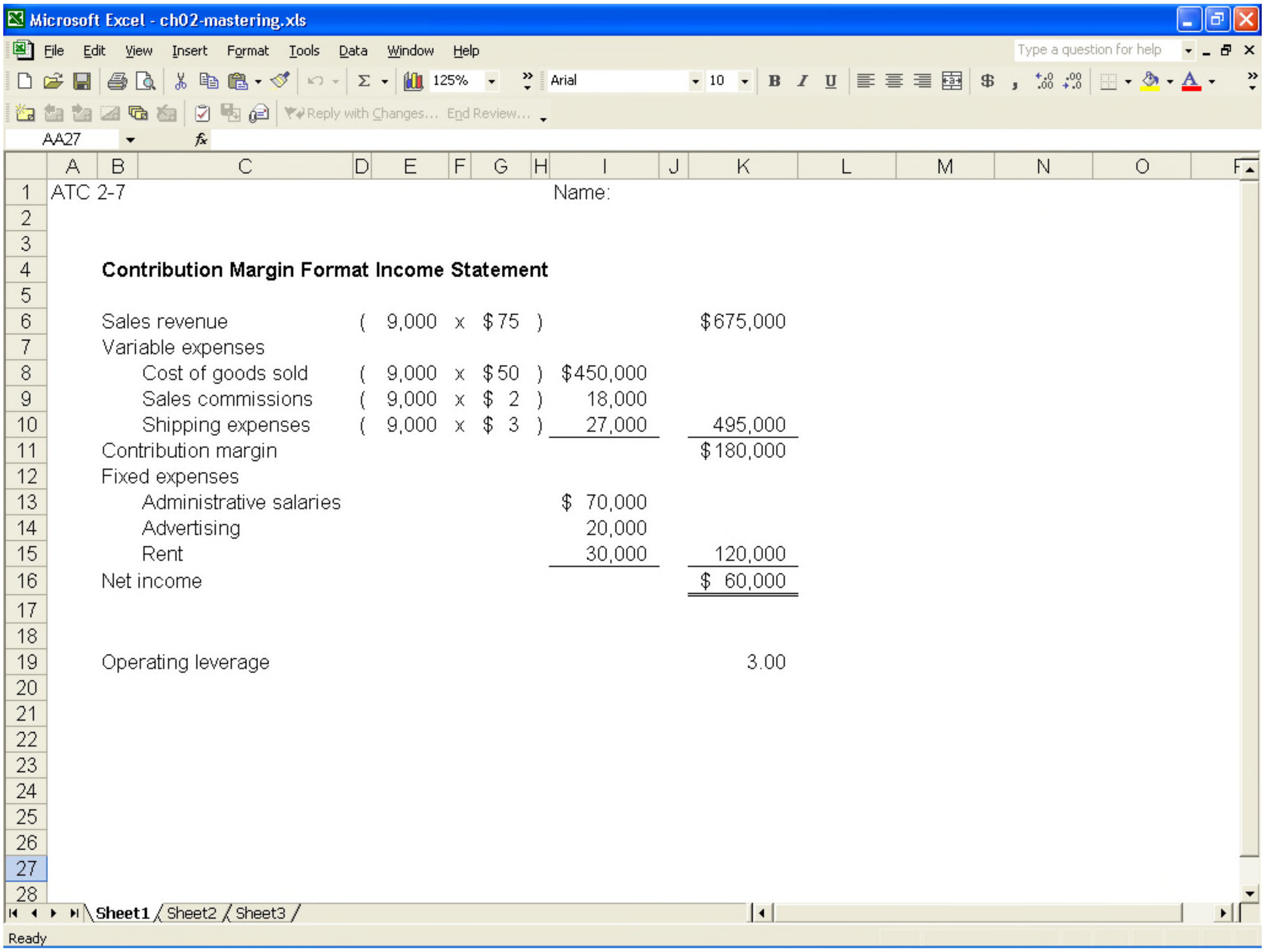
	A	B	C	D	E	F
1	ATC 2-6					Name:
3			Rental		Miles	
4			Cost		Driven	
5		High	$ 1,500		1,000	
6		Low	1,380		600	
7		Difference	$ 120		400	
9		Variable cost per mile =			Change in total cost/Change in miles	
10		Variable cost per mile =			$ 0.30	per mile
12		Fixed cost =	Total cost - Variable cost			
13		Fixed cost =	$ 1,200			
16		Predicted cost =	$ 1,200	+	$ 0.30	per mile x predicted milaege
18	If predicted mileage is:		700			
20		Predicted cost =	$ 1,410			

ATC 2-6
Screen capture of cell formulas



	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			

ATC 2-7
Screen capture of cell values:



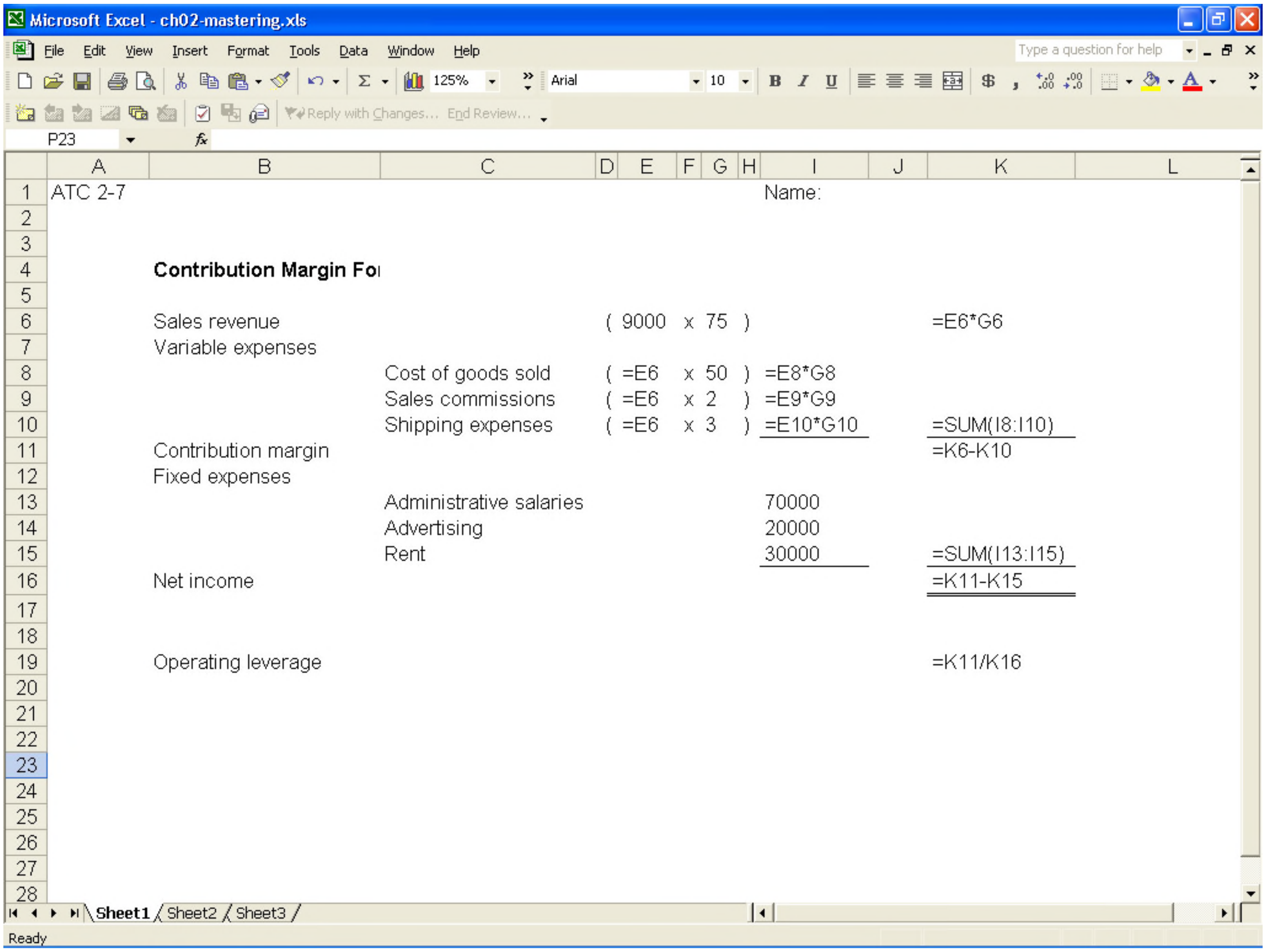
Microsoft Excel - ch02-mastering.xls

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

ATC 2-7
Screen capture of cell formulas:



	A	B	C	D	E	F	G	H	I	J	K
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

Chapter 2 Comprehensive Problem

Requirement a

Review the accounting events experienced by Magnificant Modems, Inc. during its 2017 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.

Cost Item	**Fixed**	**Variable**	**Product**	**G,S,& 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

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

Exercises—Series B

Exercise 2-1B Identifying cost behavior (LO 2-1)

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.

<u>Required:</u>
Classify each of the following costs incurred by Borris Copies as fixed, variable, or mixed:

Requirement	Fixed	Variable	Mixed
a. Lease cost relative to the number of copies made for customers.	x		
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 2-2B Identifying cost behavior (LO 2-1)

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

Units Sold	50	100	150	200	250	Fixed/ variable/ mixed?
a. Depreciation cost per unit	$30.00	$15.00	$10.00	$7.50	$6.00	Fixed
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 2-3B Determining fixed cost per unit (LO 2-1)

Tameron Corporation incurs the following annual fixed production costs:

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

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

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

Exercise 2-4B Determining total variable cost (LO 2-1)

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.

