Managerial Accounting 4th edition Davis Solutions Manual

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CHAPTER 2

Cost Behavior and Cost Estimation

Learning Objectives

1. Identify basic cost behavior patterns and explain how changes in activity level affect total cost and unit cost. (Unit 2.1)
2. Estimate a cost equation from a set of cost data and predict future total cost from that equation. (Unit 2.2)
3. Prepare a contribution format income statement. (Unit 2.3)

Summary of End of Chapter Material

Difficulty: E = Easy, M = Moderate, D = Difficult
Bloom: K = Knowledge, C = Comprehension, AP = Application, AN = Analysis, S = Synthesis, E = Evaluation
IMA: S = Strategy, planning & performance, R = Reporting and control, T = Technology and analytics, B = Business acumen & operations, L = Leadership, E = Professional ethics & values
AICPA ACC: RA = Risk assessment, M = Measurement, R = Reporting, RS = Research, S = System/process management, T = Technology
AICPA BUS: S = Strategic, G = Global, P = Process management, GV = Governance, C = Customer
AICPA PRO: E = Ethics, P = Professional behavior, D = Decision making, CO = Collaboration, L = Leadership, C = Communication, PM = Project Management

Item	L. O.	Difficulty Level	Minutes to Complete	Bloom's Taxonomy	IMA	AICPA ACC	AICPA BUS	AICPA PRO	Ethics Coverage
Unit 2.1									
1	1	M	2	C	S	R	S, P	D	
2	1	M	4	C, K	S	R	S, P	D	
3	1	M	3	C, K	S	R	S, P	D	
4	1	E	2	C	S	R	S, P	D	
5	1	M	4	C, K	S	R	S, P	D	
6	1	M	4	C, K	S	R	S, P	D	
Unit 2.2									
1	2	E	1	K	S	M	S, P	D	
2	2	M	2	C	S	M	S, P	D	
3	2	M	4	K	S	M	S, P	D	
4	2	E	2	C	S	M	S, P	D	
5	2	M	4	C	S	M	S, P	D	
Unit 2.3									
1	3	E	1	K	S	M	S, P	D	
2	3	E	2	K	S	M	S, P	D	
3	3	D	3	C	S	M	S, P	D	
4	3	D	3	C	S	M	S, P	D	
EXERCISES									
2-1*	1	M	12	C	S	R	S, P	D	
2-2	1	M	15	C	S	R	S, P	D	
2-3*	1	M	12	AP	S	M	S, P	D	
2-4*	1	M	15	AP, C	S	M	S, P	D	
2-5*	1	M	15-20	AP, AN	S	M	S, P	D	
2-6	1	D	5-7	AN	S	M	S, P	D	

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Item	L. O.	Difficulty Level	Minutes to Complete	Bloom's Taxonomy	IMA	AICPA ACC	AICPA BUS	AICPA PRO	Ethics Coverage
2-7*	1	D	8	AP, AN	S	M	S, P	D	
2-8	2	M	15-20	AP, AN	S	M	S, P	D	
2-9	2	M	20	AP, AN	S	M	S, P	D	
2-10*+	2	M	12	AP, AN	S	M	S, P	D	
2-11*	2	D	20	AP	S	M	S, P	D	
2-12*	2	D	10-15	AP	S	M	S, P	D	
2-13*+	3	M	10-15	AP	S	M	S, P	D	
2-14	3	E	10-15	AN	S	M	S, P	D	
2-15*	3	D	10-15	AP	S	M	S, P	D	
2-16*+	3	M	15	AP	S	M	S, P	D	
2-17	3	E	15	AP	S	M	S, P	D	
2-18*	3	E	10	AP	S	M	S, P	D	
PROBLEMS									
2-19	1	E	20-25	AP, AN	S	M	S, P	D	
2-20*	2	M	20-25	AP, AN	S	M	S, P	D	
2-21*	2	D	15-20	AP, AN	S	M	S, P	D	
2-22*	2	M	20-25	AP, AN	S	M	S, P	D	
2-23	2	D	30-35	AP, AN	S	M	S, P	D	
2-24	1, 3	D	20-25	AP	S	M	S, P	D	
2-25*	2, 3	D	20	AP	S	M	S, P	D	
2-26*	3	D	20-25	AP	S	M	S, P	D	
C&C CONTINUING CASE									
2-27*	1	E	5-7	C	S	M	S, P	D	
2-28*	2, 3	M	10	AP, AN	S	M	S, P	D	
CASES									
2-29*	1	D	20-25	AP	S	M	S, P	D	
2-30		M	10-15	AN	E	R	S, P	E	✔
DATA ANALYTICS PROBLEMS									
2-31	2	M	30-40	AP, AN, E	T, S	T, M	S, P	D	
2-32[n]	2	M	30-40	AP, AN, S, E	T, S	T, M	S, P	D	

* Revised problem in 4th edition
+ Lightboard video solution available
[n] New problem

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SOLUTIONS TO GUIDED UNIT PREPARATION

Unit 2.1

1. Managers must be able to predict the financial results of their various decisions. The only way to predict results is to know how costs will change or "behave" with changes in activity.

2. A variable cost is a cost that varies in total in proportion to a business activity. Within the relevant range, variable cost per unit is constant. As the level of activity increases, the total cost increases by the same proportion. Examples include commissions, cost of bicycle tires for a bicycle manufacturer, and cost of postage for a direct mail advertiser.

3. A fixed cost is a cost that does not change in total with the activity level. Within the relevant range, the total fixed cost remains constant as the activity level changes. However, the cost per unit varies inversely with changes in activity level. Examples include monthly rent, a manager's salary, and property taxes.

4. Discretionary fixed costs are fixed costs that can be changed over the short run. Committed fixed costs cannot be changed over the short run.

5. A mixed cost is a cost that has both fixed and variable components. As the level of activity increases, the total cost increases and the cost per unit decreases. Examples include electricity cost, party hall rental when the charge includes a flat fee plus a cost per guest, and t-shirt printing when the charge includes a set-up fee plus a charge for each t-shirt printed.

6. A step cost is a cost that is fixed over a small range of activity. Total cost will not change as activity levels increase if the level of activity is within a certain range. However, once the activity level exceeds this range, total cost will increase. Examples include maintenance costs when a new maintenance worker is needed per 10 machines, nurse salaries per 5 patients on a hospital floor, and hotel room rates per 4 students on a class trip.

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Unit 2.2

1. TC = (VC × x) + FC

2. With a scattergraph, a line is drawn to best fit the data points. The point at which the line intersects the y-axis is the value for fixed costs. The slope of the line, change in total cost divided by change in activity, is the variable cost per unit.

3. The high-low method uses the highest and lowest points within a data range to construct a total cost line. The variable cost per unit is calculated by dividing the change in total cost by the change in activity. The fixed cost is calculated by plugging the variable cost in the formula TC = (VC × x) + FC and using either the high point or low point of activity.

4. Regression analysis is preferable as it produces a line with the least amount of error and is relatively easy to use in Excel or ~~other~~ another spreadsheet ~~software~~application.

5. The relevant range is the normal level of operating activity. The relevant range applies to the whole company and is valid for all cost relationships. The steps in a step cost are ranges that are only valid for that particular cost. The steps in the range are smaller than the relevant range.

Unit 2.3

1. Contribution margin is the difference between sales and variable cost.

2. Contribution margin ratio is the contribution margin divided by sales. The variable cost ratio is 1 minus the contribution margin ratio. The larger the variable cost ratio, the smaller the contribution margin will be, since the two ratios must add to 100%.

3. If the variable cost per unit increases and the selling price decreases, the contribution margin per unit will decrease. The change in fixed cost has no bearing on the contribution margin.

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4. A product's contribution margin can be increased by increasing the selling price per unit or decreasing variable costs per unit. Total contribution margin can be increased by selling more units.

SOLUTIONS TO EXERCISES

Exercise 2-1

a. fixed
b. variable
c. fixed
d. fixed
e. step
f. variable
g. mixed

Exercise 2-2

a. variable
b. fixed
c. step
d. mixed
e. variable
f. fixed
g. mixed
h. variable
i. variable
j. fixed

Exercise 2-3

a. TC(200 returns) = (200 × $12 per return) + $650 fee = $3,050
TC(325 returns) = (325 × $12 per return) + $650 fee = $4,550
TC(500 returns) = (500 × $12 per return) + $650 fee = $6,650

b. Cost per unit (200) = $3,050 ÷ 200 = $15.25
Cost per unit (325) = $4,550 ÷ 325 = $14.00
Cost per unit (500) = $6,650 ÷ 500 = $13.30

c. As the number of returns increased from 200 to 500, the fixed cost of $650 decreased on a per unit basis.

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Exercise 2-4

	Answer	Reasoning
Balloons	variable	The total cost increases as activity increases and the cost per unit remains constant at $2.50 per bouquet.
Insurance	fixed	The total cost remains constant across all activity levels.
Delivery	variable	The total cost increases as activity increases and the cost per unit remains constant at $6.00 per delivery.
Employee compensation	mixed	The total cost increases as activity increases and the cost per unit decreases as activity increases.
Advertising	fixed	The total cost remains constant across all activity levels.

