

				Difficulty				CMA/CPA origin					
				LO1: DM, DL, Manuf. overhead	LO2: Period and product costs	LO3: Variable, fixed, and mixed costs	LO4: High-low method	LO5: Income statement formats	LO6: Direct and indirect costs	LO7: Decision-making cost classifications	LO8: Least squares regression (App 2A)	Professional Exam Adapted	
Question Type											ID	Origin	
	1	T/F	E								x	New,6/27/97,E	E.N.
	2	T/F	E								x	3/14/2010 M1	E.N.
	3	T/F	H								x	3/14/2010 N2	E.N.
	4	Conceptual M/C	E				x				x	8/e:ATB6-29	David Keyes
	5	Conceptual M/C	M								x	3-17-2010 Conceptual A	E.N.
	6	M/C	H								x	8/22/2004 Single MC H4	E.N.
	7	M/C	H								x	8/22/2004 Single MC G4	E.N.
	8	M/C	H								x	New,6/28/97,A9	E.N.
2A-1	9-10	Multipart M/C	M								x	8/21/2004 Multi MC G4	E.N.
2A-2	11-12	Multipart M/C	H								x	7/e: 6-59 to 60	Authors
2A-3	13-14	Multipart M/C	M								x	8/21/2004 Multi MC I4	E.N.
2A-4	15-16	Multipart M/C	M								x	8/21/2004 Multi MC H4	E.N.
	17	Problem	H				x				x	LD9e:CH05P2	Larry

Chapter 02 - Appendix A Least-Squares Regression Computations

18	Problem	H		x	8/22/2004 Problem J4	Deppe
19	Problem	H		x	New,6/29/97,A9	E.N.
20	Problem	H	x	x	6/e:5-62	Authors
21	Problem	H		x	8/21/2004 Problem H4	E.N.
22	Problem	H		x	8/21/2004 Problem I4	E.N.

Chapter 02

Appendix A Least-Squares Regression Computations

True / False Questions

1. In least-squares regression, independent variables are not included in the computations of the slope and intercept.
True False

2. Least-squares regression selects the values for the intercept and slope of a straight line that minimize the sum of the squared errors.
True False

3. When analyzing a mixed cost, you should always plot the data in a scattergraph, but it is particularly important to check the data visually on a scattergraph when the R^2 is very high.
True False

Multiple Choice Questions

4. Which of the following methods of analyzing mixed costs can be used to estimate an equation for the mixed cost?

	High-Low	Least-Squares
A)	Yes	Yes
B)	Yes	No
C)	No	Yes
D)	No	No

- A. Option A
- B. Option B
- C. Option C
- D. Option D

5. The least-squares regression method:
- A. fits a line to data by minimizing the sum of the squared errors from the line.
 - B. is generally less accurate than the high-low method.
 - C. can be used only if the fixed cost element is larger than the variable cost element.
 - D. can be used only if the fixed cost element is smaller than the variable cost element.
6. The management of Ferry Corporation would like for you to analyze their repair costs, which are listed below:

	Machine-Hours	Repair Costs
February.....	2,131	\$33,085
March.....	2,160	\$33,103
April.....	2,117	\$33,070
May.....	2,180	\$33,137
June.....	2,102	\$33,013
July.....	2,196	\$33,167
August.....	2,128	\$33,054
September	2,191	\$33,140

Management believes that repair cost is a mixed cost that depends on the number of machine-hours. Using the least-squares regression method, the estimates of the variable and fixed components of repair cost would be closest to:

- A. \$1.64 per machine-hour plus \$29,566 per month
- B. \$0.92 per machine-hour plus \$31,132 per month
- C. \$1.37 per machine-hour plus \$30,157 per month
- D. \$15.39 per machine-hour plus \$33,096 per month

7. Moeller Inc.'s inspection costs are listed below:

	Units Produced	Inspection Costs
March	125	\$9,079
April	152	\$10,473
May	121	\$8,884
June	175	\$11,689
July	191	\$12,507
August	180	\$11,939
September	182	\$12,055
October	177	\$11,795