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

Exercise 2-5B Fixed versus variable cost behavior (LO 2-1)

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.

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

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

Exercise 2-6B Fixed versus variable cost behavior (LO 2-1)

Nielsen Chairs Corporation produces ergonomically designed chairs favored by architects. 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	$ 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				
Variable				
Total cost per chair				

*Rounded

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 2-7B Fixed versus variable cost behavior (LO 2-1)

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 2 decimal points.

Number of Customers (a)	5	10	15	20	25
Total Rental Cost (b)					
Cost per customer (b) ÷ (a)					

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?

Exercise 2-8B Fixed versus variable cost behavior (LO 2-1)

In the evenings, Shawn Corder works telling fortunes using his friend Roger 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?

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

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.

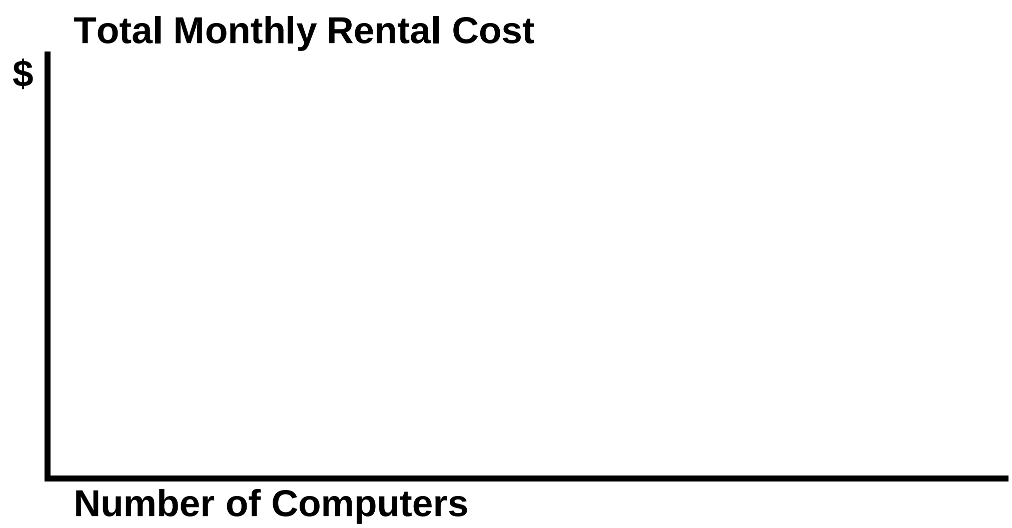
d. Comment on the likelihood that Mr. Corder will incur a loss on this business venture.

Exercise 2-9B Graphing fixed cost behavior (LO 2-1)

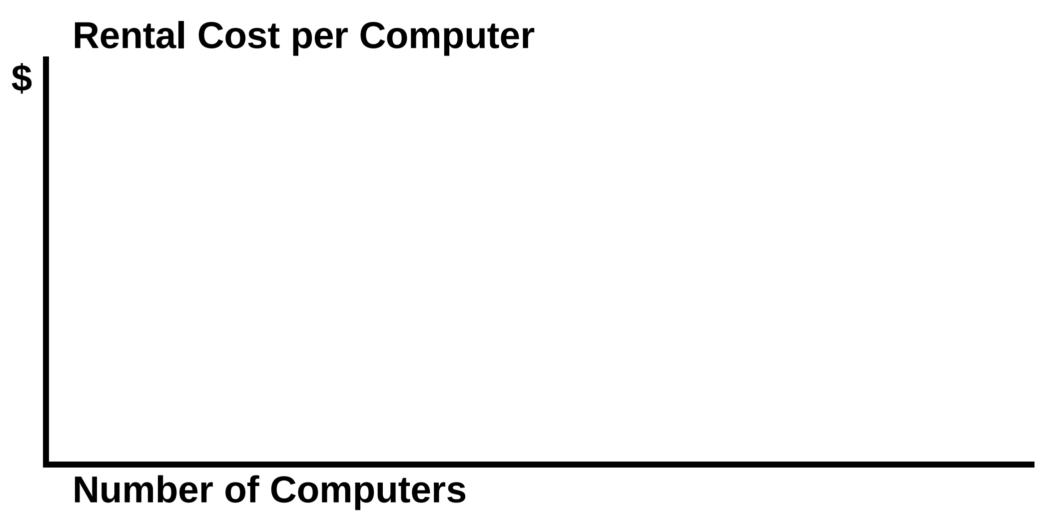
Parry Computers leases space in a mall at a monthly rental cost of $3,000. The following graph setups depict rental cost on the vertical axes and activity level on the horizontal axes:

Required:

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



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



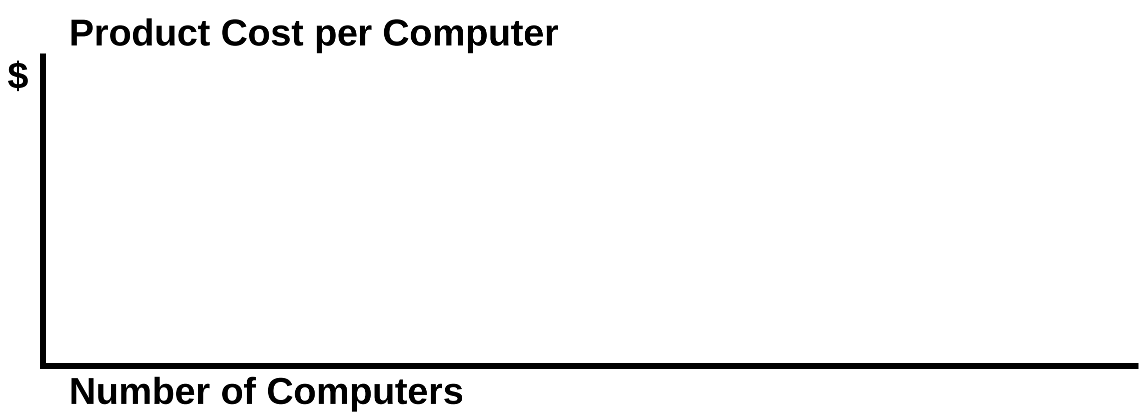
Exercise 2-10B Graphing variable cost behavior (LO 2-1)

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 graph that depicts the relationship between total product cost and the number of computers sold.

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



Exercise 2-11B Mixed cost at different levels of activity (LO 2-1)

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	$50			
Total fixed cost*	45			
Total wages cost	$95			

Exercise 2-12B Effect of cost structure on projected profits (LO 2-1, 2-2)

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 x $160)	$24,000	$ 24,000
Variable cost (a x $90)	N/A	(13,500)
Contribution margin	24,000	10,500
Fixed cost	(13,500)	N/A
Net income (loss)	$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.

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

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

Exercise 2-13B Using a contribution margin format income statement to measure the magnitude of operating leverage (LO 2-3, 2-4)

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

Income Statement	
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:

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

Income Statement		
Sales revenue		
Less: Variable costs		
Cost of goods sold		
Sales commissions		
Shipping and handling expense		
Contribution margin		
Less: Fixed costs		
Administrative salaries expense		
Advertising expense		
Depreciation expense		
Net income		

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 2-14B Assessing the magnitude of operating leverage (LO 2-4)

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.

Annual Income Statements			
Sales volume in units (a)	1,000	% Change	1,100
Sales revenue			
Variable costs			
Contribution margin			
Fixed cost			
Net income			

Exercise 2-15B Averaging costs (LO 2-5)

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 2-16B Estimating fixed and variable costs using the high-low method (LO 2-6)

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.

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.

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 x 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 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.

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 4 people (two parents and the two children) or 6 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 4, 5, or 6 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**

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.

II. Introduce the concept of operating leverage.

A. Copy and distribute **Demonstration Problem 2-1.** This problem is helpful for both LO 2 and LO 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 base measure (revenue or net income at the original estimate of 4,000 patrons) and the alternative measure (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:

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. **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 4, 5, or 6 people.

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

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.

E. **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 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.

F. 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).

G. 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 1, 2, or 3 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**.

III. Income statement under the contribution margin approach.

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.

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 under production. 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.

D. Mixed costs have both fixed and variable cost components. Review examples of mixed costs in Exhibit 2-20 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. 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 1, 2, or 3 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 x b)	**$1,200**	**$2,400**	**$3,600**

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.

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.

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.

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. **Introduce variable cost behavior.** Continue the example.
C. **Contrast managerial versus financial accounting.** The example uses **average cost** rather than **actual cost, future** vs. **historical** cost.
D. **Have students work Exercise 2-6A as an in-class assignment**. This exercise contrasts fixed and variable cost behavior.

II. **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.

III. **Explain relevant range.** What if the kids invite two friends each?

IV. **Applying cost behavior concepts to business decisions.**

Use part a of **Demonstration Problem 2-1**.

V. **Introduce the concept of operating leverage.**

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

VI. **Explain the relationship between risk and reward.**

A. Expand on part b of **Demonstration Problem 2-1**.
B. Have the students work part c of **Demonstration Problem 2-1** to reinforce the fact that fixed and variable cost classifications are context sensitive.

VII. **Illustrate the impact of fixed and variable costs in a competitive business environment. U**se **Demonstration Problem 2-2** as an in-class group exercise to introduce the effect of cost behavior on business strategy.

VIII. **Introduce the contribution margin income statement and the computation of the magnitude of operating leverage.** Use **Demonstration Problem 2-3** to introduce these topics.

