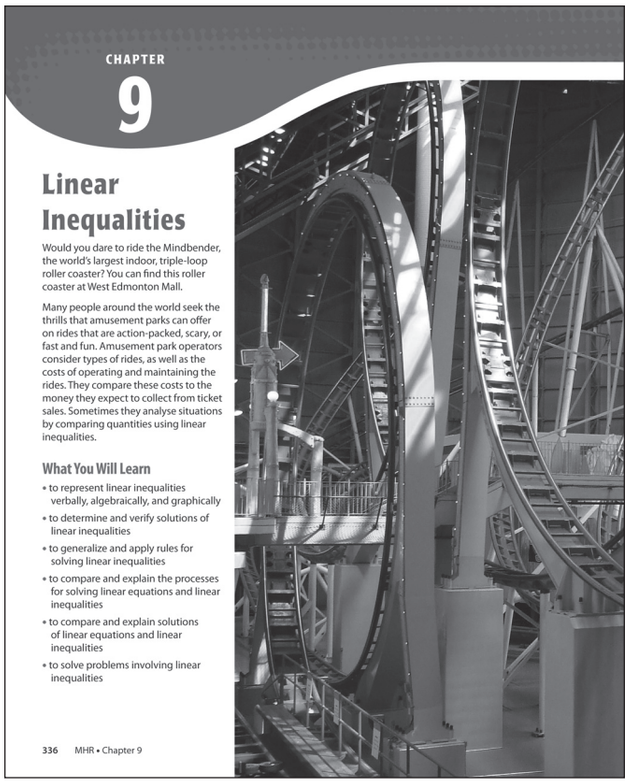
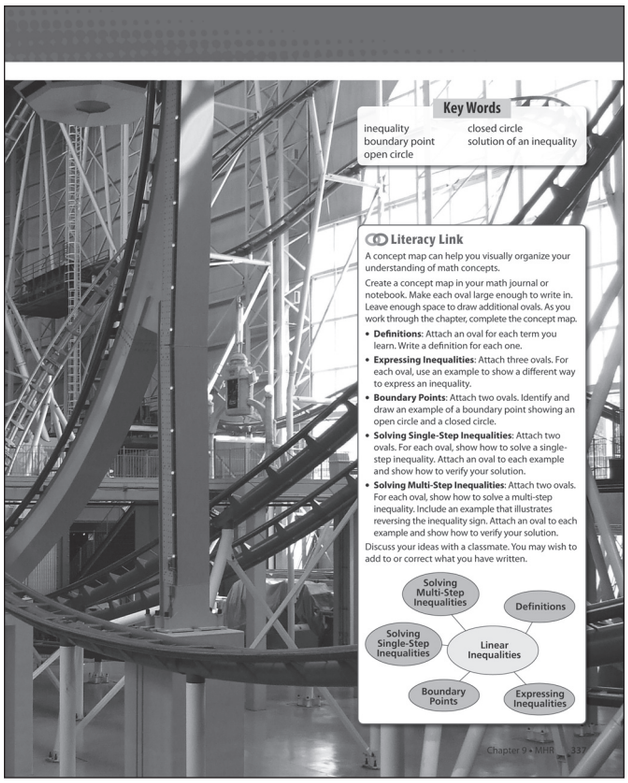




***MathLinks 9*, pages 336–339**

Suggested Timing
40–50 minutes

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

Blackline Masters
BLM 9–1 Chapter 9 Math Link Introduction
BLM 9–2 Chapter 9 Get Ready
BLM 9–3 Chapter 9 Warm-Up
BLM 9–4 Chapter 9 Problems of the Week

Key Words

inequality	boundary point	open circle
closed circle	solution of an inequality	

What's the Math?

In this chapter, students use inequalities to represent real situations and solve problems. Students first investigate how situations involving phrases such as *a minimum of*, *at most*, or *no less than* can be represented with inequalities. Next, students examine how single-step linear inequalities can be used to represent and solve problems. Finally, they look at solving and applying multi-step inequalities.

Planning Notes

Begin by pointing out to students that in this chapter they will learn about inequalities. Ask pairs of students to discuss and explain in their own words what the term *inequality* means. Discuss students' responses as a class. As a class, brainstorm a list of situations that might involve restrictions or conditions that might be described using words such as *a maximum of* or *at least*. Attention can be drawn to the opening visual of the roller coaster in West Edmonton Mall, Alberta—students can be asked to think of restrictions that might be in place for riders.