Management believes that inspection cost is a mixed cost that depends on the number of units produced. Using the least-squares regression method, the estimates of the variable and fixed components of inspection cost would be closest to:

- A. \$51.76 per unit plus \$2,621 per month
- B. \$51.99 per unit plus \$2,584 per month
- C. \$67.86 per unit plus \$11,053 per month
- D. \$52.23 per unit plus \$2,550 per month

8. Your boss would like you to estimate the fixed and variable components of a particular cost. Actual data for this cost over four recent periods appear below.

	Activity	Cost
Period 1	24	\$378
Period 2	23	\$367
Period 3	20	\$342
Period 4	25	\$386

Using the least-squares regression method, what is the cost formula for this cost?

- A. $Y = \$156.64 + \$9.20X$
- B. $Y = \$0.00 + \$16.01X$
- C. $Y = \$164.54 + \$8.86X$
- D. $Y = \$169.97 + \$6.10X$

Descoteaux Inc.'s inspection costs are listed below:

	Units Produced	Inspection Costs
February.....	415	\$6,100
March.....	365	\$5,624
April.....	434	\$6,315
May.....	449	\$6,453
June.....	391	\$5,874
July.....	366	\$5,627
August.....	441	\$6,380
September.....	392	\$5,887

Management believes that inspection cost is a mixed cost that depends on units produced.

9. Using the least-squares regression method, the estimate of the variable component of inspection cost per unit produced is closest to:

- A. \$9.87
- B. \$14.84
- C. \$9.26
- D. \$9.97

10. Using the least-squares regression method, the estimate of the fixed component of inspection cost per month is closest to:

- A. \$1,979
- B. \$6,033
- C. \$5,624
- D. \$2,021

Carr Company reports the following data for the first six months of the year:

Month	Machine Hours	Electrical Cost
January.....	400	\$40
February.....	300	\$30
March.....	400	\$50
April.....	300	\$40
May.....	200	\$30
June.....	200	\$20

11. Using the least-squares regression method, the estimated variable electrical cost per machine hour is closest to:

- A. \$0.91
- B. \$0.10
- C. \$0.20
- D. \$0.25

12. Using the least-squares regression method, the estimated monthly fixed component of the electrical cost is closest to:

- A. \$5
- B. \$20
- C. \$6
- D. \$10

Gelrud Corporation's recent utility costs are listed below:

	Machine-Hours	Utility Costs
March	2,443	\$19,941
April	2,419	\$19,804
May	2,483	\$20,161
June	2,424	\$19,801
July	2,475	\$20,127
August	2,409	\$19,733
September	2,453	\$19,983
October	2,480	\$20,147

Management believes that utility cost is a mixed cost that depends on machine-hours.

13. Using the least-squares regression method, the estimate of the variable component of utility cost per machine-hour is closest to:

- A. \$8.15
- B. \$5.78
- C. \$5.57
- D. \$5.85

14. Using the least-squares regression method, the estimate of the fixed component of utility cost per month is closest to:

- A. \$19,733
- B. \$5,809
- C. \$19,962
- D. \$5,628

Recent maintenance costs of Prideaux Corporation are listed below:

	Machine-Hours	Maintenance Costs
February	632	\$8,774
March	587	\$8,334
April	666	\$9,093
May	620	\$8,667
June	580	\$8,275
July	575	\$8,241
August	617	\$8,650
September	588	\$8,368

Management believes that maintenance cost is a mixed cost that depends on machine-hours.

