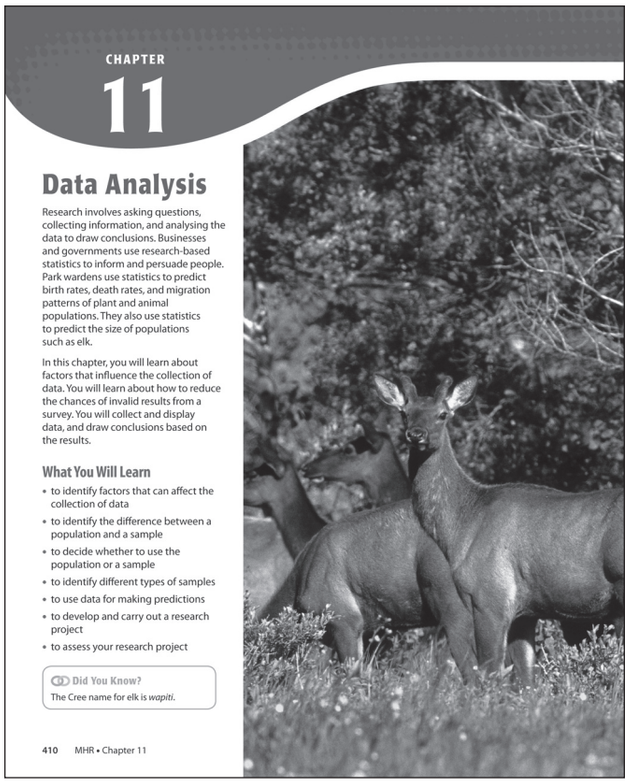
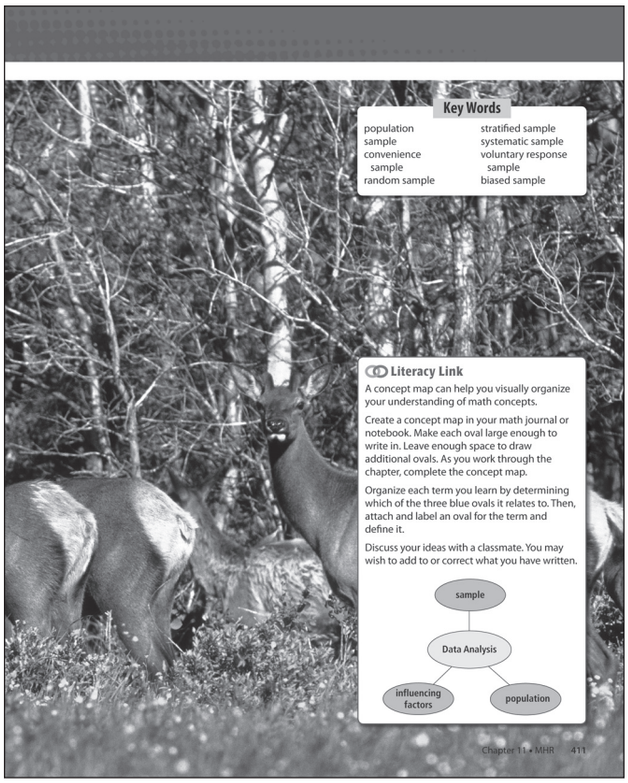




***MathLinks 9*, pages 410–413**

Suggested Timing

40–50 minutes

Materials

- sheet of 11 × 17 paper
- ruler
- seven sheets of 8.5 × 11 paper
- scissors
- stapler
- grid paper
- compass (optional)
- protractor (optional)
- coloured pencils
- newspapers and magazines (optional)
- computer with Internet access (optional)

Blackline Masters

Master 8 Centimetre Grid Paper
Master 9 0.5 Centimetre Grid Paper
BLM 11–1 Chapter 11 Math Link Introduction
BLM 11–2 Chapter 11 Get Ready
BLM 11–4 Chapter 11 Problems of the Week
BLM 11–5 Research Project Checklist

Key Words

population
sample
convenience sample
random sample
stratified sample
systematic sample
voluntary response sample
biased sample

What's the Math?

In this chapter, students focus on factors that affect the collection of data. They learn about influencing factors, how to identify bias, and how to reduce the chances of obtaining invalid results from a survey. Students learn about types of samples and applying results from a sample to a population. They learn about using experimental and theoretical probability to make decisions. Throughout the chapter, students plan and implement their own research project using secondary data. They develop a research question, collect and display data, analyse the results, and draw conclusions. Students present their findings and self-assess their project using a rubric they develop. You may wish to introduce the research project at the beginning of the chapter. If so, use the flow chart on page 440 in the student resource and outline the research project.

