3.3

Collect and Organize Data

Student Text Pages
160–167

Suggested Timing
160 min

Tools
- beanbags, clean chalk brushes, or bags filled with rice
- metre sticks
- masking tape
- large chart graph paper
- computers with Internet access and spreadsheet software

Related Resources
BLM 3-6 Section 3.3 Collect and Organize Data

Link to Prerequisite Skills

Students should complete Use Technology in the Prerequisite Skills before proceeding with this section.

Warm-Up

1. The table shows the height and age data for nine plants growing in a greenhouse.

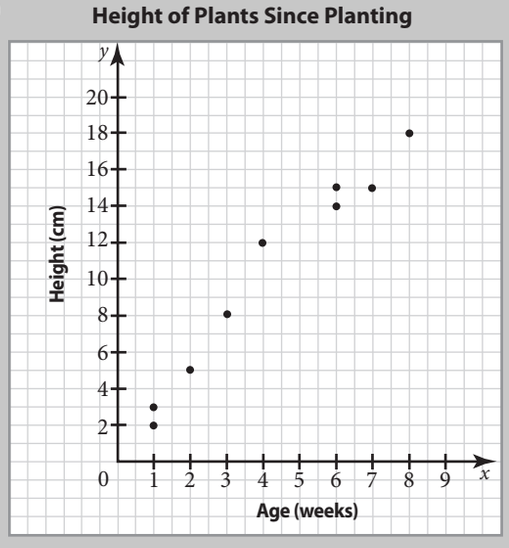
Age (weeks)	Height (cm)
1	3
8	18
4	12
2	5
6	15
3	8
6	14
7	15
1	2

a) Make a scatter plot of the data.

b) Describe the relationship between a plant's height and its age.

Warm-Up Answers

1. a)



b) As the age of the plant increases, the height also increases. There seems to be a linear relationship.

Teaching Suggestions

- In this section students take an active role in collecting and organizing data.

Warm-Up

- Display the Warm-Up question. Have students complete the question independently. Then, discuss the solution as a class.

Section Opener

- Discuss the importance of making accurate measurements or answering survey questions accurately so as to provide accurate results when analysing the survey.

Investigate

- The experiment also allows students to make an important comparison between primary and secondary data, as outlined in the text on page 161.
- As a class, discuss how accurate the measurements should be: to the nearest centimetre or the nearest millimetre?
- If the class is small, you can make one scatter plot for the class data. If the class is large, make one scatter plot for each group.
- End with a class discussion on whether practice makes perfect in a statistical sense.

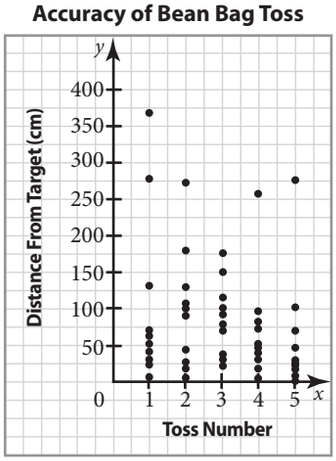
Investigate Answers (page 160)

Answers may vary. For example:

4.

Accuracy (cm)				
Toss 1	**Toss 2**	**Toss 3**	**Toss 4**	**Toss 5**
130	112	150	19	0
278	274	119	259	276
68	33	101	30	9
32	179	71	82	13
6	4	21	72	24
25	132	30	6	20
37	19	176	48	48
70	100	33	51	109
54	87	78	94	24
370	40	94	43	71

5.



6. Toss 1 has the greatest spread of data points. The spread of data points for each successive toss appears to decrease. For toss 5, most data points are less than 100 cm from the target. In general, the data points suggest that practice does make perfect.

Examples

- Example 1 is a good follow-up to the Investigate. Students need to understand why it is important to plan an experiment so that there is no bias, and to ensure their measurements are accurate. Discuss the importance of randomness in selecting the sample group. Caution students not to generalize their results for the entire population when they are analysing data for a sample group. Explain that the experiment must be repeated many times with many participants for it to apply to an entire population.
- Example 2 is a good example of secondary research and may need to be done as a second lesson. A computer lab will be required. Students might have used E-STAT previously, but a full treatment of this Example would be a good experience. Mention that E-STAT is also useful for projects in their other courses, such as business, economics, and so on.