15. Using the least-squares regression method, the estimate of the variable component of maintenance cost per machine-hour is closest to:

- A. \$9.36
- B. \$9.49
- C. \$14.06
- D. \$9.23

16. Using the least-squares regression method, the estimate of the fixed component of maintenance cost per month is closest to:

- A. \$2,859
- B. \$8,241
- C. \$8,550
- D. \$2,782

Essay Questions

17. The Stephens Leadership Center provides training seminars in personal development and time management. The company is relatively new and management is seeking information regarding the Center's cost structure. The following information has been gathered since the inception of the business in January of the current year:

Month	Seminars Offered	Costs Incurred
January	10	\$17,000
February	12	\$18,800
March	15	\$20,900
April	18	\$23,762
May	16	\$21,800
June	13	\$19,400

Required:

- Using the high-low method, estimate the variable cost per seminar and the total fixed cost per month.
- Using the least-squares method, estimate the variable cost per seminar and the total fixed cost per month.

18. Dillenbeck Printing Corp., a book printer, has provided the following data:

	Titles Printed	Press Setup Cost
February	33	\$3,170
March	34	\$3,203
April	46	\$3,688
May	28	\$2,996
June	44	\$3,607
July	42	\$3,551
August	43	\$3,586
September	39	\$3,413

Management believes that the press setup cost is a mixed cost that depends on the number of titles printed. (A specific book that is to be printed is called a "title". Typically, thousands of copies will be printed of each title. Specific steps must be taken to setup the presses for printing each title-for example, changing the printing plates. The costs of these steps are the press setup costs.)

Required:

Estimate the variable cost per title printed and the fixed cost per month using the least-squares regression method.

19. Below are cost and activity data for a particular cost over the last four periods. Your boss has asked you to analyze this cost so that management will have a better understanding of how this cost changes in response to changes in activity.

	Activity	Cost
Period 1	46	\$292
Period 2	40	\$271
Period 3	42	\$279
Period 4	41	\$267

Required:

Using the least-squares regression method, estimate the cost formula for this cost.

20. Executive Training, Inc., provides a personal development seminar that is popular with many companies. The number of seminars offered over the last five months, along with the total costs of offering these seminars, follows:

	Seminars Offered	Costs Incurred
April	55	\$15,400
May	45	\$14,000
June	60	\$18,000
July	50	\$14,700
August	75	\$19,000

Required:

- Using the high-low method, estimate the variable cost per seminar and the total fixed cost per month.
- Using the least-squares regression method, compute the variable cost per seminar and the total fixed cost per month. (Round off to the nearest whole dollar.)

21. Galarneau Inc. maintains a call center to take orders, answer questions, and handle complaints. The costs of the call center for a number of recent months are listed below:

	Calls Taken	Call Center Cost
February	7,851	\$85,115
March	7,820	\$84,934
April	7,861	\$85,178
May	7,860	\$85,161
June	7,825	\$84,965
July	7,836	\$85,009
August	7,879	\$85,262
September	7,866	\$85,201

Management believes that the cost of the call center is a mixed cost that depends on the number of calls taken.

Required:

Estimate the variable cost per call and fixed cost per month using the least-squares regression method.

22. The management of Ferriman Corporation would like to better understand the behavior of the company's warranty costs. Those costs are listed below for a number of recent months:

	Product Returns	Warranty Cost
April	24	\$2,972
May	23	\$2,928
June	27	\$3,141
July	39	\$3,752
August	36	\$3,569
September	35	\$3,551
October	26	\$3,071
November	37	\$3,636

Management believes that warranty cost is a mixed cost that depends on the number of product returns.

Required:

Estimate the variable cost per product return and the fixed cost per month using the least-squares regression method.

Chapter 02 Appendix A Least-Squares Regression Computations **Answer Key**

True / False Questions

1. In least-squares regression, independent variables are not included in the computations of the slope and intercept.

FALSE

AACSB: Reflective Thinking

AICPA BB: Critical Thinking

AICPA FN: Measurement

Bloom's: Knowledge

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method

Level: Easy

2. Least-squares regression selects the values for the intercept and slope of a straight line that minimize the sum of the squared errors.

TRUE

AACSB: Reflective Thinking

AICPA BB: Critical Thinking

AICPA FN: Measurement

Bloom's: Knowledge

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method

Level: Easy

3. When analyzing a mixed cost, you should always plot the data in a scattergraph, but it is particularly important to check the data visually on a scattergraph when the R^2 is very high.