Planning Notes

Help students recall what they learned about statistics and probability in grades 7 and 8. Ask students to recall terms, what they mean, and how they are used. Have students recall different ways to display data. You might use the results of a survey about Canadian Internet usage at home in 2007 to support this discussion.

If so, the related Web Link on this TR page provides the survey results. Consider developing a chart of terms on the board or create a poster that can be displayed in the classroom. Students will use terms related to statistics and probability throughout the chapter.

Read the opener as a class. Invite students to discuss examples of research-based statistics such as advertisements that they recall from the media.

Ask students who have visited a provincial or national park or wildlife preserve to discuss any related statistics they recall. You might direct their attention to the photo and ask what park naturalists do and why they are concerned about birth rates, death rates, and migration patterns. You might have students who have a particular interest in an animal or plant population discuss what they know.

Literacy Link Concept maps are graphic organizers that help students to understand concepts and to make connections that show how information is related. This mind map provides a way to summarize each section using key words related to data analysis.

At the beginning of the chapter, have students create a concept map in their notebook or journal. Model how to develop a concept map by working with students to develop a definition for the term *statistics*. As a class, brainstorm and discuss the information needed to start the definition. Have students draw an oval and connect it to the related oval titled Data Analysis, and record the term and its definition. Emphasize the importance of making ovals large enough to record definitions.

Students will complete the concept map as they work on Chapter 11.

- By the end of section 11.1, have students complete a definition for *influencing factors*. They should connect the oval with the definition to the oval labelled influencing factors. Encourage them to attach additional ovals and provide a definition of each type of influencing factor. Consider having students attach an oval to each type of influencing factor and using the ovals to summarize their own examples.
- By the end of section 11.2, have students complete definitions for the Key Words in the section. They should connect each oval containing a definition to the respective oval labelled population or sample. Consider having students attach an oval to each type of sample and use the ovals to summarize their own examples.
- By the end of section 11.3, have students complete a definition for *biased sample*. They should connect the oval with the definition to the oval labelled sample. Consider having students attach an additional oval to biased sample and use it to summarize their own example.

Meeting Student Needs

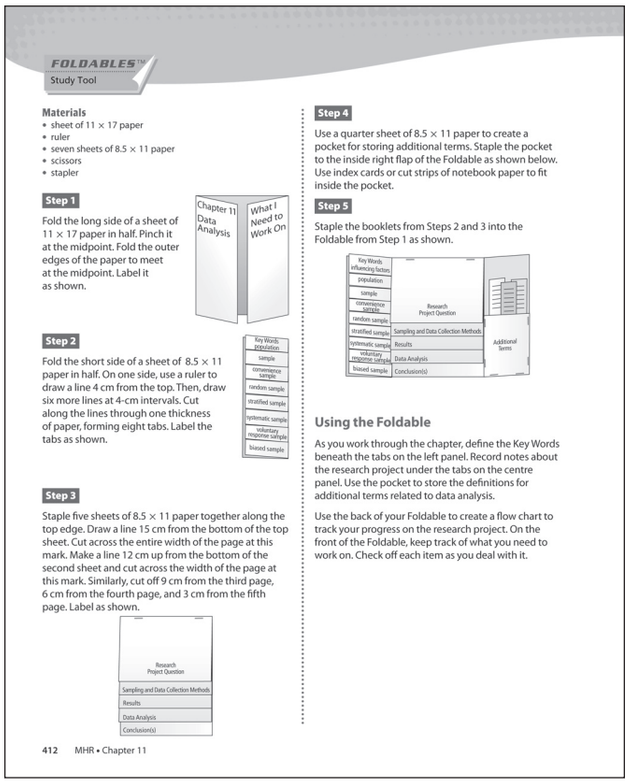
- Consider having students complete the questions on **BLM 11–2 Chapter 11 Get Ready** to activate the prerequisite skills for this chapter.
- In advance, collect articles from magazines, newspapers, and the Internet featuring statistics about wildlife populations. Alternatively, have students search these media sources for related articles. You might have students cut out statistics in headlines and articles. Add these examples to illustrate the terms on a class poster.
- Reactivate students' knowledge and skills about surveys, data collection, probability, how to calculate the mean, median, and mode, how to calculate probability, and how to predict probability.
- Consider pre-teaching the vocabulary related to surveys and data collection and probability.
- Some students may require support to develop the concept map. Have them use their Foldable to record definitions for terms as they are introduced. You might have students add to their definition the page reference in the student resource for each term. Then, at the end of each section, have them summarize the definitions for terms in the section in their own words and organize them on the concept map.

