3

Two-Variable Statistics

Key Terms
bias
categorical variable
cause and effect relationship
dot plot
influential point
outlier
variable

Curriculum Expectations

Working With Two-Variable Data

In this chapter, students will

DM1.01 distinguish situations requiring one-variable and two-variable data analysis, describe the associated numerical summaries (e.g., tally charts, summary tables) and graphical summaries (e.g., bar graphs, scatter plots), and recognize questions that each type of analysis addresses (e.g., What is the frequency of a particular trait in a population? What is the mathematical relationship between two variables?)

DM1.02 describe characteristics of an effective survey (e.g., by giving consideration to ethics, privacy, the need for honest responses, and possible sources of bias, including cultural bias) and design questionnaires (e.g., for determining if there is a relationship between age and hours per week of Internet use, between marks and hours of study, or between income and years of education) or experiments (e.g., growth of plants under different conditions) for gathering two-variable data

DM1.03 collect two-variable data from primary sources, through experimentation involving observation or measurement, or from secondary sources (e.g., Internet databases, newspapers, magazines), and organize and store the data using a variety of tools (e.g., spreadsheets, dynamic statistical software)

DM1.04 create a graphical summary of two-variable data using a scatter plot (e.g., by identifying and justifying the dependent and independent variables; by drawing the line of best fit, when appropriate), with and without technology

DM1.05 determine an algebraic summary of the relationship between two variables that appear to be linearly related (i.e., the equation of the line of best fit of the scatter plot), using a variety of tools (e.g., graphing calculators, graphing software) and strategies (e.g., using systematic trials to determine the slope and y-intercept of the line of best fit; using the regression capabilities of a graphing calculator), and solve related problems (e.g., use the equation of the line of best fit to interpolate or extrapolate from the given data set)

DM1.06 describe possible interpretations of the line of best fit of a scatter plot (e.g., the variables are linearly related) and reasons for misinterpretations (e.g., using too small a sample; failing to consider the effect of outliers; interpolating from a weak correlation; extrapolating non-linearly related data)

DM1.07 determine whether a linear model (i.e., a line of best fit) is appropriate given a set of two-variable data, by assessing the correlation between the two variables (i.e., by describing the type of correlation as positive, negative, or none; by describing the strength as strong or weak; by examining the context to determine whether a linear relationship is reasonable)

DM1.08 make conclusions from the analysis of two-variable data (e.g., by using a correlation to suggest a possible cause-and-effect relationship) and judge the reasonableness of the conclusions (e.g., by assessing the strength of the correlation; by considering if there are enough data)

Teaching Suggestions

Chapter Opener

- Introduce two-variable statistics by explaining the difference between one-variable and two-variable data. Have students give examples of each type of data.

Career Profile

Have students discuss what they know about a career as a quality controller. As an extension to the discussion, have students research this career and other careers that are related to statistics, and present their findings to the class. You may wish to use **BLM A-4 Presentation Checklist** to assess students' presentations.

Using their research, have students discuss:
- The tasks of a quality controller.
- The type of education and training needed for this career.
- Other careers that use statistics.
- The differences in the training and education required for a similar career.

You may wish to have students include their research in their Portfolios.

Chapter 3 Planning Chart

Section Suggested Timing	Student Text Page(s)	Teacher's Resource Blackline Masters	Assessment	Tools
Chapter 3 Opener • 10 min	138–139		• BLM A-4 Presentation Checklist	
Prerequisite Skills • 80 min	140–141	• BLM 3-1 Prerequisite Skills	• BLM 3-2 Prerequisite Skills Self-Assessment Checklist	• graphing calculators *Optional* • computers with dynamic statistical software or spreadsheet software
3.1 Two-Variable Data Sets • 80 min	142–151	• BLM 3-3 Section 3.1 Two-Variable Data Sets		• graphing calculators
3.2 Effective Surveys • 80–160 min	152–159	• BLM 3-4 Section 3.2 Effective Surveys	• BLM 3-5 Section 3.2 Achievement Check Rubric	
3.3 Collect and Organize Data • 160 min	160–167	• BLM 3-6 Section 3.3 Collect and Organize Data		• beanbags, clean chalk brushes, or bags filled with rice • metre sticks • masking tape • large chart graph paper • computers with Internet access and spreadsheet software
3.4 The Line of Best Fit • 80–160 min	168–181	• BLM 3-7 Section 3.4 The Line of Best Fit	• BLM 3-8 Section 3.4 Achievement Check Rubric	• graphing calculators *Optional* • computers with dynamic statistical software or spreadsheet software • TI-Nspire™ CAS graphing calculators
3.5 Analysis and Conclusions • 80 min	182–189	• BLM 3-9 Section 3.5 Analysis and Conclusions	• BLM 3-10 Section 3.5 Achievement Check Rubric	• graphing calculators
Chapter 3 Review • 80 min	190–191	• BLM 3-11 Chapter 3 Literacy • BLM 3-12 Chapter 3 Review		• graphing calculators • computers with Internet access and spreadsheet software
Chapter 3 Practice Test • 80 min	192–193		• BLM 3-13 Chapter 3 Practice Test • BLM 3-14 Chapter 3 Test	• graphing calculators • computers with Internet access and spreadsheet software
Chapter 3 Problem Wrap-Up • 40–80 min	193		• BLM 3-15 Chapter 3 Problem Wrap-Up Rubric	• graphing calculators • computers with spreadsheet software
Chapter 3 Task • 80 min	194–195		• BLM 3-16 Chapter 3 Task Rubric	• graphing calculators • computers with spreadsheet software