FALSE

AACSB: Reflective Thinking

AICPA BB: Critical Thinking

AICPA FN: Measurement

Bloom's: Knowledge

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method

Level: Hard

Multiple Choice Questions

4. Which of the following methods of analyzing mixed costs can be used to estimate an equation for the mixed cost?

	High-Low	Least-Squares
A)	Yes	Yes
B)	Yes	No
C)	No	Yes
D)	No	No

- A.** Option A
- B. Option B
- C. Option C
- D. Option D

AACSB: Reflective Thinking

AICPA BB: Critical Thinking

AICPA FN: Measurement

Bloom's: Knowledge

Learning Objective: 02A-04 Analyze a mixed cost using a scattergraph plot and the high-low method

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method

Level: Easy

5. The least-squares regression method:

- A.** fits a line to data by minimizing the sum of the squared errors from the line.
- B. is generally less accurate than the high-low method.
- C. can be used only if the fixed cost element is larger than the variable cost element.
- D. can be used only if the fixed cost element is smaller than the variable cost element.

AACSB: Reflective Thinking

AICPA BB: Critical Thinking

AICPA FN: Measurement

Bloom's: Comprehension

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method

Level: Medium

6. The management of Ferry Corporation would like for you to analyze their repair costs, which are listed below:

	Machine-Hours	Repair Costs
February.....	2,131	\$33,085
March.....	2,160	\$33,103
April.....	2,117	\$33,070
May.....	2,180	\$33,137
June.....	2,102	\$33,013
July.....	2,196	\$33,167
August.....	2,128	\$33,054
September.....	2,191	\$33,140

Management believes that repair cost is a mixed cost that depends on the number of machine-hours. Using the least-squares regression method, the estimates of the variable and fixed components of repair cost would be closest to:

- A. \$1.64 per machine-hour plus \$29,566 per month
- B. \$0.92 per machine-hour plus \$31,132 per month
- C. \$1.37 per machine-hour plus \$30,157 per month
- D. \$15.39 per machine-hour plus \$33,096 per month

Using Microsoft Excel, the solution is:

Intercept.....	\$30,157	Fixed cost
Slope	\$1.37	Variable cost
RSQ	0.93	

AACSB: Analytic

AICPA BB: Critical Thinking

AICPA FN: Measurement

Bloom's: Application

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method

Level: Hard

7. Moeller Inc.'s inspection costs are listed below:

	Units Produced	Inspection Costs
March	125	\$9,079
April	152	\$10,473
May	121	\$8,884
June	175	\$11,689
July	191	\$12,507
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September	182	\$12,055
October	177	\$11,795

Management believes that inspection cost is a mixed cost that depends on the number of units produced. Using the least-squares regression method, the estimates of the variable and fixed components of inspection cost would be closest to:

- A. \$51.76 per unit plus \$2,621 per month
- B. \$51.99 per unit plus \$2,584 per month**
- C. \$67.86 per unit plus \$11,053 per month
- D. \$52.23 per unit plus \$2,550 per month

Using Microsoft Excel, the solution is:

Intercept	\$2,584	Fixed cost
Slope	\$51.99	Variable cost
RSQ	1.00	

AACSB: Analytic

AICPA BB: Critical Thinking

AICPA FN: Measurement

Bloom's: Application

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method

Level: Hard

8. Your boss would like you to estimate the fixed and variable components of a particular cost. Actual data for this cost over four recent periods appear below.

	Activity	Cost
Period 1	24	\$378
Period 2	23	\$367
Period 3	20	\$342
Period 4	25	\$386

Using the least-squares regression method, what is the cost formula for this cost?