IX. **Explain methods of estimating fixed and variable Cost.** Use **Exercise 2-16A** from the textbook as a demonstration problem if you decide to cover the high/low method.

Quiz Questions for Chapter 2

Use the following information to answer the next four questions.

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

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

2. Relative to the number of hot dog 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.

4. The cost of supplies relative to the number of customers served at a particular hot dog cart and relative to the number of customers served by all five of the hot dog 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.

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 2018, 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

Solutions to Quiz Questions

Question	Answer
1	A
2	B
3	C
4	D
5	B
6	C
7	C
8	B
9	C
10	A

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 to patrons books illustrating the artist's work. 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 1, 2, or 3 exhibitions?

Demonstration Problem 2-2 Effect of Cost Structure

Upstream, Inc. / Downstream, Inc.

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.

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.

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 <u>total</u> 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 x c)]	$5,000	$10,000	$20,000
Average Per Unit Book Cost (c)	$5	$5	$5

Type of cost: because the <u>total</u> 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%

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%

Demonstration Problem 2-1 Solution continued

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 <u>total</u> commission cost remains constant at $20,000 regardless of the number of people attending, it is a fixed cost.

c.2.

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

Type of cost: because the <u>total</u> cost changes in direct proportion with the number of exhibitions, it is a variable cost.

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

Demonstration Problem 2-2 Solution

a.

		Upstream, Inc.	Downstream, Inc.
Number of Rafters (a)		4,000	4,000
Revenue ($50 x a)		$200,000	$200,000
Cost of Guides Upstream, Inc.	Fixed	(160,000)	
Cost of Guides Downstream, Inc. ($40 x 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 x a)		$234,000	
Revenue Downstream, Inc. ($50 x a)			$100,000
Cost of Guides Upstream, Inc.	Fixed	(160,000)	
Cost of Guides Downstream, Inc. ($40 x 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 ($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 out of business. Upstream stands to gain an additional $78,000

($39 x 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, 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.

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 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 x a)		$156,000	$156,000
Cost of Guides Upstream, Inc.	Fixed	(160,000)	
Cost of Guides Downstream, Inc. ($40 x a)	Variable		(160,000)
Net Loss		$ (4,000)	$ (4,000)

Demonstration Problem 2-3 Solution

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

Revenue ($10 x 100 deliveries)	$1,000
Variable Expenses ($2 x 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% x 4) increase in net income. Similarly, a 10% decrease in sales will produce a 40% decrease in net income.

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

Revenue ($10 x 110 deliveries)	$1,100
Variable Expenses ($2 x 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.

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			

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:

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:

Demonstration Problem 2-1 Work Papers, continued

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:

c.2.

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

Type of cost:

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			

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.

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:

($_______ – $_______) ÷ $_______ = _____%

Module 2: *How can you promote engagement in your flipped course?*

One of the biggest misconceptions with a flipped class is that it minimizes the role of the instructor. Much of the discussion about flipped classes revolves around video lectures and the technology used to create video lectures. While we agree that videos offer a great format for lecturing, in our experience, the true value of the flipped class is the ability to repurpose class time into a workshop where students learn by doing. No lecture itself can teach accounting. Students learn accounting by doing accounting, and the flipped class model significantly increases the amount of time students spend doing.

The trick is to create a classroom environment where students actively participate in the learning process. We have found that students stay actively engaged when: 1) instructors stay actively involved, and 2) students are held accountable.

Staying Actively Involved

The advantage of the flipped model is that you have the opportunity to connect more directly with your students. Be sure to take advantage of this opportunity. Be aware that students look to you for what is appropriate in terms of engagement. If you never ask them a question, they are less likely to ask questions. Be prepared to initiate engagement. If you are accustomed to lecturing, you may feel more comfortable standing at the front of the classroom and waiting for questions. Try to resist this temptation. Move through the classroom and ask your students questions… How is it going? What did you get for part A? Can I help you? Students participate when you participate. If you are active in the classroom, your students will be active as well.

Holding Students Accountable

Being active is important, but you also need to hold students accountable for the work they do in class. This means keeping track of attendance and performance on in-class assignments. Fortunately, technology has made this very easy to do. We maintain engagement and accountability by integrating a software application called Socrative. The app is free for students and at most $50 per year for a teacher depending on your number of classes and enrollment. Socrative is a web-based app that allows you to give formative and summative assessments in class and receive immediate feedback. The app also allows students or groups to use their accounting knowledge to compete in class. Students are assigned B set exercises from the text during class and use their smartphones to input their answers to the questions. Additionally, the app allows instructors to quickly identify and focus their energy on students or groups that are struggling in class to understand a particular concept.

Assessments and Games with Socrative

You can use Socrative to give assessments or play games in class. In most class sessions, we use Socrative to give formative or summative assessments. This provides students immediate feedback on their understanding of that day's exercises. It also helps us focus our energy towards the students that need assistance the most. We typically allow the students to complete the quizzes in groups but answer individually. Under this system, students get the benefit of working with others but in the end can go with their answer if they disagree with the group.

Socrative also allows students to compete in class. Competitions work best if students are grouped in teams. Socrative competitions are set up so that teams race to complete a particular assignment. Accuracy and speed are both assessed. Competition will greatly increase the engagement in class. However, we recommend using them on a limited basis, as we have found group dynamics can break down under competition. We find faster students will leave slower students behind when placed in a competitive environment. Typically, competitions are incorporated into every other class and range from 10 to 15 minutes in length. We also typically use competitions to review past lessons.

The Importance of Mini Lectures and / or Guest Lectures

We believe that problem sets keep students active and are the best way to learn accounting. However, working problems is cognitively challenging, and we recommend periodically giving your students a break. Students will tire of working problems every class. Throwing in a lecture breaks up the class and is an opportunity to re-energize and motivate students. In our classes, we either lecture on interesting topics, current business events, or bring in a good guest lecturer. The purpose of these lectures is not to deliver content but to help generate a genuine interest in accounting and business. We try to make lectures straightforward and entertaining. In a flipped class, you may only give two or three lectures the entire semester, so deliver your best talking points.

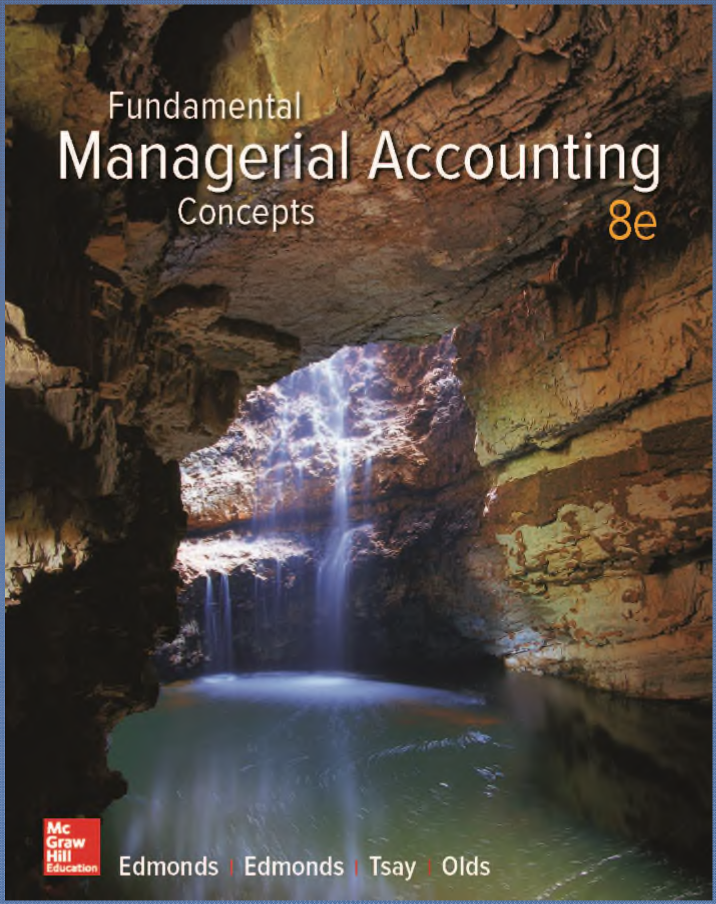
Some instructors like to start class with a 5 to 10-minute mini-lecture. This is a good way to review key points before starting in-class activities. We encourage you to keep these lectures short and to the point. It is important that students do not get the idea that these mini lectures serve as substitutes to watching the video lectures. In determining the mini lecture content, we typically review the pre-class video quiz assignments before class starts. If there is a particular objective or question where students struggle, we start class with a short mini-lecture on that topic

A Note on Large Class Sections

The flipped model works best in sections of 40 students or less. However, it is easy to scale to larger sections with the help of teaching assistants. We have had success with the flipped model in sections of up to 180 students with the help of teaching assistants. If it is the first time you are flipping the class, we recommend a 40:1 instructor to student ratio. Although, over time you will likely be able to address student questions more efficiently and accommodate larger sections with fewer resources.

Encouraging Attendance

One of the challenges in teaching introductory accounting is keeping your students actively involved. You should be aware that a flipped class can feel very unstructured. By giving your students 24/7 access to video lectures and allowing them to work at different paces in class, you are providing them with a tremendous amount of flexibility in how and when they learn. Some students abuse the system without controls. We have found that without controls you will likely experience lower attendance. In a traditional class, where the lecture is the only source of instruction, attendance may be higher. However, just because students are in their seats does not mean they are actually learning. Many students show up to class, space out for an hour, and leave class retaining very little. The first time you flip your class, you should expect dramatic changes in the way students interact with you and utilize class time. As you get more comfortable with the approach, you will want to modify the weighting of assignments, attendance policy, and other course controls to best attain your desired outcomes. We encourage you to set controls that maximize your students' learning outcomes. Finding the optimal level of controls is a trial and error process and depends on the maturity of your students and your tolerance for an unstructured learning environment. The optimal level keeps immature students focused but does not slow down self-motivated students. We provide our policies in this manual but encourage you to experiment and find the approach that works best for you and your students.