You may wish to have students discuss the different rides they have enjoyed, and what type of restriction is on each ride. Usually, for example, there are height restrictions.

Literacy Link Concept maps are graphic organizers that help students to understand essential characteristics of a concept and to make connections that show how the information is related. This form of mind map provides a method of summarizing each section with key words or phrases that are connected to the term *linear relations*.

At the beginning of the chapter, have students create a concept map in their notebooks or journals. Model how to develop a concept map by working with students to complete the first oval of the concept map. Brainstorm and discuss as a class the information needed to start this oval. For example, what terms did they learn or have reinforced while discussing the chapter opener? Have them define these terms in ovals joined to the Definitions oval. Instruct students to make the ovals they add large enough to fill in terms and phrases, examples, or solutions.

Students will complete the concept map as they work on Chapter 9.

- By the end of section 9.1, have students fill out the ovals for Definitions, Expressing Inequalities, and Boundary Points. They can complete this section of their concept map either at the end of the section or during the section, as they cover the specific concepts.
- By the end of section 9.2, have students fill in the links to the oval for Solving Single-Step Inequalities. Ask them to provide two examples of single-step inequalities and solve these inequalities, then prove that the solution is correct.
- By the end of section 9.3, have students illustrate the solution and the proof of two multi-step inequalities in the appropriate oval. Ask them to provide an example of a solution that requires the reversal of the sign.

Have students consider other restrictions.

- When might an age restriction also be appropriate? For example, how old do people have to be in order to drive? vote? see certain movies?
- What speed restrictions apply in various situations? where? when?
- Are there noise restrictions in the school community?

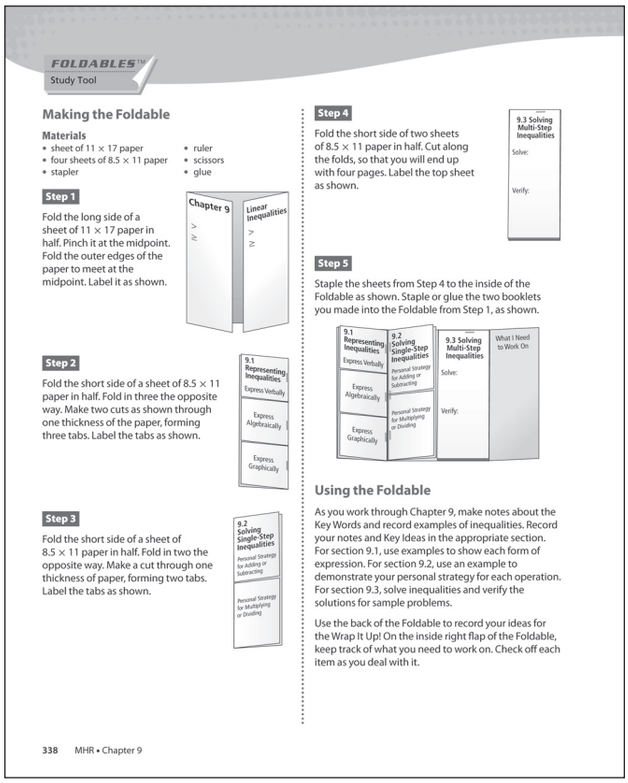
Ask students to reword some of the ideas generated by the class using the terms *greater than* or *less than* (or *greater/less than or equal to*).

Meeting Student Needs

- Some students may not be familiar with amusement parks. Consider discussing community celebrations or festivals that include games or events. The games, events, or rides might include specific requirements that students have to meet, such as minimum height or age, before being able to participate. You may also wish to find films or videos about amusement parks, to help familiarize students with the concept.
- Some students may benefit from a brief introduction to and class discussion about the Key Words used in this chapter. You may also wish to discuss the terms *algebraically*, *graphically*, or *verbally*.
- Work with the class to reactivate students' skills in working with positive and negative numbers, and in solving equations.
- Consider making and posting large representations of the following symbols, with their meanings: *greater than*, *greater than or equal to*, *less than*, and *less than or equal to*.