A. $Y = \$156.64 + \$9.20X$

B. $Y = \$0.00 + \$16.01X$

C. $Y = \$164.54 + \$8.86X$

D. $Y = \$169.97 + \$6.10X$

Using Microsoft Excel, the slope and intercept are:

Intercept.....	\$164.54
Slope	\$8.86
RSQ	1.00

Therefore, the cost formula is \$164.54 per activity plus \$8.86 per unit or:

$Y = \$164.54 + \$8.86X$

AACSB: Analytic

AICPA BB: Critical Thinking

AICPA FN: Measurement

Bloom's: Application

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method

Level: Hard

Descoteaux Inc.'s inspection costs are listed below:

	Units Produced	Inspection Costs
February.....	415	\$6,100
March.....	365	\$5,624
April.....	434	\$6,315
May.....	449	\$6,453
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Management believes that inspection cost is a mixed cost that depends on units produced.

9. Using the least-squares regression method, the estimate of the variable component of inspection cost per unit produced is closest to:

- A. \$9.87
- B. \$14.84
- C. \$9.26
- D. \$9.97**

Using Microsoft Excel functions, the solution is:

Variable cost per unit produced = Slope = \$9.97

AACSB: Analytic

AICPA BB: Critical Thinking

AICPA FN: Measurement

Bloom's: Application

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method

Level: Medium

10. Using the least-squares regression method, the estimate of the fixed component of inspection cost per month is closest to:

- A. \$1,979
- B. \$6,033
- C. \$5,624
- D. \$2,021

Using Microsoft Excel functions, the solution is:

Fixed cost per month = Intercept = \$1,979

AACSB: Analytic

AICPA BB: Critical Thinking

AICPA FN: Measurement

Bloom's: Application

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method

Level: Medium

Carr Company reports the following data for the first six months of the year:

Month	Machine Hours	Electrical Cost
January	400	\$40
February	300	\$30
March	400	\$50
April	300	\$40
May	200	\$30
June	200	\$20

11. Using the least-squares regression method, the estimated variable electrical cost per machine hour is closest to:

- A. \$0.91
- B. \$0.10**
- C. \$0.20
- D. \$0.25

Using Microsoft Excel functions, the solution is:

Variable electrical cost per machine hour = Slope = \$0.10

AACSB: Analytic

AICPA BB: Critical Thinking

AICPA FN: Measurement

Bloom's: Application

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method

Level: Hard

12. Using the least-squares regression method, the estimated monthly fixed component of the electrical cost is closest to:

- A. \$5**
- B. \$20
- C. \$6
- D. \$10

Using Microsoft Excel functions, the solution is:

Fixed electrical cost per month = Intercept = \$5.00

AACSB: Analytic

AICPA BB: Critical Thinking

AICPA FN: Measurement

Bloom's: Application

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method

Level: Hard

Gelrud Corporation's recent utility costs are listed below:

	Machine-Hours	Utility Costs
March.....	2,443	\$19,941
April	2,419	\$19,804
May.....	2,483	\$20,161
June	2,424	\$19,801
July	2,475	\$20,127
August.....	2,409	\$19,733
September	2,453	\$19,983
October	2,480	\$20,147

Management believes that utility cost is a mixed cost that depends on machine-hours.

13. Using the least-squares regression method, the estimate of the variable component of utility cost per machine-hour is closest to:

- A. \$8.15
- B. \$5.78
- C. \$5.57
- D. \$5.85**

Using Microsoft Excel functions, the solution is:

Utility cost per machine-hour = Slope = \$5.85

AACSB: Analytic

AICPA BB: Critical Thinking

AICPA FN: Measurement

Bloom's: Application

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method

Level: Medium

14. Using the least-squares regression method, the estimate of the fixed component of utility cost per month is closest to:

- A. \$19,733
- B. \$5,809
- C. \$19,962
- D. \$5,628**

Using Microsoft Excel functions, the solution is:

Fixed utility cost per month = Intercept = \$5,628

AACSB: Analytic

AICPA BB: Critical Thinking

AICPA FN: Measurement

Bloom's: Application

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method

Level: Medium

Recent maintenance costs of Prideaux Corporation are listed below:

	Machine-Hours	Maintenance Costs
February	632	\$8,774
March	587	\$8,334
April	666	\$9,093
May	620	\$8,667
June	580	\$8,275
July	575	\$8,241
August	617	\$8,650
September	588	\$8,368

Management believes that maintenance cost is a mixed cost that depends on machine-hours.