CHAPTER 2

Cost Behavior, Operating Leverage, and Profitability Analysis

PowerPoint Author:
LuAnn Bean, Ph.D., CPA, CIA, CFE

Learning Objective

Identify and describe fixed, variable, and mixed cost behavior.

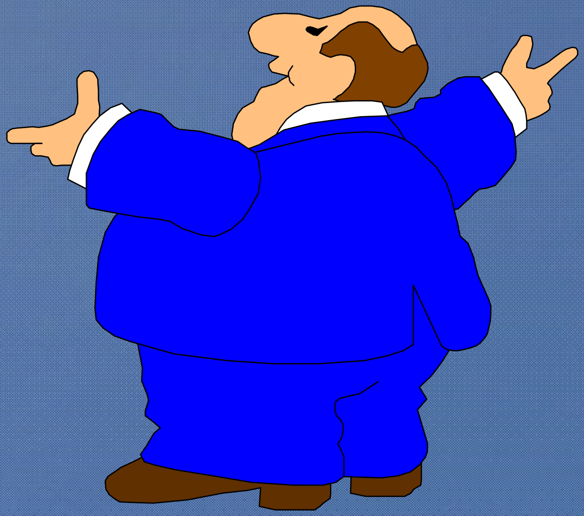
LO1

Fixed Cost Behavior

When activity . . . .

	Increases	Decreases
Total Fixed Cost	Remains constant	Remains Constant
Fixed Cost Per Unit	Decreases	Increases

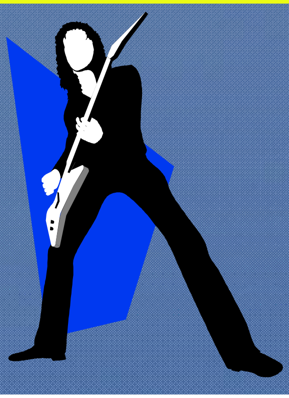
Consider the following concert example where the band will be paid $48,000 regardless of the number of tickets sold.



Fixed Cost Behavior

Tickets sold	2,700	3,000	3,300
Total cost of band	$ 48,000	$ 48,000	$ 48,000
Per ticket cost of band	$ 17.78	$ 16.00	$ 14.55

$48,000 ÷ 3,000 Tickets = $16.00 per Ticket



Learning Objective

Demonstrate the effects of operating leverage on profitability.

LO2

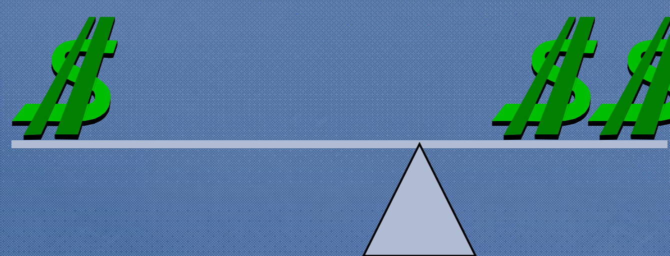
Operating Leverage

A measure of the extent to which fixed costs are being used in an organization.

Operating leverage is greatest in companies that have a high proportion of fixed costs in relation to variable costs.

Small percentage change in revenue

Large percentage change in profits



Fixed Costs

Consider the following concert example where all costs are fixed.

Operating Leverage

Tickets sold	2,700	3,000	3,300
Revenue ($18 per ticket)	$ 48,600	$ 54,000	$ 59,400
Cost of band (Fixed)	48,000	48,000	48,000
Gross profit	$ 600	$ 6,000	$ 11,400

10% Revenue Increase

90% Gross Profit Increase

When all costs are fixed, every additional sales dollar contributes one dollar to gross profit.

Variable Cost Behavior

Tickets sold	2,700	3,000	3,300
Band cost per ticket sold	$ 16	$ 16	$ 16
Total cost of band	$ 43,200	$ 48,000	$ 52,800

The total variable cost increases in direct proportion to the number of tickets sold.

Variable unit cost per ticket remains at $16 regardless of the number of tickets sold.

Calculating Percent Change

(Alternative measure − Base measure) ÷ Base measure = % change

($11,400 − $6,000) ÷ $6,000 = 90%

Variable Cost Behavior

Total variable cost increases in direct proportion to the number of units sold.

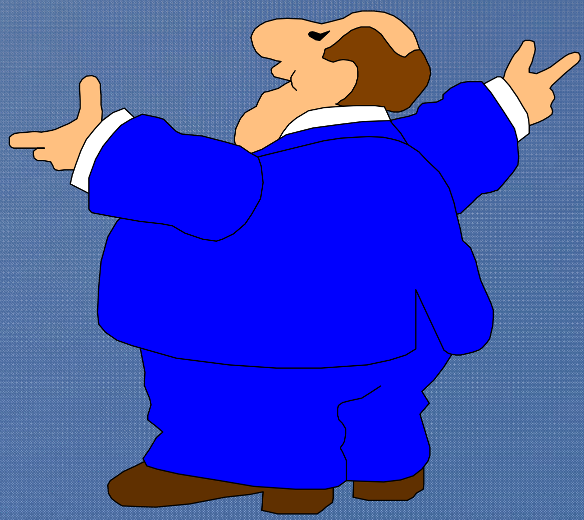
The behavior of variable cost *per* unit is contradictory to the word variable, because variable cost per unit remains constant regardless of how many units are sold.

Variable Cost Behavior

When activity . . .

	Increases	Decreases
Total Variable Cost	Increases Proportionately	Decreases Proportionately
Variable Cost Per Unit	Remains Constant	Remains Constant

Consider the concert example where a band receives $16 for each ticket sold. The more sold will increase the band's take from the concert, but they can only receive a constant $16 from each individual ticket sold.



Risk and Reward Assessment

Risk refers to the possibility that sacrifices may exceed benefits.

Risk may be reduced by converting fixed costs into variable costs.

Let's see what happens to the concert example if the band receives $16 per ticket sold instead of a fixed $48,000.

Risk and Reward Assessment

10% Revenue Increase

Tickets sold	2,700	3,000	3,300
Revenue ($18 per ticket)	$ 48,600	$ 54,000	$ 59,400
Cost of band ($16 per ticket)	43,200	48,000	52,800
Gross profit	$ 5,400	$ 6,000	$ 6,600

10% Gross Profit Increase

Shifting the cost structure from fixed to variable not only reduces risk but also the potential for profits.

Effect of Cost Structure on Profit Stability

	All Fixed Company	Combination Company	All Variable Company
Units sold	10	10	10
Selling price per unit	$ 10	$ 10	$ 10
Variable cost per unit	0	3	6
Sales revenue	$ 100	$ 100	$ 100
Total variable cost	0	(30)	(60)
Total fixed cost	(60)	(30)	0
Net income	$ 40	$ 40	$ 40

Now let's see what happens when the number of units sold increases.

Effect of Cost Structure on Profit Stability

	All Fixed Company	Combination Company	All Variable Company
Units sold	11	11	11
Selling price per unit	$ 10	$ 10	$ 10
Variable cost per unit	0	3	6
Sales revenue	$ 110	$ 110	$ 110
Total variable cost	0	(33)	(66)
Total fixed cost	(60)	(30)	0
Net income	$ 50	$ 47	$ 44

The increase in income is greater in the All Fixed Company.

Effect of Cost Structure on Profit Stability

	All Fixed Company	Combination Company	All Variable Company
Units sold	9	9	9
Selling price per unit	$ 10	$ 10	$ 10
Variable cost per unit	0	3	6
Sales revenue	$ 90	$ 90	$ 90
Total variable cost	0	(27)	(54)
Total fixed cost	(60)	(30)	0
Net income	$ 30	$ 33	$ 36

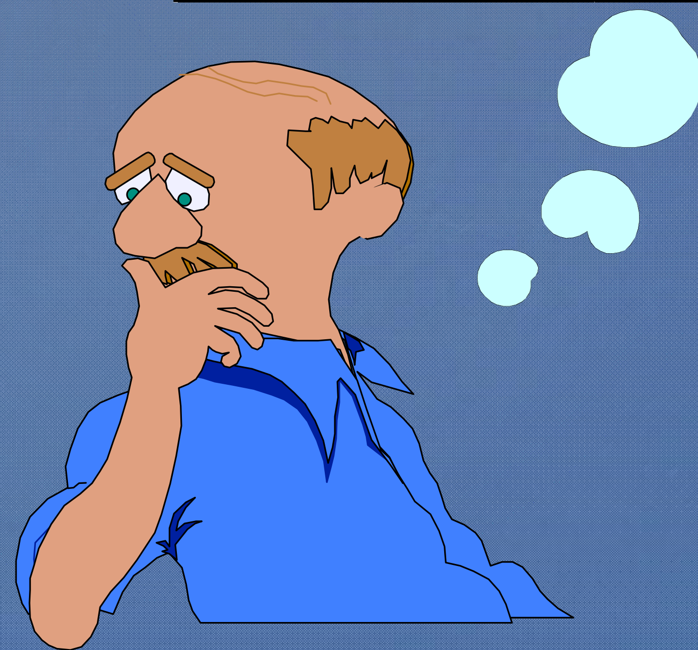
Yes, the decrease in income is greater in the All Fixed Company.

