2.3

Use Scatter Plots to Analyse Data

Mathematical Process Expectations Emphasis

- ☑ Problem Solving
- ☐ Reasoning and Proving
- ☑ Reflecting
- ☑ Selecting Tools and Computational Strategies
- ☑ Connecting
- ☑ Representing
- ☑ Communicating

Specific Expectations

Using Data Management to Investigate Relationships

RE1.01 interpret the meanings of points on scatter plots or graphs that represent linear relations, including scatter plots or graphs in more than one quadrant (e.g., on a scatter plot of height versus age, interpret the point (13, 150) as representing a student who is 13 years old and 150 cm tall; identify points on the graph that represent students who are taller and younger than this student);

RE1.03 design and carry out an investigation or experiment involving relationships between two variables, including the collection and organization of data, using appropriate methods, equipment, and/or technology (e.g., surveying; using measuring tools, scientific probes, the Internet) and techniques (e.g., making tables, drawing graphs);

RE1.04 describe trends and relationships observed in data, make inferences from data, compare the inferences with hypotheses about the data, and explain any differences between the inferences and the hypotheses (e.g., describe the trend observed in the data. Does a relationship seem to exist? Of what sort? Is the outcome consistent with your hypothesis? Identify and explain any outlying pieces of data. Suggest a formula that relates the variables. How might you vary this experiment to examine other relationships?);

Understanding Characteristics of Linear Relations

RE2.01 construct tables of values, graphs, and equations, using a variety of tools (e.g., graphing calculators, spreadsheets, graphing software, paper and pencil), to represent linear relations derived from descriptions of realistic situations;

RE2.02 construct tables of values, scatter plots, and lines or curves of best fit as appropriate, using a variety of tools (e.g., spreadsheets, graphing software, graphing calculators, paper and pencil), for linearly related and non-linearly related data collected from a variety of sources (e.g., experiments, electronic secondary sources, patterning with concrete materials).

Link to Get Ready

The Get Ready segment Scatter Plots provides the needed skills for this section. You may wish to have the students complete Get Ready questions 3 and 4 before starting this section.

Teaching Suggestions

- Until the end of grade 8, students' experience with scatter plots has been with discrete data. The Investigates and Examples extend their experience to continuous data. These activities engage students in kinesthetic learning activities, along with covering many of the process expectations, most notably, Problem Solving, Reflecting, Connecting, and Communicating.
- Investigate A furthers students' skills in using a graphing calculator as a tool for data analysis and in describing a relationship between handspan and forearm length. Have a class discussion on this relationship. (15 min)

- In Investigate B, students learn the scientific process for conducting an experiment. In the follow up discussion, a fun comparison can be made between humans and Martians. (25 min)
- Example 1 is an important overview of identifying independent and dependent variables. If graphing calculators are not available, Example 2 can be used to teach skills involving the use of other technology for making scatter plots. You may wish to use **BLM G10 Grid Paper, BLM T6** *Fathom*™, **BLM T1 Corel®** *Quattro Pro®* **8**, **BLM T2 Corel®** *Quattro Pro®* **10**, and/or **BLM T3 Microsoft®** *Excel* to support Example 2. (15 min)
- Discuss the vocabulary, **independent variable**, **dependent variable**, and **outliers**, before assigning the exercise. (2 min)
- Assign Communicate Your Understanding questions C1 and C2. (5 min)
- You may wish to use **BLM 2.3.1 Practice: Use Scatter Plots to Analyse Data** for remediation or extra practice.

Investigate Answers (page 56)

A. 5. The horizontal axis represents the left forearm length and the vertical axis represents the left handspan length.

7. As the forearms get longer, the handspan lengths also get longer.

8. Derf has a long forearm but a short handspan. The ordered pair is below the rest on the graph.

9. Answers will vary. The data could have been recorded incorrectly, Derf could still be growing and hasn't reached his full adult size yet, or it could just be a natural phenomenon.

B. 1. To determine if there is a relationship between a human's forearm length and handspan.

2. Answers will vary. The longer a person's forearm is, the greater their handspan.

4. Answers will vary. The larger a person's handspan is, the longer their forearm is.

5. Answers will vary. A person's handspan and forearm length are related, they are either both larger or both small. This supports my original hypothesis.

6. Answers will vary. A better sample could be used by increasing the size of the sample to the school and randomly selecting 5% of students.

7. Answers will vary. Find the average forearm length and handspan for both the aliens and the humans. You can compare the ratio of forearm to handspan between the two species or you could compare the forearms and the handspans separately.

Communicate Your Understanding Responses (page 63)

C1. If the points follow a line or curve, then the variables are related. If the points are scattered randomly, then they are not related.

C2. B. Outliers might tell you something interesting has occurred.

Practise

Caution students to consider cause and effect when identifying the independent and dependent variables.

Connect and Apply

Compare the relationships in questions 4 (linear) and 5 (non-linear). For question 8, the following web sites can be used to update dietary information:
- Harvey's—http://www.harveys.ca/eng/site.php (download pdf. file);
- Mr. Sub—http://www.mrsub.ca/consumers/nutritional_subs_wraps.html;

- Pizza Pizza—http://www.pizzapizza.ca/english/pages/menu/sub_nutrition/ n_pizza.htm; KFC—http://www.yum.com/nutrition/menu.asp?brandID_ Abbr=2_KFC;
- Swiss Chalet—http://www.swisschalet.ca/ourmenu/nutritionals.pdf.

Note that 1 food Calorie is about 4.19 kJ. In SI, kilojoules replace calories as the unit for food energy. Question 7 refers to the Chapter Problem. You may wish to assign this question, but not take it up in class, if it is being used as an ongoing assessment piece. You may wish to use **BLM G10 Grid Paper** for questions 3, 4, 5, 6, and 9.

Extend

Question 9 describes the relationship and asks the students to draw the graph. Question 10d) adds a level of complexity by having students consider the strength of the relationships.

Exercise Guide

Category	Question Number
Minimum (essential questions for all students to cover the expectations)	1–4, 8
Typical	1–6, 8
Extension	9–11