15. Using the least-squares regression method, the estimate of the variable component of maintenance cost per machine-hour is closest to:

- A. \$9.36
- B. \$9.49**
- C. \$14.06
- D. \$9.23

Using Microsoft Excel functions, the solution is:

Maintenance cost per machine-hour = Slope = \$9.49

AACSB: Analytic

AICPA BB: Critical Thinking

AICPA FN: Measurement

Bloom's: Application

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method

Level: Medium

16. Using the least-squares regression method, the estimate of the fixed component of maintenance cost per month is closest to:

- A. \$2,859
- B. \$8,241
- C. \$8,550
- D. \$2,782**

Using Microsoft Excel functions, the solution is:

Fixed maintenance cost per month = Intercept = \$2,782

AACSB: Analytic

AICPA BB: Critical Thinking

AICPA FN: Measurement

Bloom's: Application

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method

Level: Medium

Essay Questions

17. The Stephens Leadership Center provides training seminars in personal development and time management. The company is relatively new and management is seeking information regarding the Center's cost structure. The following information has been gathered since the inception of the business in January of the current year:

Month	Seminars Offered	Costs Incurred
January	10	\$17,000
February	12	\$18,800
March	15	\$20,900
April	18	\$23,762
May	16	\$21,800
June	13	\$19,400

Required:

- Using the high-low method, estimate the variable cost per seminar and the total fixed cost per month.
- Using the least-squares method, estimate the variable cost per seminar and the total fixed cost per month.

a. High-Low Method:

Month.....	Number of Seminars	Costs Incurred
April (high activity level).....	18	\$23,762
January (low activity level)	<u>10</u>	<u>17,000</u>
Change observed.....	<u>8</u>	<u>\$ 6,762</u>

Variable cost = Change in Cost/Change in activity = \$6,762/8 seminars = \$845.25 per seminar

Fixed cost element = Total cost - Variable cost element
 = \$23,762 - (\$845.25 per seminar × 18 seminars) = \$8,547.50

Cost formula for seminar costs: \$8,547.50 per month plus \$845.25 per seminar held

b. Least-Squares Method:

$$n = 6$$

$$\text{sum}X = 84$$

$$\text{sum}Y = 121,662$$

$$\text{sum}XY = 1,737,816$$

$$\text{sum}X^2 = 1,218$$

$$b = [n(\text{sum}XY) - (\text{sum}X)(\text{sum}Y)] / [n(\text{sum}X^2) - (\text{sum}X)^2]$$

$$= [6(1,737,816) - (84)(121,662)] / [6(1,218) - (84)^2]$$

$$= \$822.57 \text{ (rounded to the nearest whole cent)}$$

$$a = [(\text{sum}Y) - b(\text{sum}X)] / n$$

$$= [(121,662) - 822.57(84)] / 6$$

$$= \$8,761 \text{ (rounded to the nearest whole dollar)}$$

The cost formula is \$8,761 per month plus \$822.57 per seminar. A similar answer can be obtained using Microsoft Excel.

AACSB: Analytic

AICPA BB: Critical Thinking

AICPA FN: Measurement

Bloom's: Application

Learning Objective: 02A-04 Analyze a mixed cost using a scattergraph plot and the high-low method

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method

Level: Hard

18. Dillenbeck Printing Corp., a book printer, has provided the following data:

	Titles Printed	Press Setup Cost
February	33	\$3,170
March	34	\$3,203
April	46	\$3,688
May	28	\$2,996
June	44	\$3,607
July	42	\$3,551
August	43	\$3,586
September	39	\$3,413

Management believes that the press setup cost is a mixed cost that depends on the number of titles printed. (A specific book that is to be printed is called a "title". Typically, thousands of copies will be printed of each title. Specific steps must be taken to setup the presses for printing each title-for example, changing the printing plates. The costs of these steps are the press setup costs.)