Effect of Cost Structure on Profit Stability

Level of Fixed Cost	Earnings Volatility
High	High
Low	Low

Fixed Costs

Variable Costs



Learning Objective

Prepare an income statement using the contribution margin approach.

LO3

An Income Statement under the Contribution Margin Approach

EXHIBIT 2.11

Income Statements

	Company Name	
	Bragg	**Biltmore**
Variable cost per unit (a)	$ 6	$ 12
Sales revenue (10 units × $20)	$ 200	$ 200
Variable cost (10 units × a)	(60)	(120)
Contribution margin	140	80
Fixed cost	(120)	(60)
Net income	$ 20	$ 20

Fixed Cost to Provide Competitive Operating Advantage

EXHIBIT 2.12

Comparative Profitability at 2,000 Hours of Tutoring

		MaHall		Strike
Number of hours of tutoring provided		2,000		2,000
Service revenue ($11 per hour)		$ 22,000		$ 22,000
Cost of tutors	Fixed	(16,000)	Variable ($8 × 2,000)	(16,000)
Net income		$ 6,000		$ 6,000

Fixed Cost to Provide Competitive Operating Advantage (continued)

EXHIBIT 2.13

MaHall's Profitability at 4,000 Hours of Tutoring

		MaHall
Number of hours of tutoring provided		4,000
Service revenue ($7 per hour)		$ 28,000
Cost of tutors	Fixed	(16,000)
Net income (loss)		$ 12,000

Fixed Cost to Provide Competitive Operating Advantage (continued)

EXHIBIT 2.14

Comparative Profitability at 2,000 Hours of Tutoring

		MaHall		Strike
Number of hours of tutoring provided		2,000		2,000
Service revenue ($7 per hour)		$ 14,000		$ 14,000
Cost of tutors	Fixed	(16,000)	Variable ($8 × 2,000)	(16,000)
Net income (loss)		$ (2,000)		$ (2,000)

Learning Objective

Calculate the magnitude of operating leverage.

LO4

Measuring Operating Leverage Using Contribution Margin

$$\text{Magnitude of Operating Leverage} = \frac{\text{Contribution margin}}{\text{Net income}}$$

Show me an example.

Measuring Operating Leverage Using Contribution Margin

	Actual sales 5,000 Hammers
Sales	$ 50,000
Less: variable expenses	30,000
Contribution margin	20,000
Less: fixed expenses	15,000
Net income	$ 5,000

$$\text{Operating Leverage} = \frac{\$20,000}{\$5,000} = 4$$

A measure of how a percentage change in sales will effect profits.

Measuring Operating Leverage Using Contribution Margin

	Current sales 5,000 Hammers	Increased sales 5,500 Hammers
Sales	$ 50,000	$ 55,000
Less: Variable expenses	30,000	33,000
Contribution margin	20,000	22,000
Less: Fixed expenses	15,000	15,000
Net income	$ 5,000	$ 7,000

A 10 percent increase in sales results in a 40 percent increase in net income.

(10% × 4 = 40 %)

EXHIBIT 2.17

Graphical Presentation of Fixed Cost Behavior

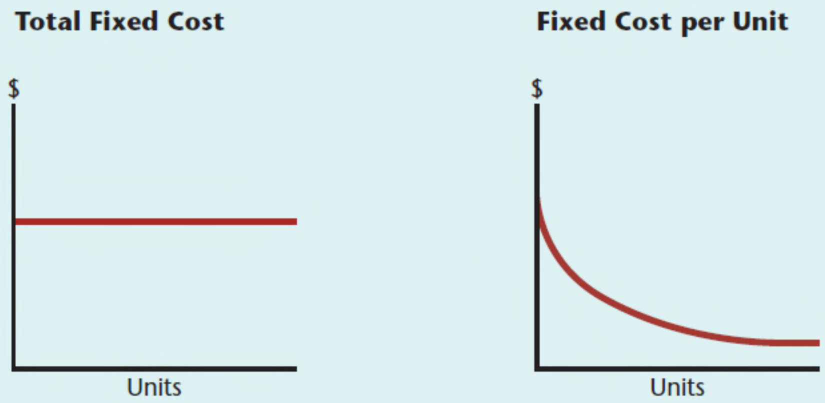


EXHIBIT 2.18

Graphical Presentation of Variable Cost Behavior

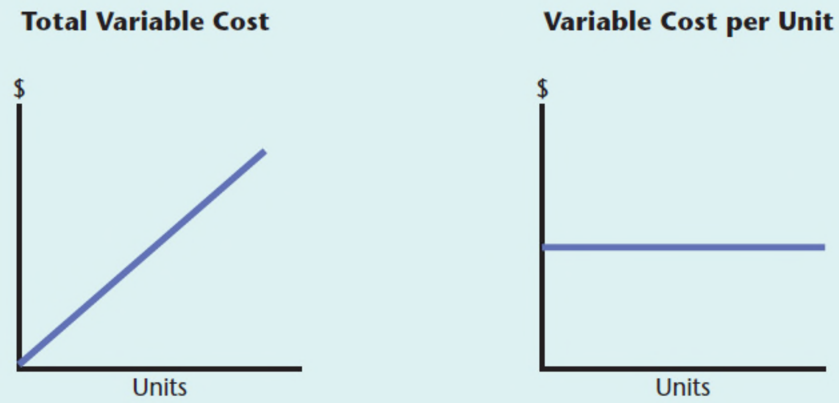


EXHIBIT 2.19

Fixed and Variable Cost Behavior

When Activity Level Changes	Total Cost	Cost per Unit
Fixed costs	Remains constant	Changes *inversely*
Variable costs	Changes in direct proportion	Remains constant

Mixed, or Semivariable, Costs

Mixed costs (or semivariable costs) include both fixed and variable components.

For example, Star Productions, Inc., has to pay a janitorial company a base fee of $1,000 plus $20 per hour required to do each cleanup job. The $1,000 base fee is fixed. The $20 per hour is variable. If 60 hours are required to accomplish a cleanup, the total mixed cost is:

$1,000 + ($20 x 60 hours) = $2,200

EXHIBIT 2.20

Examples of Mixed Costs

Type of Cost	Fixed Cost Component(s)	Variable Cost Component(s)
Cost of sales staff	Monthly salary	Bonus based on sales volume
Truck rental	Monthly rental fee	Cost of gas, tires, and maintenance
Legal fees	Monthly retainer	Reimbursements to attorney for out-of-pocket costs (copying, postage, travel, filing fees)
Outpatient service cost	Salaries of doctors and nurses, depreciation of facility, utilities	Medical supplies such as bandages, sterilization solution, and paper products
Phone services	Monthly connection fee	Per-minute usage fee
LP gas utility cost	Container rental fee	Cost of gas consumed
Cable TV services	Monthly fee	Pay-per-view charges
Training cost	Instructor salary, facility cost	Textbooks, supplies
Shipping and handling	Salaries of employees who process packages	Boxes, packing supplies, tape, and other shipping supplies, postage
Inventory holding cost	Depreciation on inventory warehouse, salaries of employees managing inventory	Delivery costs, interest on funds borrowed to finance inventory, cost of supplies

The Relevant Range

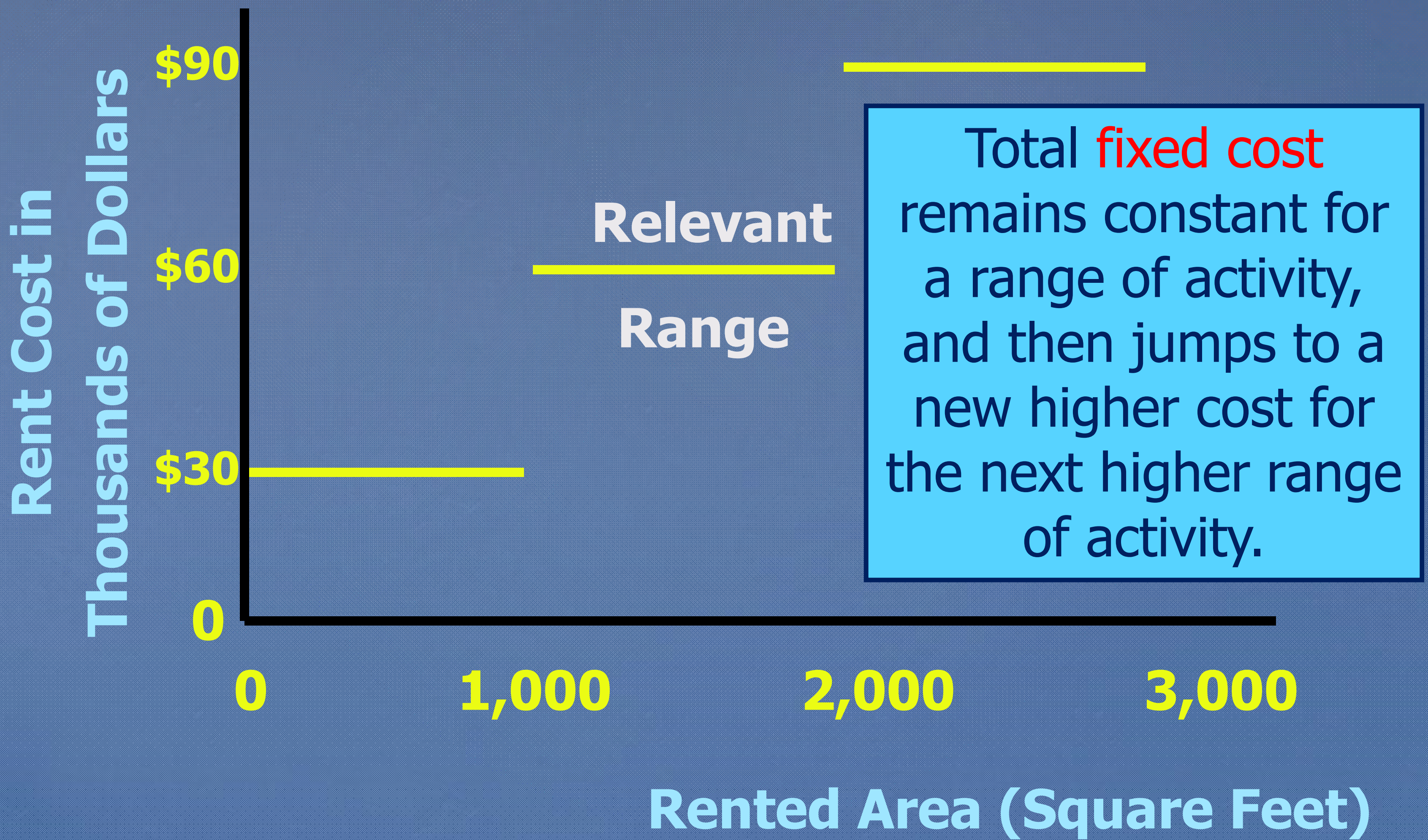
The range of activity over which the definitions of fixed and variable costs are valid is commonly called the **relevant range.**