ELL

- Before beginning this chapter, some students may benefit from having their knowledge and skills reactivated by discussing the terms *relationship*, *variable*, *equation*, *formula*, *expression*, *linear relation*, *values*, *greater than or equal to*, *less than or equal to*, and *table of values*. You may wish to have some students add these terms and related symbols or examples to their concept map.



FOLDABLES™
Study Tool

Making the Foldable

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

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 9 | Linear Inequalities
$<$ $>$
$\leq$ $\geq$

Step 2
Fold the short side of a sheet of 8.5 × 11 paper in half. Fold in three the opposite way. Make two cuts as shown through one thickness of the paper, forming three tabs. Label the tabs as shown.

9.1 Representing Inequalities
Express Verbally
Express Algebraically
Express Graphically

Step 3
Fold the short side of a sheet of 8.5 × 11 paper in half. Fold in two the opposite way. Make a cut through one thickness of paper, forming two tabs. Label the tabs as shown.

9.2 Solving Single-Step Inequalities
Personal Strategy for Adding or Subtracting
Personal Strategy for Multiplying or Dividing

Step 4
Fold the short side of two sheets of 8.5 × 11 paper in half. Cut along the folds, so that you will end up with four pages. Label the top sheet as shown.

9.3 Solving Multi-Step Inequalities
Solve:
Verify:

Step 5
Staple the sheets from Step 4 to the inside of the Foldable as shown. Staple or glue the two booklets you made into the Foldable from Step 1, as shown.

9.1 Representing Inequalities | 9.2 Solving Single-Step Inequalities | 9.3 Solving Multi-Step Inequalities | What I Need to Work On
Express Verbally | Personal Strategy for Adding or Subtracting | Solve:
Express Algebraically | Personal Strategy for Multiplying or Dividing | Verify:
Express Graphically

Using the Foldable

As you work through Chapter 9, make notes about the Key Words and record examples of inequalities. Record your notes and Key Ideas in the appropriate section. For section 9.1, use examples to show each form of expression. For section 9.2, use an example to demonstrate your personal strategy for each operation. For section 9.3, solve inequalities and verify the solutions for sample problems.

Use the back of the Foldable to record your ideas for the Wrap It Up! On the inside right flap of the Foldable, keep track of what you need to work on. Check off each item as you deal with it.

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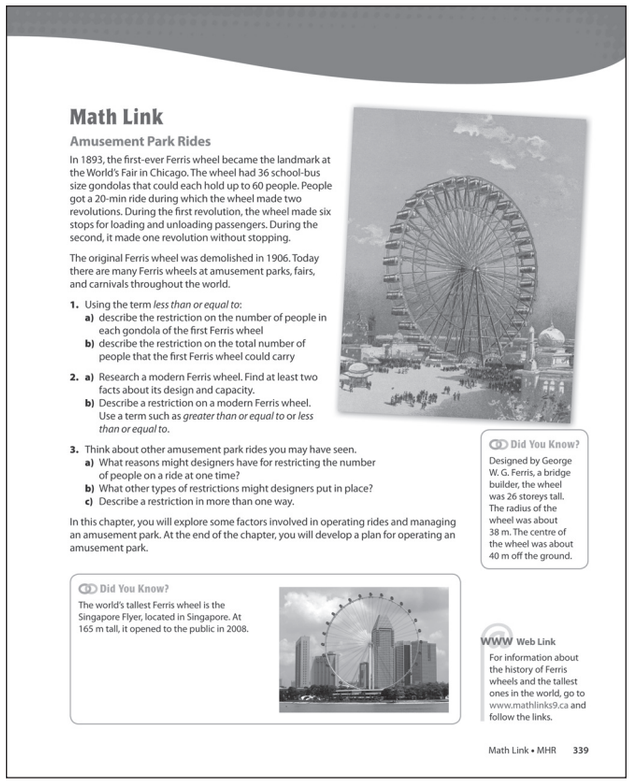

Math Link

Amusement Park Rides

In 1893, the first-ever Ferris wheel became the landmark at the World's Fair in Chicago. The wheel had 36 school-bus size gondolas that could each hold up to 60 people. People got a 20-min ride during which the wheel made two revolutions. During the first revolution, the wheel made six stops for loading and unloading passengers. During the second, it made one revolution without stopping.