Per unit costs (variable and mixed costs only):

	2,000	4,000	6,000
Balloons	$\frac{\$5,000}{2,000 \text{ bouquets}} = \$2.50$	$\frac{\$10,000}{4,000 \text{ bouquets}} = \$2.50$	$\frac{\$15,000}{6,000 \text{ bouquets}} = \$2.50$
Delivery	$\frac{\$12,000}{2,000 \text{ bouquets}} = \$6.00$	$\frac{\$24,000}{4,000 \text{ bouquets}} = \$6.00$	$\frac{\$36,000}{6,000 \text{ bouquets}} = \$6.00$
Employee compensation	$\frac{\$15,000}{2,000 \text{ bouquets}} = \$7.50$	$\frac{\$23,000}{4,000 \text{ bouquets}} = \$5.75$	$\frac{\$29,000}{6,000 \text{ bouquets}} = \$4.83$

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Exercise 2-5

		Home Visits			
	F, V, M	15,000	20,000	25,000	30,000
Employee wages	variable	***$225,000***	$300,000	$375,000	$450,000
Billing services	mixed	***$62,000***	$ 82,000	102,000	$122,000
Medical supplies	variable	$120,000	$160,000	200,000	***$240,000***
Insurance	fixed	***$15,000***	$ 15,000	***$15,000***	$15,000

Variable cost per unit:

Employee wages:

$$\frac{\$450{,}000 - \$300{,}000}{30{,}000 - 20{,}000} = \$15 \text{ per visit}$$

Billing services:

$$\frac{\$122{,}000 - \$82{,}000}{30{,}000 - 20{,}000} = \$4 \text{ per visit}$$

Medical supplies:

$$\frac{\$200{,}000 - \$120{,}000}{25{,}000 - 15{,}000} = \$8 \text{ per visit}$$

Fixed cost (using the low point):

Employee wages:

$300,000 – (20,000 visits × $15) = $0

Billing services:

$82,000 – (20,000 visits × $4) = $2,000

Medical supplies:

$120,000 – (15,000 visits × $8) = $0

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Exercise 2-5, continued

Total cost:

Employee wages:
(15,000 visits × $15) + $0 = $225,000

Billing services:
(15,000 ~~hours~~ visits × $4) + $2,000 = $62,000

Medical supplies:
(30,000 ~~hours~~ visits × $8) + $0 = $240,000

Insurance:
(15,000 visits × $0) + $15,000 = $15,000
(30,000 visits × $0) + $15,000 = $15,000

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Exercise 2-6

Undoubtedly, some of your costs are fixed and will not change with the number of units sold. For example, you probably pay rent to the mall ~~to set up~~each month for your kiosk. Total rent does not change with the number of video games sold. Other costs may be mixed, and these costs will include a fixed component as well. Using the unit cost you calculated, your estimate will be too high if you sell more units next year and too low if you sell fewer games next year.

Exercise 2-7

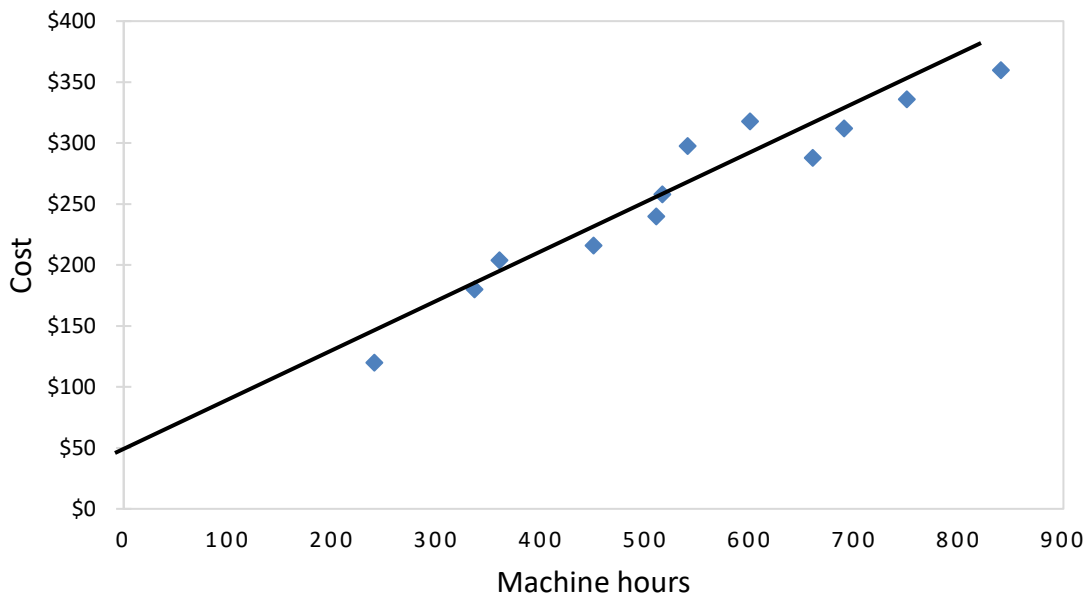
a. No effect – total fixed costs do not change with changes in quantity.

b. Decrease – The unit cost would decrease because the increase in accounting quantity would lower the fixed costs per unit, which would lower the unit cost of the 737 Next Generation plane.

NOTE: While the annual report states that these fixed infrastructure costs will not vary with changes in production rates, it is possible that a large increase in volume may push Boeing to a new relevant range. If this shift occurs, total fixed costs will likely increase.

Exercise 2-8

a.



Note: Students may draw lines that differ from the one above. That will affect the equation they use in the remaining parts of the exercise.

b. The line intersects the y-axis at $50, representing total fixed costs. The line passes through the point (520, $260), so the slope can be calculated as follows:

$$\frac{\$260 - \$50}{520 - 0} = \$0.404 \text{ per machine hour}$$

The equation of the line is: y = ($0.404 × MH) + $50

c. Total cost = ($0.404 × 750 MH) + $50 = $353

d. The line is merely an estimation of what costs will be. Since the line does not intersect the actual cost at which machine hours is 750, then the cost estimate will not equal the actual cost.

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Exercise 2-9

a. Variable cost = $\frac{\$360 - \$120}{840 - 240}$ = $0.40 per machine hour

b. Fixed cost using the low point = $120 – ($0.40 × 240) = $24
Fixed cost using the high point = $360 – ($0.40 × 840) = $24

c. Total cost = ($0.40 × MH) + $24

d. Total cost = ($0.40 × 750 MH) + $24 = $324

e. The equation of the line was determined using two points, neither of which was 750 machine hours. Since the line does not intersect the actual cost at which machine hours is 750, then the cost estimate will not equal the actual cost.

Exercise 2-10

a. Variable cost = $\frac{\$9,900 - \$6,800}{1,150 - 750}$ = $7.75 per instrument

b. Fixed cost using the low point = $6,800 – ($7.75 × 750) = $987.50

c. Total cost = ($7.75 × # of instruments) + $987.50

d. Total cost = ($7.75 × 900 instruments) + $987.50 = $7,962.50

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Exercise 2-11

	Answer	Calculations
Balloons	y = $2.50x + $0	$VC = \frac{\$15,000 - \$5,000}{6,000 - 2,000} = \$2.50$
		FC = $15,000 – $2.50(6,000) = $0
Insurance	y = $6,000	Since the total cost is constant, no calculations are needed.
Delivery	y = $6.00x + $0	$VC = \frac{\$36,000 - \$12,000}{6,000 - 2,000} = \$6.00$
		FC = $36,000 – $6.00(6,000) = $0
Employee Compensation	y = $3.50x + $8,000	$VC = \frac{\$29,000 - \$15,000}{6,000 - 2,000} = \$3.50$
		FC = $29,000 – $3.50(6,000) = $8,000
Advertising	y = $1,500	Since the total cost is constant, no calculations are needed.

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Exercise 2-12

a. Current system = (.04 × sales) + $50,000
Salary and 5% = (.05 × sales) + $20,000
25% commission = .25 × sales

b.

	Current system	Salary and 5% commission	25% commission
Sales revenue	$900,000	$1,100,000	$1,300,000
Cost of goods sold[a]	270,000	330,000	390,000
Gross profit	630,000	770,000	910,000
Compensation expense	86,000[b]	75,000[c]	325,000[d]
Operating income	$544,000	$695,000	$585,000

The salary + 5% commission results in the most profitable result for the company.

[a]0.3 × Sales revenue
[b]$50,000 + ($900,000 × 0.04)
[c]$20,000 + ($1,100,000 × 0.05)
[d]$1,300,000 × 0.25

Exercise 2-13

			Per Unit
Sales revenue		$65,000	$50
Variable expenses:			
Cost of goods sold	$20,800		16
Commissions expense	3,900		3
Shipping expense	2,600		2
Total variable expenses			21
		27,300	
Contribution margin		37,700	$ 29
Fixed expenses:			
Salaries expense	8,000		
Advertising expense	2,500		
Total fixed expenses			
		10,500	
Operating income		$27,200	

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Exercise 2-14

	a.	b.	c.	d.
Sales revenue	***$295,000***	$425,000	***$267,000***	$700,000
Variable expenses	210,000	***275,000***	86,000	***300,000***
Contribution margin	85,000	150,000	***181,000***	400,000
Fixed expenses	***58,000***	70,000	120,000	***200,000***
Operating income	27,000	***80,000***	***61,000***	***200,000***
Income taxes	***16,500***	18,000	16,000	55,000
Net income	$10,500	***$62,000***	$45,000	$145,000

Exercise 2-15

			Per Unit
Sales revenue		$35,200	$16.00
Variable costs:			
Cost of goods sold	$19,800		9.00
Operating expenses	6,600[a]		3.00
Total variable expenses		26,400	12.00
Contribution margin		8,800	$ 4.00
Fixed operating expenses		2,100[b]	
Operating Income		$ 6,700	

Units sold = $35,200 sales revenue ÷ $16.00 per unit = 2,200 units
[a]2,200 units × $3 per unit
[b]$8,700 total operating ~~costs~~ expenses – $6,600 variable cost

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Exercise 2-16

a.