The Relevant Range

Example: Office space is available at a fixed rental rate of $30,000 per year in increments of 1,000 square feet. As the business grows more space is rented, increasing the total cost.

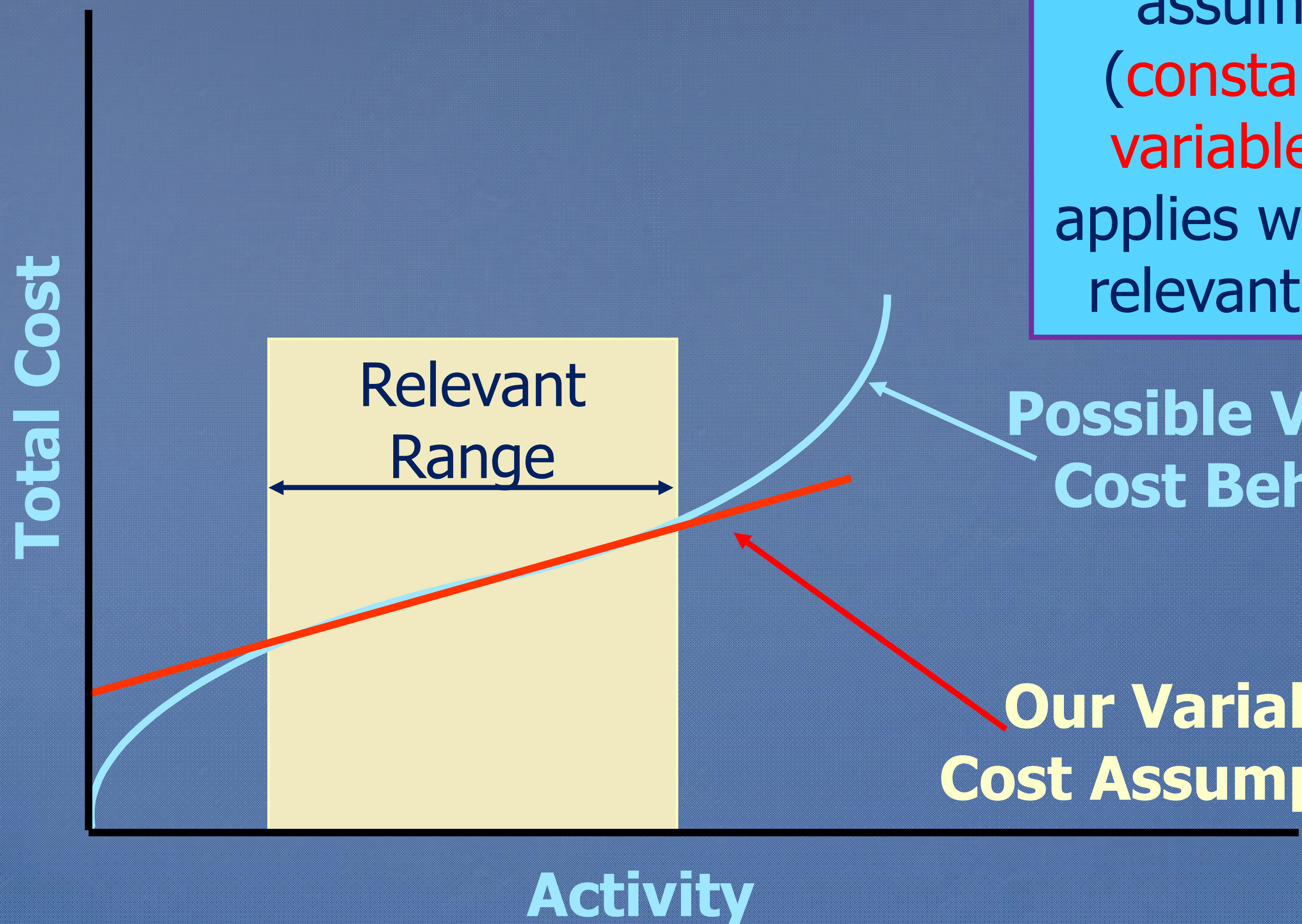
Continue

The Relevant Range



The Relevant Range

Our variable cost assumption (constant unit variable cost) applies within the relevant range.



Context Sensitive Definitions of Fixed and Variable

Recall the earlier concert example, where the band was paid $48,000 regardless of the number of tickets sold.

The cost of the band is fixed relative to the number of tickets sold for a specific concert.

Number of concerts	1	2	3	4	5
Cost per concert	$ 48,000	$ 48,000	$ 48,000	$ 48,000	$ 48,000
Total cost	$ 48,000	$ 96,000	$ 144,000	$ 192,000	$ 240,000

The cost of the band is variable relative to the number of concerts produced.

Learning Objective

Select an appropriate time period for calculating the average cost per unit.

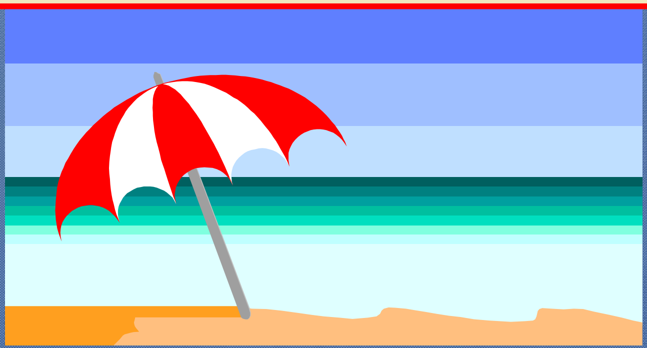
LO5

Cost Averaging

Lake Resorts, Inc. (LRI) provides water-skiing lessons for its guests with the following costs:

Equipment rental	**$80 per day**
Instructor pay	**$15 per hour**
Fuel	**$ 2 per hour**

LRI can provide up to 20 lessons per day.
What is the average cost per one-hour lesson for 2 lessons per day? 10 lessons per day? 20 lessons per day?



Cost Averaging

Number of lessons	2	10	20
Cost of equipment rental	$ 80	$ 80	$ 80
Cost of instruction	30	150	300
Cost of fuel	4	20	40
Total cost	$ 114	$ 250	$ 420
Cost per lesson	$ 57	$ 25	$ 21

Average costs decline as activity increases when fixed costs such as equipment rental are involved.

Managers must use these average costs with caution as they differ at every level of activity.

Weekly Average vs. Daily Average

Equipment rental (7 days × $80 per day)	$ 560
Cost of instruction ($15 × 50 lessons)	750
Cost of fuel ($2 × 50 lessons)	100
Total	$1,410
Average cost per lesson	$1,410/50 lessons = $28.20

Learning Objective

Use the high-low method, scattergraphs, and regression analysis to estimate fixed and variable costs.

LO6

The High-Low Method

Iris Company recorded the following production activity and maintenance costs for

	Units	Cost
High activity level	10,000	$ 9,700
Low activity level	5,000	5,700

Using these two levels of activity, compute:

➊ the variable cost per unit.
➋ the fixed cost.
➌ the total cost.