The original Ferris wheel was demolished in 1906. Today there are many Ferris wheels at amusement parks, fairs, and carnivals throughout the world.

1. Using the term *less than or equal to*:
   a) describe the restriction on the number of people in each gondola of the first Ferris wheel
   b) describe the restriction on the total number of people that the first Ferris wheel could carry
2. a) Research a modern Ferris wheel. Find at least two facts about its design and capacity.
   b) Describe a restriction on a modern Ferris wheel. Use a term such as *greater than or equal to* or *less than or equal to*.
3. Think about other amusement park rides you may have seen.
   a) What reasons might designers have for restricting the number of people on a ride at one time?
   b) What other types of restrictions might designers put in place?
   c) Describe a restriction in more than one way.

In this chapter, you will explore some factors involved in operating rides and managing an amusement park. At the end of the chapter, you will develop a plan for operating an amusement park.

Did You Know?
Designed by George W. G. Ferris, a bridge builder, the wheel was 26 storeys tall. The radius of the wheel was about 38 m. The centre of the wheel was about 40 m off the ground.

Did You Know?
The world's tallest Ferris wheel is the Singapore Flyer, located in Singapore. At 165 m tall, it opened to the public in 2008.

WWW Web Link
For information about the history of Ferris wheels and the tallest ones in the world, go to www.mathlinks9.ca and follow the links.

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Foldables Study Tool

Have students make the Foldable in the student resource to keep track of the information in the chapter. Have them define Key Words, record notes, and provide examples in the appropriate booklets. They should also write down the Key Ideas for each section in their own words.

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

As they work through the chapter, have students record their ideas for the MathLink: Wrap It Up! on the back of the Foldable. 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 the plastic envelope mentioned below.

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

This Math Link introduction has students think about restrictions on amusement park rides and express them verbally. Have students look at the picture of the original Ferris wheel, and help them realize how incredibly large it actually was. You might point out that it moved rather slowly compared to modern rides, and that the thrill of the ride might have come simply from being very high off the ground and having a fantastic view, rather than from the speed. Students need to read the information given in order to complete #1.

Question #2a) requires access to the Internet or other sources relating to Ferris wheel design and capacity information. Students can do this individually, in pairs, or as a whole class. If your school has limited access to the Internet, you may wish to download appropriate information from the Web Links that follow and provide it to students.

Before completing #3, students might look at the opening visual of West Edmonton Mall's Mind Bender. They can also be asked to think about their favourite ride they have been on. Be careful when students consider possible restrictions in #3. They are bound to suggest age, height, weight (mass), etc. These things should be stated in an appropriate manner.

Students will need to complete the related Math Link revisits in sections 9.2 and 9.3 in order to complete the MathLink: Wrap It Up! at the end of the chapter. Have students read the MathLink: Wrap It Up! on page 371 to give them a sense of where the Math Link is heading. The MathLink: Wrap It Up! problem is a summative assessment.

Meeting Student Needs

- To help them get started, some students may benefit from using **BLM 9–1 Chapter 9 Math Link Introduction**, which provides scaffolding for this activity.

Common Errors

- In discussing everyday situations that could be described using inequalities, students may have difficulty with negative statements involving words such as *no more than*.

R_x Encourage them to reword such statements in a positive way to avoid words such as *no* or *not*. So, *no more than* could be expressed as *less than or equal to*.

Web Link

For information about modern Ferris wheels, go to www.mathlinks9.ca and follow the links.

Answers

Math Link

1. a) Example: The gondola can hold all numbers of people less than or equal to 60.

b) Example: The Ferris wheel can hold all numbers of people less than or equal to 2160.

2. a) Example: The Singapore Flyer is 165 m tall and has a maximum capacity of 784 passengers.

b) Example: When the Singapore Flyer was built its height was greater than or equal to the height of all other Ferris wheels.

3. a) Example: Designers might restrict the number of people on a ride due to safety concerns. Also, there will be a maximum weight that will be suitable for a ride based on its design and materials used.

b) Example: There may be restrictions on the speed of the ride, types of materials that can be used, and frequency of use.

c) Example: The maximum speed of a ride might be 60 km/h. Or, the speed of the ride shall not exceed 60 km/h.