Sales price	$10.00
Less variable costs:	
Towel, water, protein shake	2.65
Contribution margin	$7.35

b. $\frac{\$7.35}{\$10.00} = 73.5\%$

c.

			Per Unit
Sales revenue		$45,000	$10.00
Variable expenses:			
Towel, water, shake		11,925	2.65
Contribution margin		33,075	$7.35
Fixed expenses:			
Instructor salaries expense	$6,000		
Management salary expense	6,500		
Rent expense	1,800		
Depreciation expense	1,350		
Utilities & insurance expense	1,425		
Total fixed expenses		17,075	
Operating Income		$16,000	

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Exercise 2-17

a.

Sales revenue		$50,000
Variable expenses:		
Cost of goods sold	$26,250	
Selling expense (75%)	6,000[a]	
Administrative expense (25%)	3,250[b]	
Total variable expenses		35,500
Contribution margin		14,500
Fixed expenses:		
Selling expense (25%)	2,000[c]	
Administrative expense (75%)	9,750[d]	
Total fixed expenses		11,750
Operating Income		$2,750

[a]$8,000 × 0.75
[b]$13,000 × 0.25
[c]$8,000 × 0.25
[d]$13,000 × 0.75

b. $50,000 ÷ $2 per cookie = 25,000 cookies

c. $14,500 ÷ 25,000 cookies = $0.58 per cookie

d. $14,500 ÷ $50,000 = 29%

Exercise 2-18

a. $\frac{\$87,000}{\$15 \text{ per unit}}$ = 5,800 phone covers

b. $\frac{\$37,410}{5,800 \text{ units}}$ = $6.45 per phone cover

c. $\frac{\$6.45}{\$15.00}$ = 43%

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SOLUTIONS TO PROBLEMS

Problem 2-19

a.

Minutes	Cost per minute	Total Cost
10	$5.00	$50
100	$0.50	$50
250	$0.20	$50
500	$0.10	$50

b. This is a fixed cost because total cost remains fixed while the cost per minute decreases as minutes used increases.

c. 1,000 × $0.02 = $20; prefer $0.02 per minute instead of $50 per month

3,000 × $0.02 = $60; prefer $50 per month

indifferent where $50 = $0.02x
x = 2,500 minutes

d. You should determine which phone plan to buy based on how many minutes you expect to use in one month.

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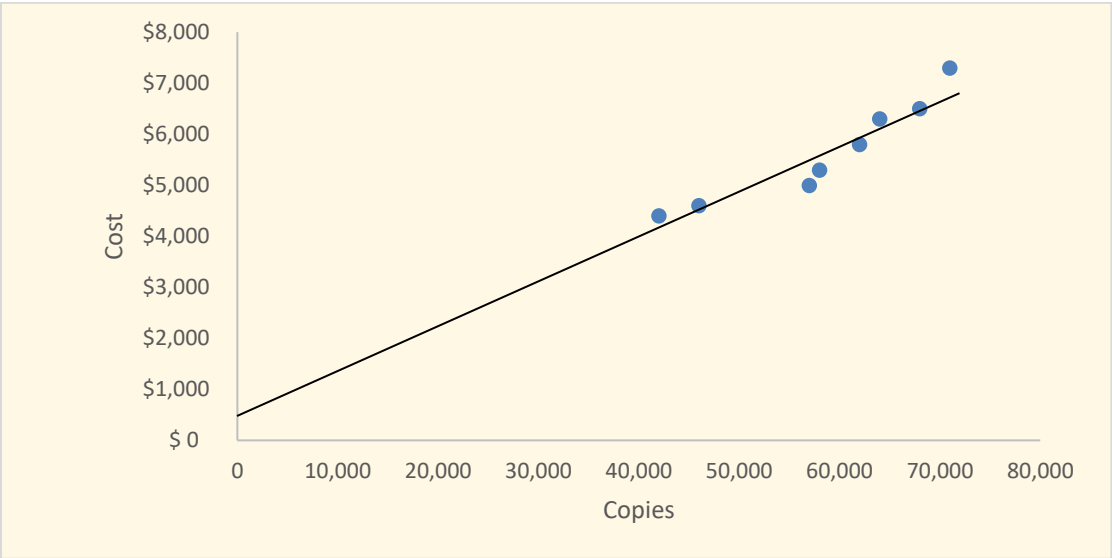
Problem 2-20

a.



NOTE: Students may draw lines that differ from the one above, which will affect the equation they develop for this part of the solution.

The line intersects the y-axis at $500, representing total fixed costs. The line passes through the point (68,000, $6,500), so the slope can be calculated as follows:

$$\frac{\$6{,}500 - \$500}{68{,}000 - 0} = \$0.088 \text{ per copy}$$

The equation of the line is: y = $0.088/copy + $500

b. Variable cost = $\frac{\$7{,}300 - \$4{,}400}{71{,}000 - 42{,}000}$ = $0.10 per copy

c. Fixed cost = $7,300 – ($.10 × 71,000) = $200

d. y = $0.10x + $200

e. September cost = ($0.10 × 62,000) + $200 = $6,400. The equation is just an approximation of the relationship between cost and copies. Since the June cost was not one of the points used to construct the line, then it is not surprising that the two figures are not equal.

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Problem 2-21

a. Variable cost = $\frac{\$80,000 - \$59,000}{8,300 - 3,300}$ = $4.20 per labor hour
Fixed cost = $80,000 – ($4.20 × 8,300) = $45,140 ***or***
Fixed cost = $59,000 – ($4.20 × 3,300) = $45,140

b. Total cost = ($4.20 × 4,200) + $45,140 = $62,780

c. Additional overhead = $4.20 × 350 = $1,470

d. In regression analysis, the cost equation is calculated using all of the data points. In the high-low method, only two points are used to determine the cost equation. In either case, they are both estimates.

Problem 2-22

a. Variable cost = $\frac{\$8,885 - \$6,605}{76,900 - 48,400}$ = $0.08 per spike set sold

b. Fixed cost = $8,885 – ($0.08 × 76,900) = $2,733 or
Fixed cost = $6,605 – ($0.08 × 48,400) = $2,733

c. Marketing cost = ($0.08 × sets sold) + $2,733

d. February sales volume and costs are much lower than the others.

e. Variable cost = $\frac{\$8,885 - \$8,265}{76,900 - 64,500}$ = $0.05 per spike set sold
Fixed cost = $8,885 – ($0.05 × 76,900) = $5,040 or
Fixed cost = $8,265 – ($0.05 × 64,500) = $5,040

Marketing cost = ($0.05 × sets sold) + $5,040

f. The second equation is better for estimating future costs because the endpoints used to estimate the line are more consistent with the normal sales volumes and costs.

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Problem 2-23

a. **Passengers:**

Variable cost = $\frac{\$25,480 - \$19,990}{2,480 - 2,030}$ = $12.20 per passenger

Fixed cost = $25,480 – ($12.20 × 2,480) = ($4,776)

Fuel expense = ($12.20 × passengers) – $4,776

Passenger miles:

Variable cost = $\frac{\$25,459 - \$22,435}{580,214 - 361,214}$ = $0.0138 per passenger mile

Fixed cost = $25,459 – ($0.0138 × 580,214) = $17,452

Fuel expense = ($0.0138 × passenger miles) + $17,452

Train Miles:

Variable cost = $\frac{\$25,459 - \$22,225}{3,515 - 3,025}$ = $6.60 per train mile

Fixed cost = $25,459 – ($6.60 × 3,515) = $2,260

Fuel expense = ($6.60 × train miles) + $2,260

b. The formula based on passengers doesn't make sense as the fixed cost is negative. While this might have some predictive ability, it doesn't help managers understand any causal relationship between the number of passengers and fuel expense.

c. Logically, train miles would seem to have the most predictive ability since the miles a train travels and fuel costs should be directly related. While passenger miles would likely provide information related to the fuel expended due to weight (more passengers, greater weight), it is unlikely that one more passenger mile will have the same impact on fuel expenses that one more train mile will have.

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Problem 2-24

a. Cost of goods sold – variable
   Advertising expense – fixed
   Salaries and wages expense – mixed
   Insurance expense – fixed
   Postage expense – variable

b. Sales price = $3,000 ÷ 1,000 windows = $3.00 per window

   Cost of goods sold = $1,200 ÷ 1,000 windows = $1.20 per window

   Variable salaries expense = $\frac{\$1{,}100 - \$700}{3{,}000 - 1{,}000}$ = $0.20 per window

   Fixed salaries expense = $1,100 – (.2 × 3,000) = $500

   Postage expense = $400 ÷ 1,000 windows = $0.40 per window

   ~~Fixed salaries expense = $1,100 – (.2 × 3,000) = $500~~

		2,500 windows	Per Unit
Sales revenue		$7,500	$3.00
Variable expenses:			
Cost of goods sold	3,000		1.20
Salaries expense	500		0.20
Postage expense	1,000		0.40
Total variable expenses		4,500	1.80
Contribution margin		3,000	$1.20
Fixed expenses:			
Advertising expense	400		
Salaries expense	500		
Insurance expense	200		
Total fixed expenses		1,100	
Operating Income		$1,900	

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Problem 2-25

a. coats sold = $750,000 ÷ $200 = 3,750 units

variable selling expense = $6.00 × 3,750 units = $22,500

variable administrative expense = 6% × $750,000 = $45,000 ÷ 3,750 = $12 per unit

fixed selling expense = $41,060 – $22,500 = $18,560

fixed administrative expense = $68,600 – $45,000 = $23,600

			Per Unit
Sales revenue		$750,000	$200.00
Variable expenses:			
Cost of goods sold	525,000		140.00
Selling expense	22,500		6.00
Administrative expense	45,000		12.00
Total variable expenses		592,500	158.00
Contribution margin		157,500	$ 42.00
Fixed expenses:			
Selling expense	18,560		
Administrative expense	23,600		
Total fixed expenses		42,160	
Operating Income		$115,340	

b. Operating expenses = $158x + $42,160

c. $42 × 4,000 = $168,000

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Problem 2-26

a.