Key Concepts

- Go over the Key Concepts with the class. Review the steps needed to ensure an experiment is accurate and fair.

Discuss the Concepts

- Have students refer to the Key Concepts when answering these questions. Then, have a class discussion to ensure all students understand the concepts.

Discuss the Concepts Suggested Answers (page 165)

D1. a) Primary data. The data is collected through observation.

b) Secondary data. The data is collected from an environmental group, who originally observed and recorded the data.

c) Primary data. The data is collected through an experiment.

D2. The balance of international payments generally increases as employment generated by tourism increases. Small increases in employment generated by tourism correspond to large increases in the balance of international payments. The data cannot be approximated by a straight line. For example, at approximately 175 jobs generated, there are three different levels for the balance of international payments.

Practise (A)

- You may wish to have students work in pairs or small groups to complete the Practise questions.
- Encourage students to refer to the Examples before asking for assistance.
- Students will need computers with Internet access for **questions 5 to 7.**

Apply (B)

- Students should work in groups for **question 8.**
- Students will need computers with Internet access for **questions 9, 10, and 13.**
- In **question 12**, students set up an observational study of the number of cars passing their school. This study will require students to keep an observation schedule for an entire school day. Some planning might be needed to ensure this does not disrupt their other classes.
- For **question 13**, students could also research gas and water consumption for various municipalities and compare the rates of consumption.

Common Errors

- Some students have difficulty setting up an experiment because they are confused about the appropriate steps.

R_x Have students make a chart listing the six steps for designing and performing an experiment from **Example 1**. Have students work in groups to discuss how to follow each step and discuss the advantages and disadvantages of each strategy. **Question 8** provides a good set of questions that students should ask when setting up an experiment.

Accommodations

Motor—have students work in groups to set up the **Investigate** and assist with measuring, recording the data, and constructing the graphs. Allow students to use technology to create the graphs.

Visual—post the six steps for gathering primary data from **Example 1**

Perceptual—complete **Example 2** as a class using an LCD projector to demonstrate how to access E-STAT. Provide a handout or a poster of the steps for future reference.

ESL—provide a partner to assist students with reading and understanding this section, and with accessing data from E-Stat in **Example 2**. Ask students to add the definitions of new terms in this section to their personal math dictionaries: primary data, secondary data, outlier, E-STAT, and Statistics Canada.

Language—add definitions for primary data, secondary data, observational studies, experiment, and outlier to the Word Wall

Extend (C)

- Assign the Extend questions to students who are not being challenged by the Apply questions.
- Students should work in groups. They will need computers with Internet access.

Literacy Connect

- Have one or two students read the section opener and the Investigate instructions out loud. Ensure students understand what is expected of them in the Investigate.
- You may wish to demonstrate the steps required to access E-STAT for **Example 2**.
- Discuss the **Literacy Connect** as related to the Discuss the Concepts on page 165.
- Discuss the meaning of the new terms in this section: primary data, secondary data, outlier, E-STAT, and Statistics Canada. Encourage students to add these definitions to their personal math dictionaries.
- Allow students to work in pairs to assist each other when completing the Practise questions.

Mathematical Process Expectations

Process Expectation	Questions
Problem Solving	5, 6, 8–10, 12–15
Reasoning and Proving	1–4, 7–10, 12–15
Reflecting	5–8, 13–15
Selecting Tools and Computational Strategies	8–15
Connecting	1, 2, 5, 6, 8–10, 12–15
Representing	3, 4, 8–15
Communicating	1, 2, 5–10, 12–15

Ongoing Assessment

- Most of the Discuss the Concepts questions can be used as short quizzes to determine if students have understood the Investigate and Examples.

Extra Practice

- Use **BLM 3-6 Section 3.3 Collect and Organize Data** for extra practice or remediation.