Chapter 3 Blackline Masters Checklist

	Title		Purpose
Chapter 3 Opener			
	BLM A-4	Presentation Checklist	Assessment
Prerequisite Skills			
	BLM 3-1	Prerequisite Skills	Practice
	BLM 3-2	Prerequisite Skills Self-Assessment Checklist	Self-Assessment
3.1 Two-Variable Data Sets			
	BLM 3-3	Section 3.1 Two-Variable Data Sets	Practice
3.2 Effective Surveys			
	BLM 3-4	Section 3.2 Effective Surveys	Practice
	BLM 3-5	Section 3.2 Achievement Check Rubric	Assessment
3.3 Collect and Organize Data			
	BLM 3-6	Section 3.3 Collect and Organize Data	Practice
3.4 The Line of Best Fit			
	BLM 3-7	Section 3.4 The Line of Best Fit	Practice
	BLM 3-8	Section 3.4 Achievement Check Rubric	Assessment
3.5 Analysis and Conclusions			
	BLM 3-9	Section 3.5 Analysis and Conclusions	Practice
	BLM 3-10	Section 3.5 Achievement Check Rubric	Assessment
Chapter 3 Review			
	BLM 3-11	Chapter 3 Literacy	Review
	BLM 3-12	Chapter 3 Review	Student Support
Chapter 3 Practice Test			
	BLM 3-13	Chapter 3 Practice Test	Diagnostic Assessment
	BLM 3-14	Chapter 3 Test	Summative Assessment
Chapter 3 Problem Wrap-Up			
	BLM 3-15	Chapter 3 Problem Wrap-Up Rubric	Summative Assessment
Chapter 3 Task			
	BLM 3-16	Chapter 3 Task Rubric	Summative Assessment
	BLM 3-17	Chapter 3 BLM Answers	

Accommodations

Language—play *Jeopardy* using the definitions in **question 1** as answers. Post the definitions and terms on a Word Wall after the game.

Visual—before students answer **questions 2 and 3**, display the graphs on an overhead projector and review the key components of graphs: labels, title, scales, and data accuracy

Perceptual—work through **question 4** with the class using an LCD projector to review graphing calculator keystrokes for constructing histograms

Memory—review slope and y-intercept. Have students work in groups to graph the equations from **question 6** on large grid paper. Post the graphs and compare the slopes and y-intercepts of each graph.

Teaching Suggestions
• Consider having students use a placemat activity for the questions.
• All BLMs referred to throughout this chapter can be found on the *Foundations for College Mathematics 12: Teacher's Resource CD ROM.*

Assessment
• Assess student readiness to proceed by informal observation as students are working on the questions. A formal test is inappropriate since this material is not part of the grade 12 curriculum for this chapter.
• Student self-assessment is also an effective technique; students can place a checkmark beside topics in the Prerequisite Skills in which they feel confident with the necessary skills. Use **BLM 3-2 Prerequisite Skills Self-Assessment Checklist** as a self-assessment tool for students.
• Remedial action can be taken in small groups or with a whole-class skills review.

Extra Practice
• Use **BLM 3-1 Prerequisite Skills** for extra practice or remediation.

Chapter Problem
• The Chapter Problem is introduced on page 141. Have students discuss their understanding of surveys, including surveys they may have completed or designed in the past. You may wish to have students complete the Chapter Problem revisits that occur throughout the chapter. These questions are designed to help students move toward the Chapter 3 Problem Wrap-Up on page 193.
• Alternatively, you may wish to assign the Chapter Problem questions and Chapter Problem Wrap-Up when students have completed the chapter, as part of a summative assessment.