			Per Unit
Sales revenue		$34,000	$40
Variable expenses:			
Service expense	$17,000		20
Bookkeeping expense	2,550		3
Total variable expenses		19,550	23
Contribution margin		14,450	$17
Fixed expenses:			
Vans expense	2,000		
Salaries expense	3,000		
Total fixed expenses		5,000	
Operating Income		$9,450	

b. $9,450 + (150 × $17) = $12,000

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Problem 2-26, continued

c.

	850	1,000	1,100
Current cost: $3 × customers × 12 months	$30,600	$36,000	$39,600
Option 1: $20,400 + ($1 × customers × 12 months)	$30,600	$32,400	$33,600
Option 2: $27,000 + $5,000	$32,000	$32,000	$32,000

d. Mr. Harris needs to evaluate what he thinks future demand for his services will be. If he thinks he will have more customers, then he should consider switching to option 1 or 2 before prices increase. He also needs to think about the stability of his customer base. If he services fewer than 850 customers, options 1 and 2 will be more expensive than the current arrangement.

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SOLUTIONS TO CASES

Case 2-27

	Cost	Behavior
a.	Monthly sales staff payroll of $650 plus 5% sales commission on jerseys	mixed
b.	$100 monthly rental for credit card processing equipment	fixed
c.	Cost of goods sold of $22.00 per jersey	variable
d.	The cost of price tags attached to each jersey	variable
e.	Inventory insurance that costs $2 per $1,000 of sales	step
f.	Website hosting cost of $25 per month	fixed

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Case 2-28

a. $30.00x – $24.00x – $240,000 = operating profit

b. ($24.00 × 55,000) + $240,000 = $1,320,000 + $240,000 = $1,560,000

c. Fixed selling expenses will increase by $20,000 to $165,000, so total fixed expenses will increase by $20,000 to $260,000.

d.

			Per Unit
Sales revenue		$1,950,000	$30.00
Variable expenses:			
Cost of goods sold	$1,430,000		22.00
Sales commission expense	97,500		1.50
Tags	32,500		0.50
Total variable expenses		1,560,000	24.00
Contribution margin		390,000	$ 6.00
Fixed expenses:			
Selling expense	165,000		
Administrative expense	95,000		
Total fixed expenses		260,000	
Operating Income		$ 130,000	

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Case 2-29

a.

Ad development	$7,200	
Placement[a]	1,500	($1.50 × 1,000)
Click-through	6,000	($0.60 × .01 × 1,000,000)
	$14,700	

[a] $\frac{1{,}000{,}000 \text{ ad impressions}}{1{,}000}$ = 1,000 (impressions are priced per thousand)

b. customers = 1,000,000 × .01 × .20 = 2,000

$\frac{\$14{,}700}{2{,}000} = \$7.35$ per customer

c. You need to work backwards to solve this problem:

Since only 20% of those who click through make a purchase, it will take 5 click-throughs to generate one customer (1 ÷ .20).

Since only 1% of banner ad viewers click through to the site, 500 more banner ads need to be placed (5 ÷ .01)

Cost of 500 placements = (500 ÷ 1,000) x $1.50	$0.75
Cost of 5 click-throughs = 5 × $0.60	$3.00
	$3.75

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Case 2-30

a. No, it wasn't ethical. The family and friends are not legitimate customers, and they are driving up Bohlander's cost.

b. No, it wouldn't change. While the purchase is an unintended benefit, the motivation behind Sami's actions was fraudulent.

c. As a result of Sami's actions, Bohlander will experience a higher click-through rate and a lower purchase rate than expected. These "artificial" rates could influence future expectations for similar ad campaigns. Additionally, Bohlander will incur increased advertising expenses as a result of the additional click-throughs ($0.60 per click-through).

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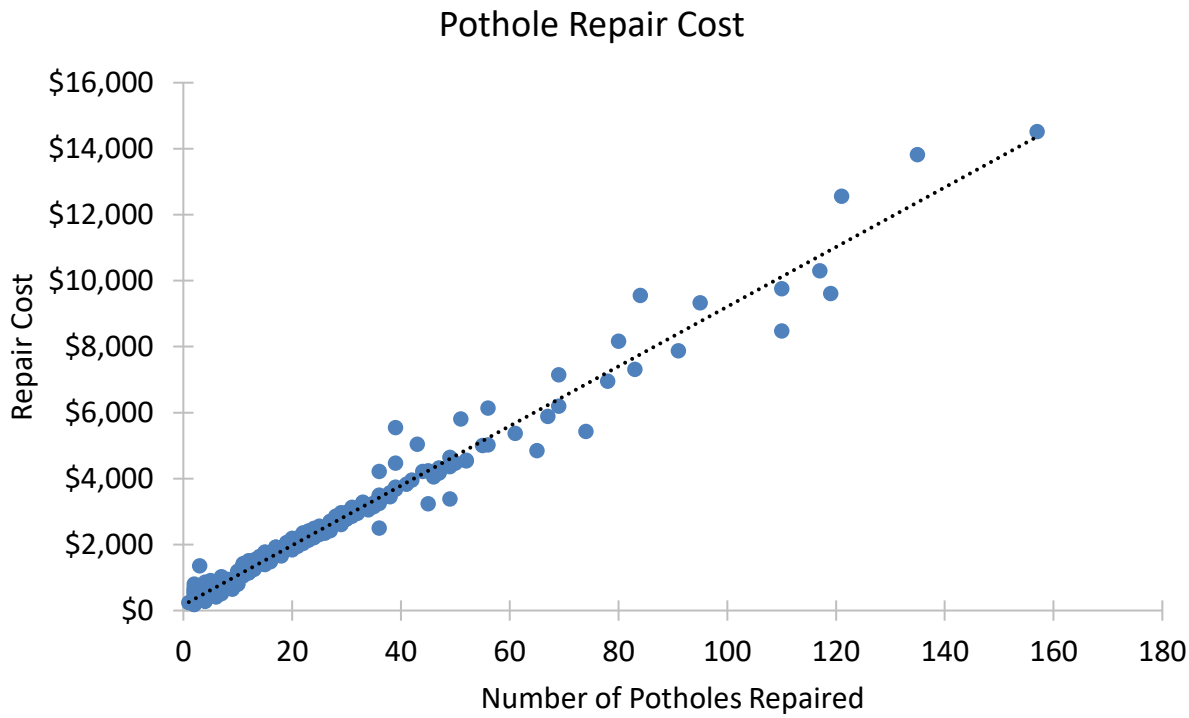
SOLUTIONS TO DATA ANALYTICS CASE

Case 2-31

a.



The dotted line is the linear estimation for pothole repair cost. It appears that as the number of potholes in a work order increases, there is more variability in the total cost to repair those potholes. This variability appears to occur around a volume of 40 potholes.

b. Low point: 1 pothole, $245 repair cost

High point: 157 potholes, $14,519 repair cost

$$\text{Variable repair cost} = \frac{\$14{,}519 - \$245}{157 \text{ potholes} - 1 \text{ pothole}} = \$91.50 \text{ per pothole}$$

Fixed repair cost = $14,519 – ($91.50 × 157) = $153.50 per work order

Cost estimate = $153.50 + ($91.50 × number of potholes repaired)

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Case 2-31, continued

c. Slope from Excel = $90.4453

Intercept from Excel = $165.5404

Cost function = $165.5404 + ($90.4453 × number of potholes repaired)

d. The high-low estimate is similar to the regression estimate. It is possible, however, that these cost equations may not be useful when the number of potholes in a repair order exceeds 40, since the data shows greater variability at that point.

e. It is possible that repair materials, as well as worker speed, may vary with the outside temperature, so including that temperature may provide additional explanatory power and improve future cost estimates, provided forecasted temperatures are available when estimates are made. If temperature is added to the prediction model, average past daily temperatures could be used until updated weather forecasts are available.

Another possible factor of interest is the type of repair material. For instance, some repairs may be asphalt while others may be concrete.

The size and skill level of the work crew will also have an impact on the repair costs.