ELL

- Ensure students understand the terms *birth rates*, *death rates*, *migration patterns*, and *elk*. Have them add any new terms to their personal dictionary.
- Consider displaying Key Words on a math word wall. Encourage students to create their own vocabulary dictionary and to illustrate the terms using visuals.

Web Link

For results of a survey of Canadian Internet usage at home, go to www.mathlinks9.ca and follow the links.



FOLDABLES™
Study Tool

Materials
- sheet of 11 × 17 paper
- ruler
- seven sheets of 8.5 × 11 paper
- scissors
- stapler

Step 1

Fold the long side of a sheet of 11 × 17 paper in half. Pinch it at the midpoint. Fold the outer edges of the paper to meet at the midpoint. Label it as shown.

Chapter 11 Data Analysis | What I Need to Work On

Step 2

Fold the short side of a sheet of 8.5 × 11 paper in half. On one side, use a ruler to draw a line 4 cm from the top. Then, draw six more lines at 4-cm intervals. Cut along the lines through one thickness of paper, forming eight tabs. Label the tabs as shown.

Key Words: population | sample | convenience sample | random sample | stratified sample | systematic sample | voluntary response sample | biased sample

Step 3

Staple five sheets of 8.5 × 11 paper together along the top edge. Draw a line 15 cm from the bottom of the top sheet. Cut across the entire width of the page at this mark. Make a line 12 cm up from the bottom of the second sheet and cut across the width of the page at this mark. Similarly, cut off 9 cm from the third page, 6 cm from the fourth page, and 3 cm from the fifth page. Label as shown.

Research Project Question | Sampling and Data Collection Methods | Results | Data Analysis | Conclusion(s)

Step 4

Use a quarter sheet of 8.5 × 11 paper to create a pocket for storing additional terms. Staple the pocket to the inside right flap of the Foldable as shown below. Use index cards or cut strips of notebook paper to fit inside the pocket.

Step 5

Staple the booklets from Steps 2 and 3 into the Foldable from Step 1 as shown.

Key Words: influencing factors | population | sample | convenience sample | random sample | stratified sample | systematic sample | voluntary response sample | biased sample

Research Project Question | Sampling and Data Collection Methods | Results | Data Analysis | Conclusion(s)

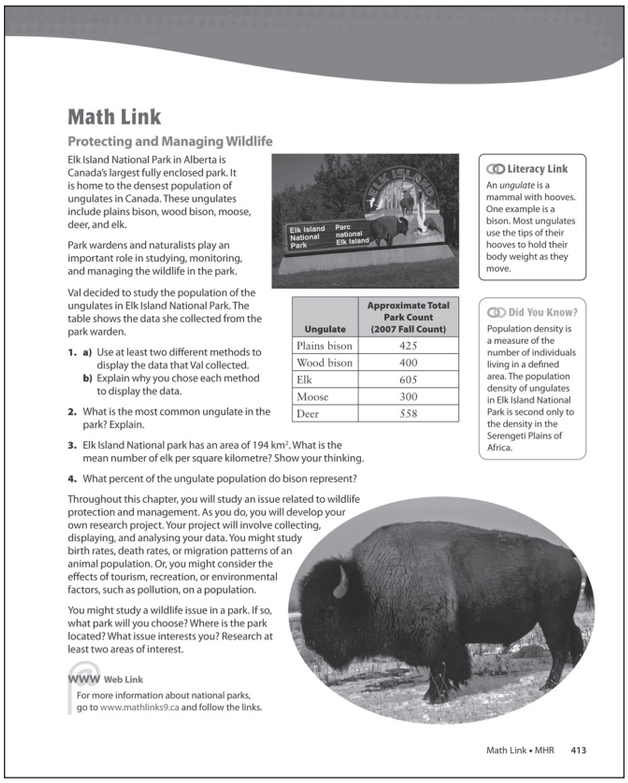
Additional Terms

Using the Foldable

As you work through the chapter, define the Key Words beneath the tabs on the left panel. Record notes about the research project under the tabs on the centre panel. Use the pocket to store the definitions for additional terms related to data analysis.

Use the back of your Foldable to create a flow chart to track your progress on the research project. On the front of the Foldable, keep track of what you need to work on. Check off each item as you deal with it.

412 MHR • Chapter 11



Math Link

Protecting and Managing Wildlife

Elk Island National Park in Alberta is Canada's largest fully enclosed park. It is home to the densest population of ungulates in Canada. These ungulates include plains bison, wood bison, moose, deer, and elk.