The High-Low Method

	Units	Cost
High activity level	10,000	$ 9,700
Low activity level	5,000	5,700
Change	5,000	$ 4,000

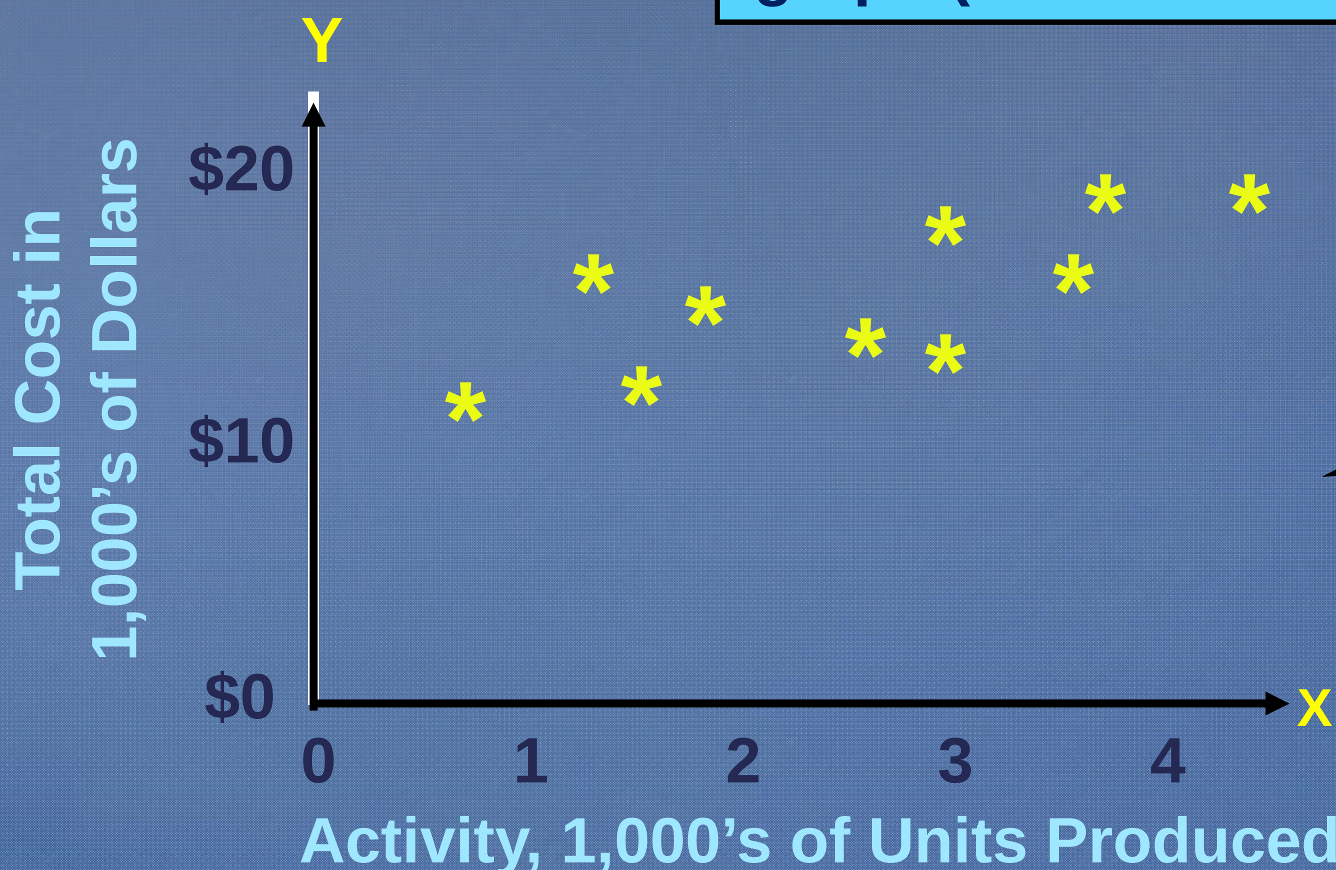
❶ **Unit variable cost = $4,000 ÷ 5,000 units = $0.80 per unit**

❷ **Fixed cost = Total cost – Total variable cost**
Fixed cost = $9,700 – ($0.80 per unit × 10,000 units)
Fixed cost = $9,700 – $8,000 = $1,700

❸ **Total cost = Fixed cost + Variable cost**
Total cost = $1,700 + $0.80X

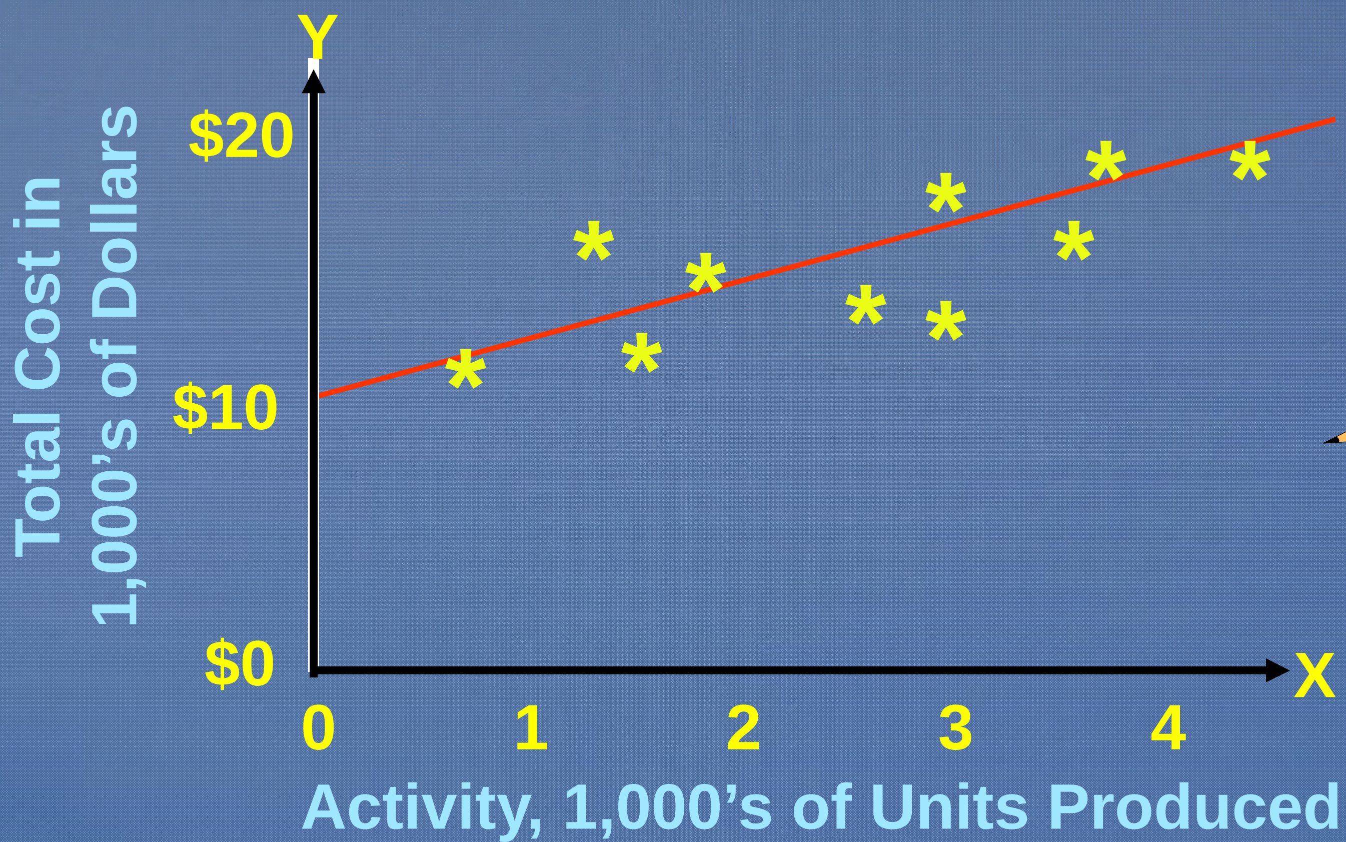
The Scattergraph Method

Plot the data points on a graph (total cost vs. activity).

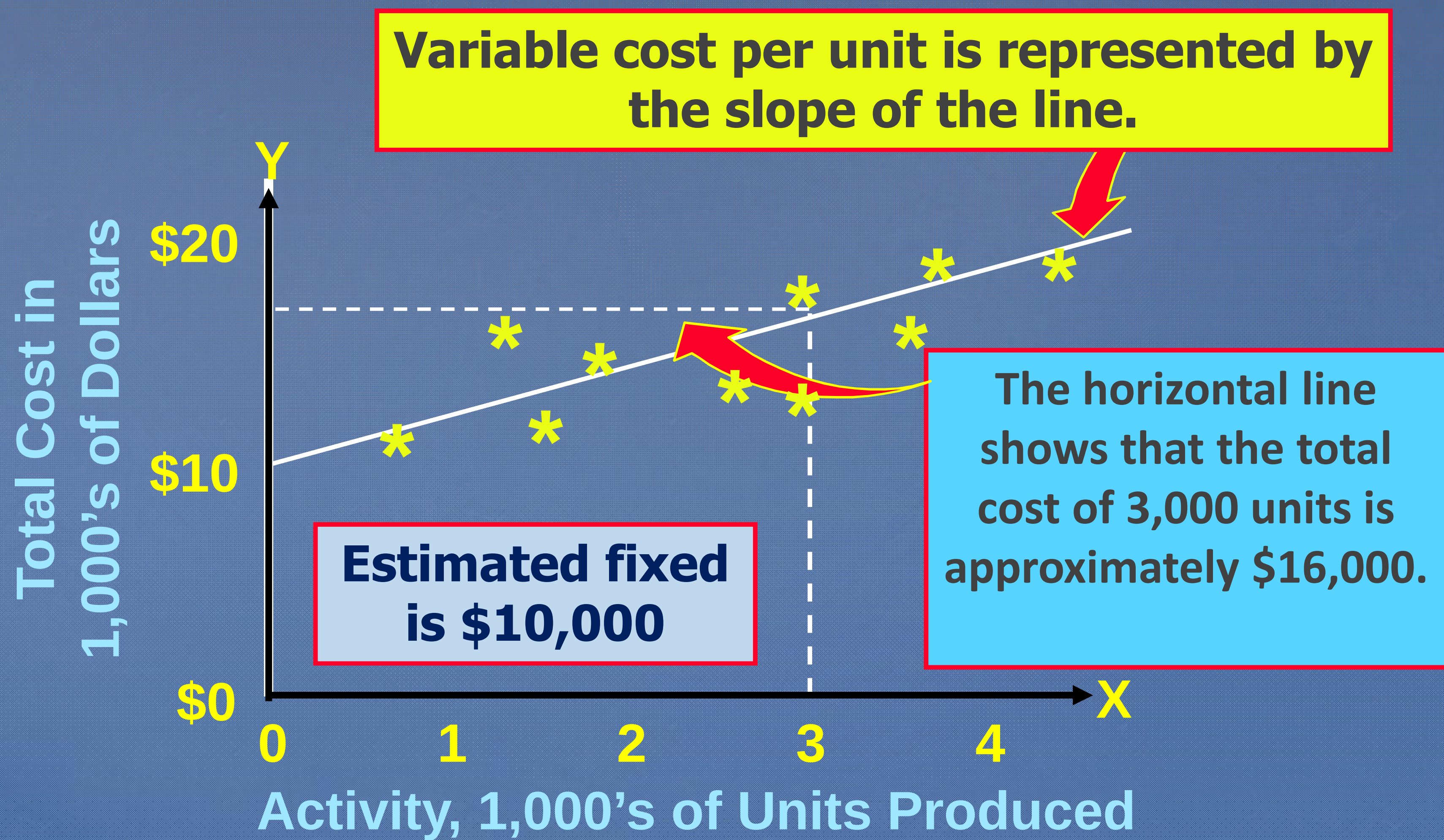


The Scattergraph Method

Draw a line through the data points with about an equal numbers of points above and below the line.