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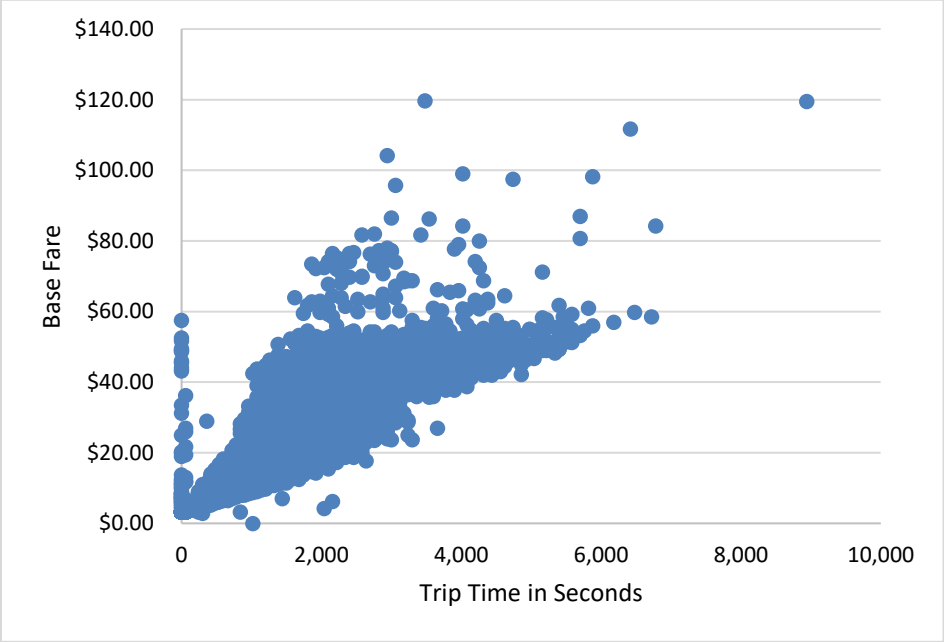
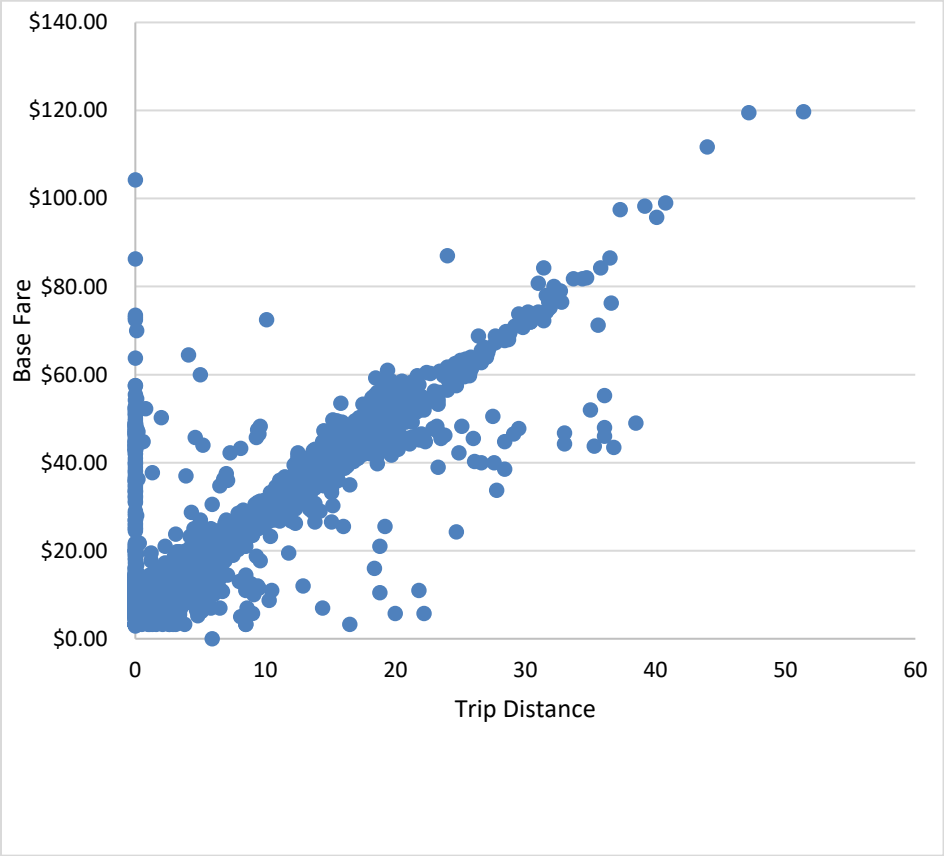
Case 2-32

a.





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Case 2-32, continued

There is a strong linear relationship between trip distance in miles and base fare. While there appears to be a linear relationship between trip length in seconds and base fare, there is more variation than with miles. There are trips of zero distance and/or zero time. There appear to be some trips that are likely outliers.

b. Fare = ($2.19 × miles) + $5.70

c. Fare = ($0.01 × seconds) + $2.45

d. 2.5 miles: ($2.19 × 2.5 miles) + $5.70 = $11.18
850 seconds: ($0.01 × 850 seconds) + $2.45 = $10.95

e. Fare = ($2.25 × miles) + $4.87
Fare = ($0.01 × seconds) + $2.29

2.5 miles: ($2.25 × 2.5 miles) + $4.87 = $10.50
850 seconds: ($0.01 × 850 seconds) + $2.29~~7~~ = $10.79

f. Consider using multiple regression with both miles and seconds as independent variables.

g. Answers will vary depending on the locations students choose.

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CHAPTER 2

Cost Behavior and Cost Estimation

Unit Summaries

Unit 2.1 – Cost Behavior Patterns

This unit examines four cost behavior types – variable, fixed, mixed, and step.

Unit 2.2 – Cost Estimation

This unit focuses on using knowledge of cost behaviors to develop cost functions and estimate total costs. The high-low method and the EXCEL functions for regression are illustrated as a means for analyzing mixed costs.

Unit 2.3 – Contribution Margin Analysis

The contribution margin and the contribution format income statement are introduced.

Continuing Case Recap

This is the first chapter in the text that uses the running case. In this chapter students are introduced to Universal Sports Exchange, one of C&C Sports' customers.

Motivating the Chapter with The Business Decision and Context

Martin Keck, Universal Sports' vice president of sales, wonders why a 10% decrease in sales volume did not result in a 10% decrease in net income. The 10% decrease in sales volume also resulted in a larger than expected ending inventory of baseball jerseys. Martin needs to know how to predict the changes in income when sales volume changes.

Assignment Classification by Learning Objective

Learning Objective	Exercises	Problems	Cases
1. Identify basic cost behavior patterns and explain how changes in activity level affect total cost and unit cost. (Unit 2.1)	1, 2, 3, 4, 5, 6, 7	19, 24	27, 29
2. Estimate a cost equation from a set of cost data and predict future total cost from that equation. (Unit 2.2)	8, 9, 10, 11, 12	20, 21, 22, 23, 25	28, 31, 32
3. Prepare a contribution format income statement. (Unit 2.3)	13, 14, 15, 16, 17, 18	24, 25, 26	28

Assignment Characteristics

*** Revised problem in 4th edition** **+ Lightboard video solution available** **n New problem**

Difficulty: E = Easy, M = Moderate, D = Difficult
Bloom's: K = Knowledge, C = Comprehension, AP = Application, AN = Analysis, S = Synthesis, E = Evaluation
IMA: S = Strategy, planning & performance, R = Reporting and control, T = Technology and analytics, B = Business acumen & operations, L = Leadership, E = Professional ethics & values
AICPA ACC: RA = Risk assessment, M = Measurement, R = Reporting, RS = Research, S = System/process management, T = Technology
AICPA BUS: S = Strategic, G = Global, P = Process management, GV = Governance, C = Customer
AICPA PRO: E = Ethics, P = Professional behavior, D = Decision making, CO = Collaboration, L = Leadership, C = Communication, PM = Project Management

Item	Description	L. O.	Difficulty Level	Minutes to Complete	Bloom's Taxonomy	IMA	AICPA ACC	AICPA BUS	AICPA PRO	Ethics Coverage
EXERCISES										
2.1*	Identify cost behaviors	1	M	12	C	S	R	S, P	D	
2.2	Identify cost behaviors	1	M	15	C	S	R	S, P	D	
2.3*	Identify cost behaviors	1	M	12	AP	S	M	S, P	D	
2.4*	Identify cost behaviors	1	M	15	AP, C	S	M	S, P	D	
2.5*	Identify cost behaviors	1	M	15-20	AP, AN	S	M	S, P	D	
2.6	Explain use of fixed costs in calculating unit cost	1	D	5-7	AN	S	M	S, P	D	
2.7*	Understand the effect of changes in volume on costs	1	D	8	AP, AN	S	M	S, P	D	
2.8	Use a scattergraph to estimate a cost function	2	M	15-20	AP, AN	S	M	S, P	D	
2.9	Use the high-low method to estimate a cost function	2	M	20	AP, AN	S	M	S, P	D	
2.10* +	Use the high-low method to estimate a cost function	2	M	12	AP, AN	S	M	S, P	D	
2.11*	Develop cost functions	2	D	20	AP	S	M	S, P	D	
2.12*	Develop cost function and estimate total cost	2	D	10-15	AP	S	M	S, P	D	
2.13* +	Prepare a contribution format income statement	3	M	10-15	AP	S	M	S, P	D	
2.14	Find missing amounts in a contribution format income statement	3	E	10-15	AN	S	M	S, P	D	
2.15*	Prepare a contribution format income statement	3	D	10-15	AP	S	M	S, P	D	
2.16* +	Prepare a contribution format income statement	3	M	15	AP	S	M	S, P	D	
2.17	Prepare a contribution format income statement	3	E	15	AP	S	M	S, P	D	