Required:

Estimate the variable cost per title printed and the fixed cost per month using the least-squares regression method.

The solution using Microsoft Excel functions is:

Variable cost per title printed = Slope = \$39.53

Fixed cost per month = Intercept = \$1,875

The solution using the formulas in the text is:

$$n = 8$$

$$\text{sum}X = 309$$

$$\text{sum}Y = \$27,214$$

$$\text{sum}XY = \$1,062,203$$

$$\text{sum}X^2 = 12,215$$

$$\begin{aligned} b &= [n(\text{sum}XY) - (\text{sum}X)(\text{sum}Y)]/[n(\text{sum}X^2) - (\text{sum}X)^2] \\ &= [8(\$1,062,203) - (309)(\$27,214)]/[8(12,215) - (309)^2] \\ &= \$39.53 \end{aligned}$$

$$\begin{aligned} a &= [(\text{sum}Y) - b(\text{sum}X)]/n \\ &= [(\$27,214) - \$39.53(309)]/8 \\ &= \$1,875 \end{aligned}$$

Any difference in the solutions is due to rounding errors when the formulas are used.

Chapter 02 - Appendix A Least-Squares Regression Computations

AACSB: Analytic

AICPA BB: Critical Thinking

AICPA FN: Measurement

Bloom's: Application

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method

Level: Hard

19. Below are cost and activity data for a particular cost over the last four periods. Your boss has asked you to analyze this cost so that management will have a better understanding of how this cost changes in response to changes in activity.

	Activity	Cost
Period 1	46	\$292
Period 2	40	\$271
Period 3	42	\$279
Period 4	41	\$267

Required:

Using the least-squares regression method, estimate the cost formula for this cost.

The solution using Microsoft Excel functions is:

Variable cost = Slope = \$3.94

Fixed cost = Intercept = \$110.80

Therefore, the cost formula is \$110.80 per period plus \$3.94 per unit of activity or:

$$Y = \$110.80 + \$3.94X$$

The solution using the formulas in the text is:

$$n = 4$$

$$\text{sum}X = 169$$

$$\text{sum}Y = 1,109$$

$$\text{sum}XY = 46,937$$

$$\text{sum}X^2 = 7,161$$

$$\begin{aligned} b &= [n(\text{sum}XY) - (\text{sum}X)(\text{sum}Y)] / [n(\text{sum}X^2) - (\text{sum}X)^2] \\ &= [4(46,937) - (169)(1,109)] / [4(7,161) - (169)^2] \\ &= \$3.94 \text{ (rounded to nearest whole cent)} \end{aligned}$$

$$\begin{aligned} a &= [(\text{sum}Y) - b(\text{sum}X)] / n \\ &= [(1,109) - 3.94(169)] / 4 \\ &= \$111 \text{ (rounded to nearest whole dollar)} \end{aligned}$$

Cost formula: $Y = \$111 + \$3.94X$.

AACSB: Analytic

AICPA BB: Critical Thinking

AICPA FN: Measurement

Bloom's: Application

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method

Level: Hard

20. Executive Training, Inc., provides a personal development seminar that is popular with many companies. The number of seminars offered over the last five months, along with the total costs of offering these seminars, follows:

	Seminars Offered	Costs Incurred
April	55	\$15,400
May	45	\$14,000
June	60	\$18,000
July	50	\$14,700
August	75	\$19,000

Required:

- Using the high-low method, estimate the variable cost per seminar and the total fixed cost per month.
- Using the least-squares regression method, compute the variable cost per seminar and the total fixed cost per month. (Round off to the nearest whole dollar.)

a. Using the high-low method, estimate the variable cost per seminar and the total fixed cost per month.