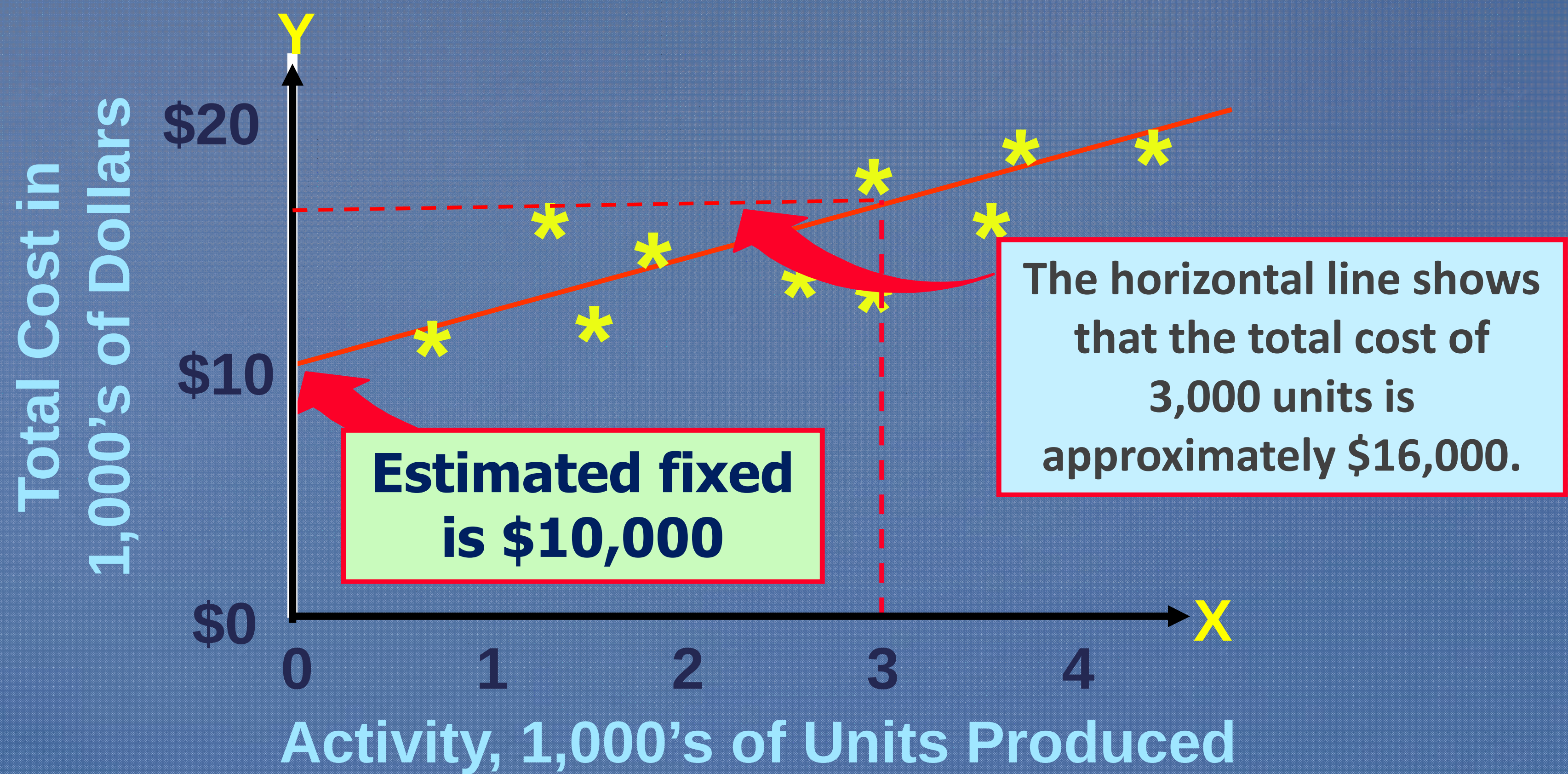


The Scattergraph Method



The Scattergraph Method

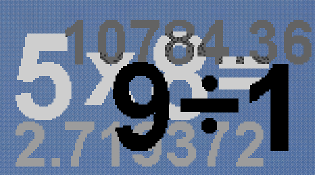
Total variable cost = Total cost – Total fixed cost
Total variable cost = $16,000 – $10,000 = $6,000
Unit variable cost = $6,000 ÷ 3,000 units = $2



Regression Method of Cost Estimation

A method used to analyze mixed costs if a scattergraph plot reveals an approximately linear relationship between the X and Y variables.

This method uses *all* of the data points to estimate the fixed and variable cost components of a mixed cost.

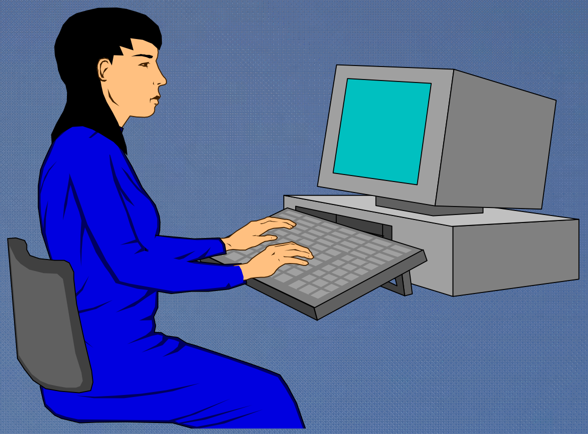


The goal of this method is to fit a straight line to the data that *minimizes the sum of the squared errors*.

Regression Method of Cost Estimation

- **Software can be used to fit a regression line through the data points.**
- **The cost analysis objective is the same:**

$$Y = a + bX$$

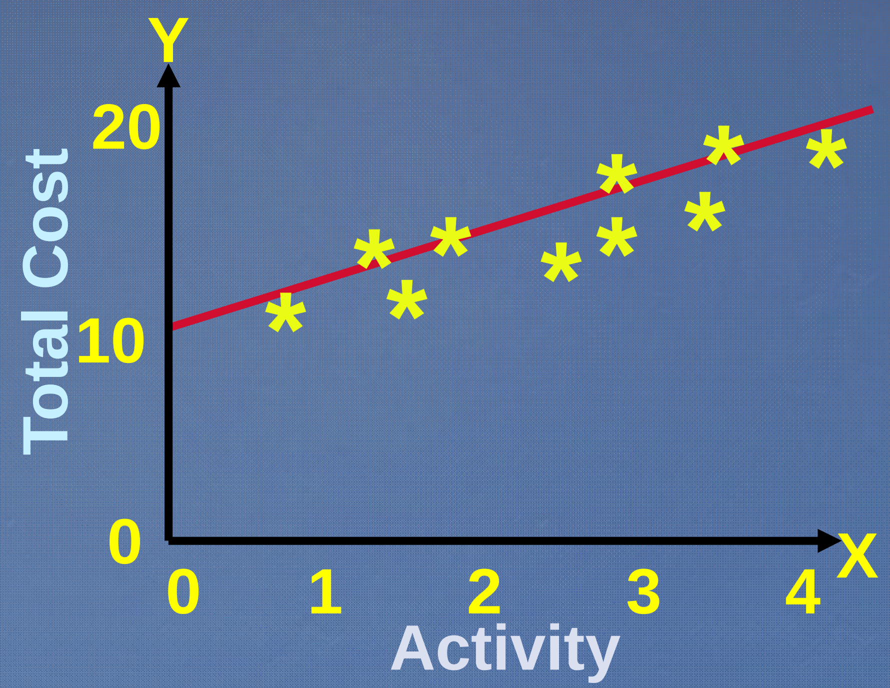


Least-squares regression also provides a statistic, called the R^2, that is a measure of the goodness of fit of the regression line to the data points.

Regression Method of Cost Estimation

Follow these steps in Excel to perform regression analysis:

1. **Enter the data in spreadsheet columns.**
2. **Click *Tools*.**
3. **Click *Data Analysis*.**
4. **Click *Regression* and then *OK*.**
5. **Define data ranges and click *Line Fit Plot*.**
6. **Click *OK*.**



The regression function will return an estimate for fixed cost and variable cost per unit.

End of Chapter 2