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Item	Description	L. O.	Difficulty Level	Minutes to Complete	Bloom's Taxonomy	IMA	AICPA ACC	AICPA BUS	AICPA PRO	Ethics Coverage
2.18*	Interpret contribution format income statement	3	E	10	AP	S	M	S, P	D	
PROBLEMS										
2.19	Identify cost behavior using unit cost information	1	E	20-25	AP, AN	S	M	S, P	D	
2.20*	Develop cost function using scattergraph and high-low method, estimate total cost	2	M	20-25	AP, AN	S	M	S, P	D	
2.21*	Develop cost function using high-low method, estimate total cost	2	D	15-20	AP, AN	S	M	S, P	D	
2.22*	Develop cost function using high-low method, identify cost outliers	2	M	20-25	AP, AN	S	M	S, P	D	
2.23	Develop and evaluate cost function using high-low method	2	D	30-35	AP, AN	S	M	S, P	D	
2.24	Identify cost behavior, prepare contribution format income statement	1, 3	D	20-25	AP	S	M	S, P	D	
2.25*	Prepare a contribution format income statement, estimate total cost	2, 3	D	20	AP	S	M	S, P	D	
2.26*	Prepare a contribution format income statement, evaluate changes in cost behavior	3	D	20-25	AP	S	M	S, P	D	
C&C CONTINUING CASE										
2.27*	Identify cost behavior	1	E	5-7	C	S	M	S, P	D	
2.28*	Determine operating profit equation, prepare contribution format income statement	2, 3	M	10	AP, AN	S	M	S, P	D	
CASES										
2.29*	Identify cost behavior, estimate total cost	1	D	20-25	AP	S	M	S, P	D	
2.30	Evaluate ethical issues		M	10-15	AN	E	R	S, P	E	✔
DATA ANALYTICS PROBLEMS										
2.31	Identify cost behavior, estimate total cost	2	M	30-40	AP, AN, E	T, S	T, M	S, P	D	
2.32[n]	Identify cost behavior, estimate total cost	2	M	30-40	AP, AN, S, E	T, S	T, M	S, P	D	

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Learning Objective Summary by Unit

Unit 2.1

LO 1 ***Identify basic cost behavior patterns and explain how changes in activity level affect total cost and unit cost.***

The two basic cost behavior patterns are variable and fixed. Costs that are a combination of these two basic patterns are referred to as mixed. The following table shows how these costs change with changes in activity:

	AS ACTIVITY INCREASES		AS ACTIVITY DECREASES	
Cost Behavior	**Total Cost**	**Cost per Unit**	**Total Cost**	**Cost per unit**
Variable	increases	remains constant	decreases	remains constant
Fixed	remains constant	decreases	remains constant	increases
Mixed	increases	decreases	decreases	increases

Unit 2.2

LO 2 ***Estimate a cost equation from a set of cost data and predict future total cost from that equation.***

Total cost can be expressed in the form $y = mx + b$, where y is the total cost, m is the variable cost per unit, x is the number of units, and b is the total fixed cost. Given a set of costs and activity levels, you can estimate a cost equation using one of the following methods: scattergraph, high-low, or regression.

Unit 2.3

LO 3 ***Prepare a contribution format income statement.***

A contribution format income statement is an income statement that categorizes expenses by their behavior. It follows the structure:

	Sales revenue
-	Variable expenses
=	Contribution margin
-	Fixed expenses
=	Operating income

Besides showing total sales revenue and expenses, the contribution format statement should also show per unit amounts for sales revenue, variable expenses, and contribution margin.

Related Reading

Douglas MacMillan, "Turning Smartphones Into Cash Registers," Bloomberg Businessweek, February 14 – February 20, 2011, 44-45.

This article, while a little dated, provides information about the costs incurred to use Square, a mobile payment system that plugs into smartphones. The cost information in the article provides an example of a mixed cost, with a fixed monthly base charge and a variable charge per transaction. One interesting twist on this mixed cost is that there are two variable components – one based on the number of transactions and one based on the sales revenue.

Alex Colon, "New iPad 4G Data Plans: AT&T Vs. Verizon," PCMag.com, March 15, 2012, http://www.pcmag.com/article2/0,2817,2401618,00.asp

The data plans discussed in this article provide a good example of a step-variable cost.

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David E. Stout, "Using Excel 2013 for Regression-Based Cost Estimation: Part 1," Management Accounting Quarterly, Winter 2017, 12-22.

This article provides information about using Excel to develop cost estimates using Excel's regression function.

Additional Cases

Thomas L. Albright, Paul Juras, and Russ Elrod, "Over-land Trucking and Freight: Relevant Costs for Decision Making," *IMA Educational Case Journal,* June 2014 (Vol. 7, No. 2, Art. 2).

This case provides an opportunity to use one case across several chapters to help students see connections between topics. For Chapter 2, concentrate on assignments 1, 2, and 3. Since the case refers to relevant costs, a topic not covered until Chapter 8, you may need to supplement the discussion with a brief explanation of this concept or give students enough information to complete the assignment. An additional assignment to consider for Chapter 2 is to have students prepare a contribution format income statement for the company.

Thomas Calderon, James W. Hesford, Nicolas Mangin, and Mina Pizzini, "Sunrise Hotels: An Integrated Managerial Accounting Teaching Case," *Journal of Accounting Education,* 2018, 60-72.

This case can be used across Chapters 2, 3, 5, 6, 8, and 10. It provides students an opportunity to see how these topics are related, rather than isolated, by examining them in one company setting. Part (A) requires students to classify costs by behavior and identify cost drivers. Once this has been decided, students develop a cost estimate function.

Susan P. Convery and Amy M. Swaney, "Analyzing Business Issues – With EXCEL: The Case of Superior Log Cabins, Inc.," *Issues in Accounting Education,* February 2012, 141-156.

This case provides an opportunity to practice cost estimation using scattergraphs, the high-low method, and regression. It also provides the opportunity to practice and improve EXCEL skills. The assignment contains several components, some of which have not been covered at this point in the text, so you will need to provide revised instructions to students about which components to complete.

Shane S. Dikolli and Karen L. Sedatole, "Delta's New Song: A Case on Cost Estimation in the Airline Industry," *Issues in Accounting Education,* August 2004, 345-358.

This case provides an opportunity for students to make and test hypotheses about cost drivers and cost behavior. Using quarterly operating data from Delta Airlines, students are asked to identify possible cost drivers for salary costs and to establish a salary cost formula using high-low, single regression and multiple regression. The data, which covers 1993 – 2002, may appear a bit old, but the exercise does not depend on the newness of the data. The case also offers limited data for the first years of Jet Blue Airlines' operations, allowing a comparison of the cost functions of two airlines with different operating strategies. If you have an alumnus with experience in the airline industry, the case offers an excellent chance for team teaching.

Robert Rankin and Martin Stuebs, "The Chicken or the Egg: Hatching a New and Innovative Product," *IMA Educational Case Journal*, June 2017 (Vol. 10, No. 2, Art. 3).

While this case is set in a manufacturing environment, cost behaviors are described in a way that students should be able to complete the contribution format income statement without knowing details about product costs. The case can also be used with Chapter 3 and Chapter 4.

Martin Stuebs, Scott M. Bryant, Cari Edison, and Kate Reese, "Brittney's Boutique: Tailoring a Budget for Function as well as Fashion," *Journal of Accounting Education,* 2017 (Vol. 39), 32-47.

Students are asked to prepare a contribution format income statement in a retail setting (part 1). Parts 2 and 3 can be assigned with Chapters 3 and 5, respectively, to provide integration across the three chapters. Part 2 requires students to conduct CVP analysis and Part 3 requires preparation of a cash budget.

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Wendy Tietz, Indrarini Laksmana, and John Rose, "Snowie's Shaved Ice Business: Planning and Decision Making," *IMA Educational Case Journal*, September 2018 (Vol. 11, No. 3, Art. 3).

This is a case that illustrates cost behaviors in a simple retail setting. After studying Chapter 2, students will be able to complete questions 1-5 in Part 1. You can return to the case after Chapter 3 to complete questions 6-8. The case can also be used with Chapters 5 (Part 3) and 8 (Part 2) to provide a single case that integrates across four chapters.

L. Melissa Waters and Teresa M. Pergola, "An Instructional Case: Cost Concepts and Managerial Analysis," *Issues in Accounting Education*, November 2009, 531-538.

This case illustrates basis cost concepts using a library setting. Students must identify cost drivers, identify the relevant range of activity, identify can classify costs by behavior, and calculate unit cost. One of the case requirements does require knowledge of cost traceability, which is not covered in the text until Chapter 3. However, the case can be used at this point by omitting that requirement.

Critical Thinking Exercise

Read Alison Sider, "Pricier Fuel to Test Airline Profits," *The Wall Street Journal*, July 9, 2018 (https://www.wsj.com/articles/pricier-fuel-to-test-airline-profits-1531058400) and Susan Carey, "American Airlines to Raise Pay for Pilots, Flight Attendants," *The Wall Street Journal*, April 26, 2017 (https://www.wsj.com/articles/american-airlines-to-raise-pay-for-pilots-flight-attendants-1493245909)

Questions

- Fuel and crew salaries are two of an airline's largest expenses. Using the number of passengers on a flight as the cost driver, how would you classify the behavior of these two costs?
  Crew sizes are determined by the size of the aircraft and the length of the flight (long flights will require additional crew to provide adequate rest periods). Therefore, few salaries would be fixed with regard to the number of passengers on a particular flight. Fuel cost will be a function of the type of aircraft engine and the length of time the engines are running. Again, this cost would be fixed with regard to the number of passengers on a particular flight. However, weight is also a contributor to fuel efficiency, so there would be a very small component of fuel cost that would be attributable to the number of passengers on the flight.

- If an airline were to consider crew salaries as variable, what would be a reasonable cost driver?
  Many airlines use flight time as the driver for crew payroll costs.

- A standard cost metric used by airlines is "cost per available seat mile". This metric is calculated by dividing the total operating costs by the available seat miles flown. How would you classify this metric's cost behavior?
  While at first glance a metric that is expressed per available seat mile appears to be variable, this metric is actually a mixed cost. Total operating costs include fixed and variable costs.