Park wardens and naturalists play an important role in studying, monitoring, and managing the wildlife in the park.

Val decided to study the population of the ungulates in Elk Island National Park. The table shows the data she collected from the park warden.

Ungulate	Approximate Total Park Count (2007 Fall Count)
Plains bison	425
Wood bison	400
Elk	605
Moose	300
Deer	558

1. **a)** Use at least two different methods to display the data that Val collected.
   b) Explain why you chose each method to display the data.
2. What is the most common ungulate in the park? Explain.
3. Elk Island National park has an area of 194 km². What is the mean number of elk per square kilometre? Show your thinking.
4. What percent of the ungulate population do bison represent?

Throughout this chapter, you will study an issue related to wildlife protection and management. As you do, you will develop your own research project. Your project will involve collecting, displaying, and analysing your data. You might study birth rates, death rates, or migration patterns of an animal population. Or, you might consider the effects of tourism, recreation, or environmental factors, such as pollution, on a population.

You might study a wildlife issue in a park. If so, what park will you choose? Where is the park located? What issue interests you? Research at least two areas of interest.

WWW Web Link
For more information about national parks, go to www.mathlinks9.ca and follow the links.

Literacy Link
An *ungulate* is a mammal with hooves. One example is a bison. Most ungulates use the tips of their hooves to hold their body weight as they move.

Did You Know?
Population density is a measure of the number of individuals living in a defined area. The population density of ungulates in Elk Island National Park is second only to the density in the Serengeti Plains of Africa.

Math Link • MHR 413

Foldables Study Tool

Have students make the Foldable in the student resource to keep track of the information in the chapter. Direct students to the flow chart on page 440 in the student resource. They might use it as a guide to create their own flow chart for organizing their research project. Have students record definitions for Key Words on the left, inside flap. They can use the pocket on the right, inside flap to store definitions and examples for additional terms that they learn.

Filling in the What I Need to Work On section as they progress through the chapter will assist them in identifying and solving difficulties with concepts, skills, and processes.

As they work through the chapter, have students record ideas for the research project in the booklet on the centre panel. Have students use the flow chart on the back of the Foldable to keep track of their progress on the research project.

Note that there is no room on this Foldable for the Math Links throughout the chapter. You may wish to have students keep track of this work in their math portfolio or slip it into a plastic envelope. As well, students may wish to use such an envelope to store information related to their research project.

Have students store the Foldable in a binder by punching holes along one of the long sides. Alternatively, you may wish to provide students with a plastic envelope that fits into their binder.

Math Link

The Math Link for this chapter is about issues relating to wildlife protection and management. You might have students discuss wildlife management issues or factors that affect managing wildlife (e.g., tourism, pollution, climate change, land use) that they are familiar with.

After reading the Math Link introduction as a class, have students work individually or in pairs to complete the questions in the Math Link. Point out the Did You Know? that explains the term *population density*. Make grid paper, compasses, and protractors available for students to use. Provide copies of **Master 8 Centimetre Grid Paper** and **Master 9 0.5 Centimetre Grid Paper**.

Discuss as a class the different methods used to represent the data for #1. Have students decide which types of graphs display the data about ungulates most appropriately. Have students discuss their response to #2 to 4 with a classmate, and then have them make any needed corrections.

As a class, read the information about the research project. Use this opportunity to introduce the research project and what it involves. Encourage students to begin the process of selecting a wildlife issue. If possible, have newspapers, magazines, and/or Internet access available for students to research areas of interest.

It is important for students to complete the Math Links in this chapter as they help them with the research project and the Math Link: Wrap It Up! You might use this opportunity to direct students to the flow chart on page 440 in the student resource that organizes the research project in steps. Read and discuss the steps. Have students read the Wrap It Up! on page 443 to give them a sense of where the Math Link is heading. The Wrap It Up! is a summative assessment in which students assess their research project.

Literacy Link Use the Literacy Link on page 413 to clarify the meaning of *ungulate*. Consider showing students a photo of the hoof of an ungulate such as a bison. Students may find the Web Link on TR page 561 useful to learn more about ungulate populations.

Meeting Student Needs

- Consider creating the chapter Foldable ahead of time to use as a model.
- Provide students who would benefit with the checklist on **BLM 11–5 Research Project Checklist** to help them organize their research project. They might staple the flow chart to the back of the centre panel in their Foldable.
- You may wish to adapt the Math Link by using an agricultural theme with students who are less familiar with plant and animal populations in the wild.
- Students with motor challenges may benefit from using spreadsheet software or graphing calculators, if available, to create graphs.
- Some students may benefit from reactivating their knowledge about different types of graphs and how to create them (e.g., bar graph, line graph, circle graph, pictograph).