	Cost	Activity
High level of activity	\$19,000	75
Low level of activity	14,000	45
Difference.....	<u>\$ 5,000</u>	<u>30</u>

Variable cost = Change in cost ÷ Change in activity
 = \$5,000 ÷ 30 seminars = \$166.67 per seminar

Fixed cost = Total cost - Variable cost
 = \$19,000 - (\$166.67 per seminar × 75 seminars)
 = \$19,000 - \$12,500
 = \$6,500

b. Using Microsoft Excel functions, the estimates are:

Variable cost per seminar = Slope = \$177.92

Total fixed cost per month = Intercept = \$6,078.30

Using the formulas in the text, the solution is:

$$n=5$$

$$\text{sum}X=285$$

$$\text{sum}Y=\$81,100$$

$$\text{sum}XY=\$4,717,000$$

$$\text{sum}X^2=16,775$$

Least squares formulas:

$$b = [n(\text{sum}XY) - (\text{sum}X)(\text{sum}Y)] \div [n(\text{sum}X^2) - (\text{sum}X)^2]$$

$$= [5(4,717,000) - (285)(81,100)] \div [5(16,775) - (285)^2]$$

$$= \$178 \text{ per seminar}$$

$$a = [(\text{sum}Y) - b(\text{sum}X)] \div n$$

$$= [(81,100) - 178(285)] \div 5$$

$$= \$6,074 \text{ per month}$$

The two solutions differ due to rounding error.

AACSB: Analytic

AICPA BB: Critical Thinking

AICPA FN: Measurement

Bloom's: Application

Learning Objective: 02A-04 Analyze a mixed cost using a scattergraph plot and the high-low method

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method

Level: Hard

21. Galarneau Inc. maintains a call center to take orders, answer questions, and handle complaints. The costs of the call center for a number of recent months are listed below:

	Calls Taken	Call Center Cost
February	7,851	\$85,115
March	7,820	\$84,934
April	7,861	\$85,178
May	7,860	\$85,161
June	7,825	\$84,965
July	7,836	\$85,009
August	7,879	\$85,262
September	7,866	\$85,201

Management believes that the cost of the call center is a mixed cost that depends on the number of calls taken.

Required:

Estimate the variable cost per call and fixed cost per month using the least-squares regression method.

Using Microsoft Excel functions, the solution is:

Variable cost per call = Slope = \$5.74

Fixed cost per month = Intercept = \$40,083

AACSB: Analytic

AICPA BB: Critical Thinking

AICPA FN: Measurement

Bloom's: Application

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method

Level: Hard

22. The management of Ferriman Corporation would like to better understand the behavior of the company's warranty costs. Those costs are listed below for a number of recent months:

	Product Returns	Warranty Cost
April	24	\$2,972
May	23	\$2,928
June	27	\$3,141
July	39	\$3,752
August	36	\$3,569
September	35	\$3,551
October	26	\$3,071
November	37	\$3,636

Management believes that warranty cost is a mixed cost that depends on the number of product returns.

Required:

Estimate the variable cost per product return and the fixed cost per month using the least-squares regression method.

The solution using Microsoft Excel functions is:

Variable cost per product return = Slope = \$51.08

Fixed cost per month = Intercept = \$1,750

The solution using the formulas in the text is:

$$n = 8$$

$$\text{sum}X = 247$$

$$\text{sum}Y = \$26,620$$

$$\text{sum}XY = \$836,954$$

$$\text{sum}X^2 = 7,921$$

$$\begin{aligned} b &= [n(\text{sum}XY) - (\text{sum}X)(\text{sum}Y)]/[n(\text{sum}X^2) - (\text{sum}X)^2] \\ &= [8(\$836,954) - (247)(\$26,620)]/[8(7,921) - (247)^2] \\ &= \$51.08 \end{aligned}$$

$$\begin{aligned} a &= [(\text{sum}Y) - b(\text{sum}X)]/n \\ &= [(\$26,620) - \$51.08(247)]/8 = \$1,750 \end{aligned}$$

AACSB: Analytic

AICPA BB: Critical Thinking

AICPA FN: Measurement

Bloom's: Application

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method

Level: Hard