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PowerPoint Slide Notes

Chapter 2

Cost Behavior and Cost Estimation

Managerial Accounting

Fourth Edition

Charles E. Davis and Elizabeth Davis

Universal Sports' income statement

Sales	$1,620,000
COGS	1,188,000
Gross Profit	432,000
Selling and administrative expense	348,000
Operating income	84,000
Tax expense (30%)	25,200
Net income	$ 58,800

What would Universal Sports' net income be if it met the original sales volume projection?

The Business Decision and Context is based on Universal Sports Exchange's (a C&C customer) vice president of sales wondering what net income would have been if the company had reached its planned jersey sales. Ask students to use this income statement to come up with an answer for Universal. After getting some answers, point out that some of the costs won't change in total. For example, selling more jerseys wouldn't increase the amount that the company pays for factory rent. Set the stage by telling students they will learn how to identify which costs will change with additional sales volume and how to prepare a different format of an income statement to help answer this type of question.

Unit 2.1

Cost Behavior Patterns

Learning Objective 1

Identify basic cost behavior patterns and explain how changes in activity level affect total cost and unit cost.

1. Why is it important for managers to understand cost behavior patterns?
2. What is a variable cost? If the activity level increases, what happens to the total cost incurred? Give three examples of a variable cost.
3. What is a fixed cost? If the activity level increases, what happens to the total cost incurred? Give three examples of a fixed cost.
4. Distinguish between committed and discretionary fixed costs.
5. What is a mixed cost? If the activity level increases, what happens to the total cost incurred? Give three examples of a mixed cost.
6. What is a step cost? If the activity level increases, what happens to the total cost incurred? Give three examples of a step cost.

---

4 types of cost behavior

- Variable
- Fixed
- Step-Variable
- Mixed

Inform students that there are four general types of cost behavior that will be studied in Chapter 2.

It's time for a study break!

You've been studying for several hours and are getting ready to take a study break, so you break open a nice cold can of soda. Just then the doorbell rings and in come three friends.

Use this and the following slides of familiar scenarios to illustrate cost behaviors.

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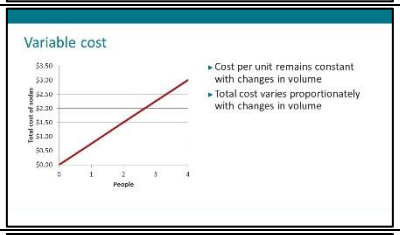
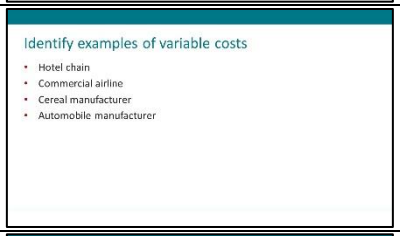
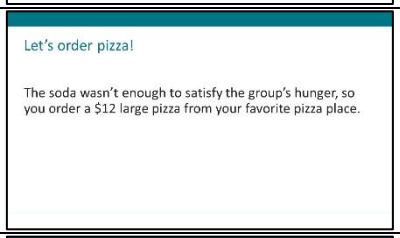
Point out that each can of soda costs $0.75 and that doesn't change as more friends show up and drink a can of soda. This is a variable cost because the cost per unit of $0.75 remains the same, and the total cost of soda increases as more cans of soda are consumed.



Define variable cost. Point out that the graph shows the same information as the table in the previous slide. Review the concept of the slope of a line and how the slope of the cost line is the cost per unit.

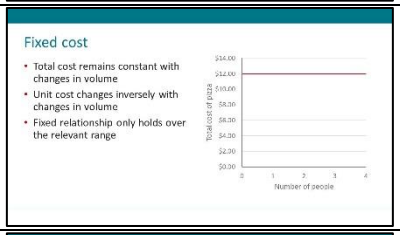


Ask students to identify variable costs for each of these industries. The hotel chain is a good example to use to talk about activity drivers. For instance, the cost of laundry is driven by the number of guests registered. However, the cost of maid service is driven by the number of rooms rented and cleaned. A room with four people will require more laundry than a room with one person. However, each of the rooms will require approximately the same amount of cleaning.

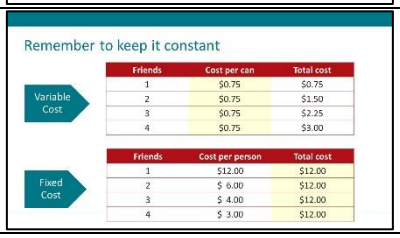


Continue the study break example.

Point out that one pizza was ordered, and the total cost of the pizza will not change as more friends drop in, causing this to be a fixed cost.



Define fixed cost. Point out that the graph illustrates the data from the table in the previous slide. Discuss the concept of relevant range.



Emphasize that if students will always work with the "constant" form of the costs, they will be less likely to adjust costs incorrectly for changes in volume or activity. For variable costs, this is the cost per unit; for fixed costs, it is the total cost.

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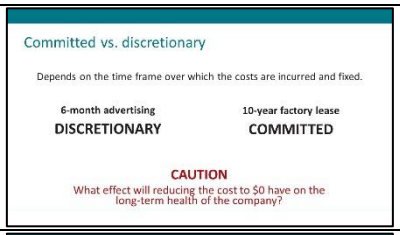
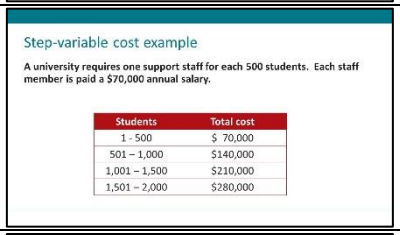
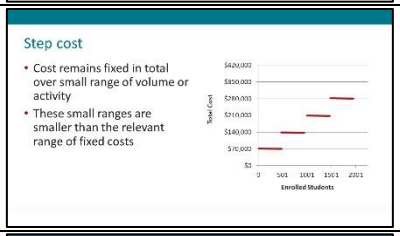


Discuss the concepts of committed and discretionary costs. Relate the concepts to students' lives by using apartment rent and movie tickets to illustrate committed and discretionary costs, respectively.

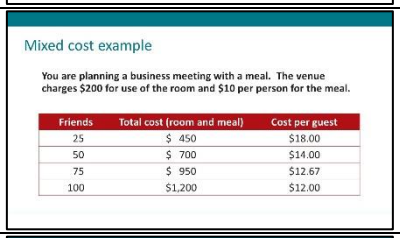


Students	Total cost
1 - 500	$ 70,000
501 – 1,000	$140,000
1,001 – 1,500	$210,000
1,501 – 2,000	$280,000

Discuss step-variable costs. This illustration assumes an academic support person for online courses is paid $70,000 per year and can handle 500 students. Make sure students understand that while step variable costs appear fixed, they steps are relatively small compared to the relevant range over which fixed costs are fixed.

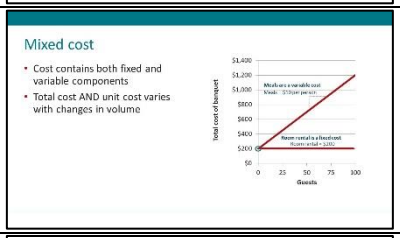


Make sure students understand that while step costs appear fixed, the steps are relatively small compared to the relevant range over which fixed costs are fixed. Inform students that these are sometimes referred to as step-variable costs.

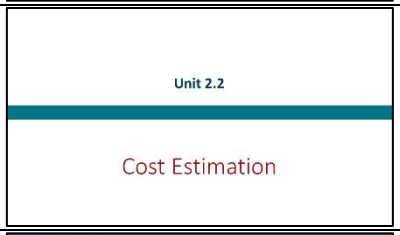


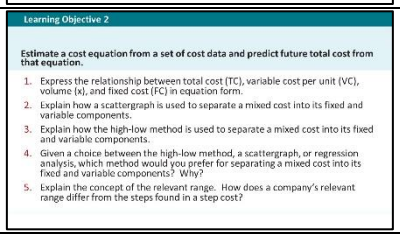
Friends	Total cost (room and meal)	Cost per guest
25	$ 450	$18.00
50	$ 700	$14.00
75	$ 950	$12.67
100	$1,200	$12.00

Discuss this scenario about an event that has a room rental fee and a cost per person for food. Relate back to the pizza example, point out how total cost increases and the cost per person decreases as more people are added to the pizza party. Ask students why the overall cost per guest declines – it's because the total fixed costs are spread over the higher number of guests attending the event.



Discuss mixed costs and present the definition. The graph shows the total cost of a banquet that requires a $200 charge for the room plus a $10 per person charge for food.