  For a bar graph:
  – Decide on a scale.
  – Title and label the *x*-axis.
  – Title and label the *y*-axis.
  – Plot the categories along the *x*-axis.
  – Plot the values along the *y*-axis.
  – Add a title.

  For a circle graph using a protractor:
  – Draw a circle using a compass.
  – Use a protractor to measure and draw each angle.
  – Label each sector with its category and its percent.
  – Shade each sector.
  – Add a title.

  For a line graph:
  – Decide on a scale.
  – Title and label the *x*-axis.
  – Title and label the *y*-axis.
  – Plot the categories along the *x*-axis.
  – Plot the values along the *y*-axis.
  – Join the data points.
  – Add a title.

  For a pictograph:
  – Decide on a symbol.
  – Provide a key.
  – Add a title.
- To help them to get started, some students may benefit from using **BLM 11–1 Chapter 11 Math Link Introduction**, which provides scaffolding for this activity.
- To help students research a possible wildlife issue, you might discuss who is responsible for wildlife management. For example, the government of Nunavut has ultimate responsibility for wildlife management in Nunavut. However, responsibilities are shared with partners including the Nunavut Wildlife Management Board, regional wildlife organizations, and community hunters' and trappers' organizations. You may be able to obtain related information or invite a guest speaker to address the class about wildlife management.
- You might encourage students to research a local or regional wildlife issue.
- As an alternative topic, consider having students research human health issues. You might invite a representative from Statistics Canada or Indian and Northern Affairs Canada to explain the process of data collection and the types of information collected. The presentation may act as a springboard for students to research a human health issue such as the incidence of diabetes among Aboriginal youth.

ELL

- Teach the following terms in context: *fully enclosed*, *densest*, *Plains bison*, *Wood bison*, *moose*, *deer*, *park warden*, and *tourism*.
- Explain population density by asking eight to ten students to stand in a square metre space, and state that the students represent a dense population. Then, have two student stand in the same space, and state that in this case, the students represent a less dense population.

Common Errors

- Some students may not recall which type of graph is most appropriate for displaying the data in the Math Link.

R_x Refer students to the class chart or poster or use sample graphs to review different types of graphs and discuss which ones display certain types of data better.

– Bar graphs are best for comparing data across categories.
– Circle graphs are best for comparing categories to the whole using percents.
– Line graphs are best for showing changes in data over time.
– Pictographs are best for comparing data that can be easily counted and represented using symbols.

Encourage students to add these terms along with a sketch of a sample graph to their Foldable.

- For #3, some students may not recall the term *mean*.

R_x Refer students to the class chart or poster, which may include this term. Alternatively, explain that *mean* refers to average. Ask students how to calculate an average.

- For #4, some students may struggle with calculating percent.

R_x Help students reactivate their skills for changing a fraction to a decimal and a decimal to a percent.

Web Link

For more information about ungulates, go to www.mathlinks9.ca and follow the links.

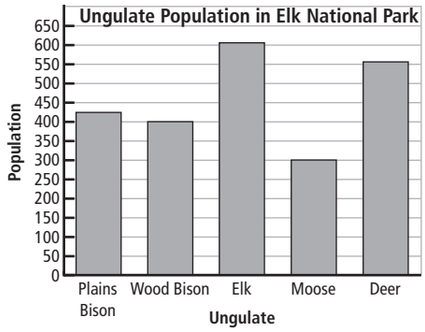
For information about wildlife research and wildlife management plans in Nunavut, go to www.mathlinks9.ca and follow the links.

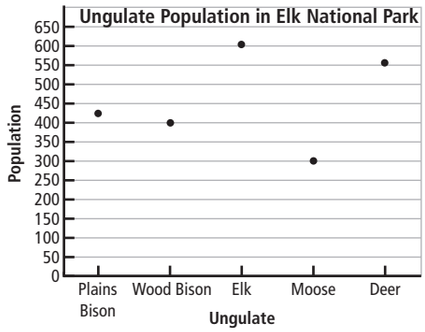
For information about national parks, provincial parks, and urban parks in Canada, go to www.mathlinks9.ca and follow the links.

Answers

Math Link

1. a) Examples:





b) Examples: The bar graph and the line graph compare the number of different ungulate populations in the park. Both graphs are scaled so that it is easy to determine the approximate number of each ungulate.

2. Example: The elk is the most common ungulate because it has the largest population.

3. $\frac{605 \text{ elk}}{194 \text{ km}^2} = 3$. There are approximately three elk per square kilometre.

4. 36%