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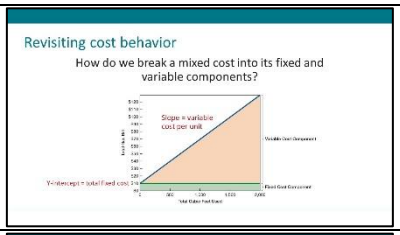
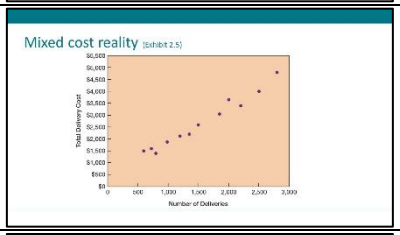
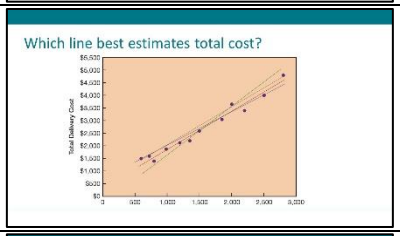
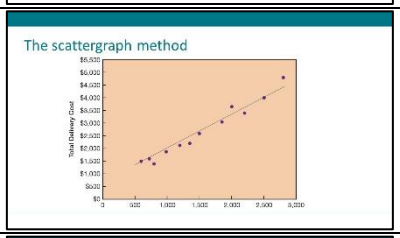
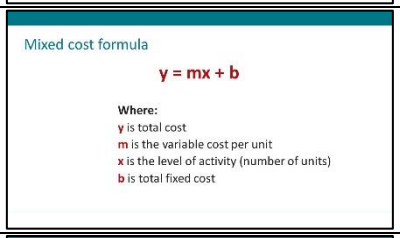
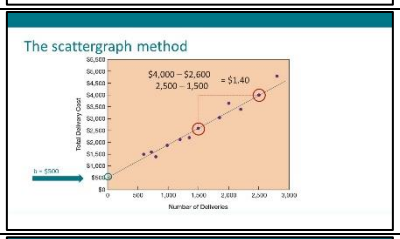
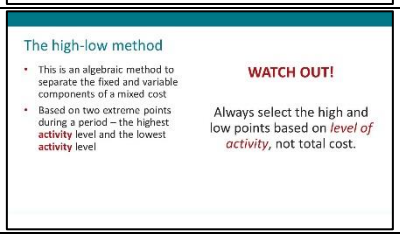
	This graph illustrates the fixed and variable components of a mixed cost. Point out the line intercepts the y-axis at the level of the fixed component of the mixed cost and that the slope of the total cost line represents the variable cost per unit.
	This is a scattergraph of the delivery cost example in the textbook. Ask students how they would use this data to find the fixed and variable delivery cost. Then show the next slide.
	Discuss the pros and cons of each of these possible lines drawn through the delivery cost data points. Ask students which is the best line and what makes that line the best.
	This shows one potential total cost line that could be used to define the cost function. Once again, point out the y-intercept and the slope of the line.
	This is the basic linear cost function definition. Remind students that this is the same line equation they learned in high school algebra, where x is the number of units, m is the variable cost per unit, and b is total fixed costs.
	Point out the steps for developing the equation of a line. 1. Select two points from the data. 2. Draw the line through the two points. 3. Find the y-intercept. 4. Calculate the slope of the line using the two points. 5. Write the equation of the line. Have students compute the equation of the line before you reveal the answer.
	Discuss the usefulness of the high-low method as a quick way to estimate the fixed and variable components of a mixed cost. Point out that the change in the total cost is a result of a change in volume (the cost per unit or slope of the cost line). Be sure to emphasize the WATCH OUT! reminder that activity is always based on level of activity, not the total costs.

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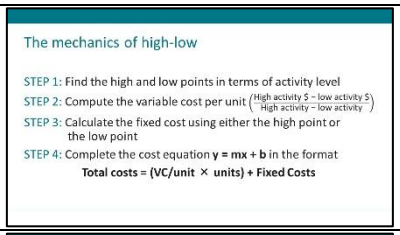
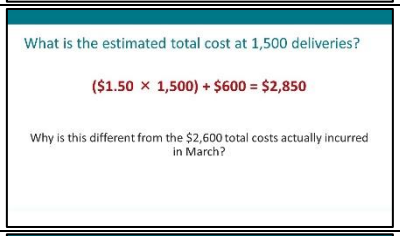
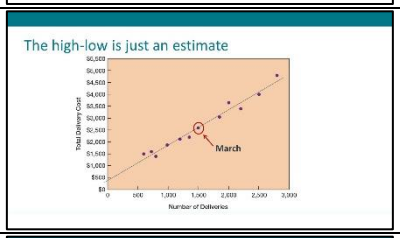


Verbally walk students through the steps of the high-low calculation. Many students will stop after step 2, so remind students that they are not done until they complete the last step to calculate fixed costs.

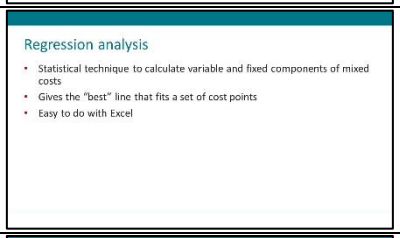
Have students identify the high and low points in this data set. Remind them that the high and low points are based on activity level, not total cost. Once students have tried the problem, walk through the calculations with them.



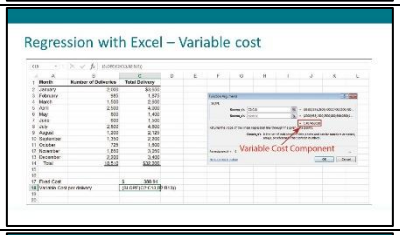
Have students calculate the estimated cost, then work through the calculation with them. Ask why their answer differs from the actual cost when 1,500 deliveries were made.



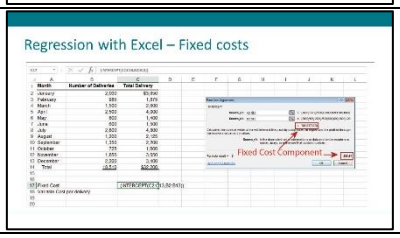
Tie back to the calculation from the previous slide and point out the actual March data point. Emphasize that the high-low method of cost estimation is just that – an estimate. Point out how many actual points fail to fall on the high-low line. But remind students that this doesn't mean it isn't a good tool to use.



If students have completed a statistics course, they should be familiar with regression. Talk about using regression to determine the intercept (total fixed cost) and slope (variable cost per unit) of a set of cost data points. You may want to create a spreadsheet with the delivery data points and show the students how to use a spreadsheet program such as Excel to compute the regression analysis.



This slide shows how to calculate the variable cost per unit using EXCEL's SLOPE function. Inform students that they can also use the LINEST function or the REGRESSION tool in the Data Analysis Tool Pack to find both the slope and intercept.



This slide shows how to calculate the total fixed costs using EXCEL's INTERCEPT function. Inform students that they can also use the LINEST function or the REGRESSION tool in the Data Analysis Tool Pack to find both the slope and intercept.

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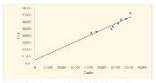
Let's practice **Problem 2.20**	Have students work Problem 2.20 or work it as a class.
Problem 2.20 (a) solution  NOTE: Students may draw lines that differ from the one shown, which will affect the equation they develop for the partial-line solution. The line shown is the result of $MS representing total fixed costs. The line passes through the point (0,$200; $0,000), so the slope can be calculated as follows: $\frac{\$6,900 - \$200}{68,000 - 0} = \$0.0984$ per copy The equation of the line is: $y = \$0.0984x + \$200$	Answers for part A will differ depending on what line the student draws through the data points.
Problem 2.20 solution (cont.) b. Variable cost per unit = $\frac{\$7,300 - \$4,400}{71,000 - 42,000}$ = $0.10 per copy c. Fixed cost = $7,300 – ($0.10 × 71,000) = $200 d. y = $0.10x + $200 e. September cost = ($0.10 × 62,000) + $200 = $6,400. The equation is just an approximation of the relationship between cost and copies. Since the June cost was not one of the points used to construct the line, then it is not surprising that the two figures are not equal.	
Unit 2.3 Contribution Margin Analysis	
Learning Objective 3 **Prepare a contribution format income statement.** 1. Define the term **contribution margin**. 2. What is the contribution margin ratio? How is it related to the variable cost ratio? 3. If a product's variable cost per unit increases while the selling price and fixed cost decrease, what will happen to the contribution margin per unit? 4. How can a company increase a product's contribution margin?	
What is "contribution margin"? Contribution margin is the revenue remaining to cover fixed expenses and provide profit after variable expenses have been covered Contribution margin = Sales revenue – Total variable expenses Contribution margin ratio = $\frac{\text{Contribution margin}}{\text{Sales revenue}}$	Define contribution margin and point out how it differs from the term gross margin that the students are familiar with.
Contribution income statement Sales revenue - Variable expenses = Total contribution margin - Total fixed expenses = Operating income	Walk through the contribution margin income statement. Point out that expenses are classified by behavior rather than function. Illustrate how a mixed cost will appear in both variable and fixed sections of the income statement. Emphasize that operating income will not change when recasting a functional income statement into a contribution format income statement. Expenses are not changing, they are just being rearranged.

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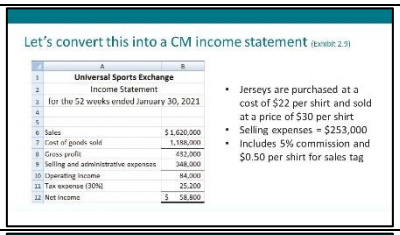
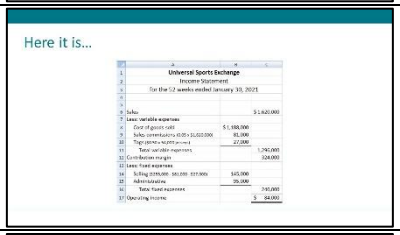
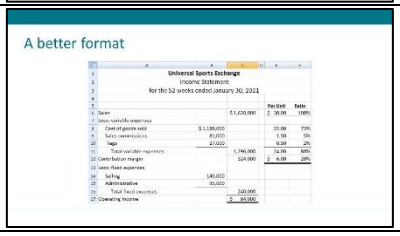


Have students recast Universal Sports Exchange's functional income statement (Exhibit 2.9) into a contribution format income statement using Exhibit 2.9 and the information on page 2-19.



Work through Universal's contribution format income statement.



Emphasize that including the per unit amounts for sales, variable expenses, and contribution margin, along with their percentages, will create a more useful income statement to support decision-making efforts.

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