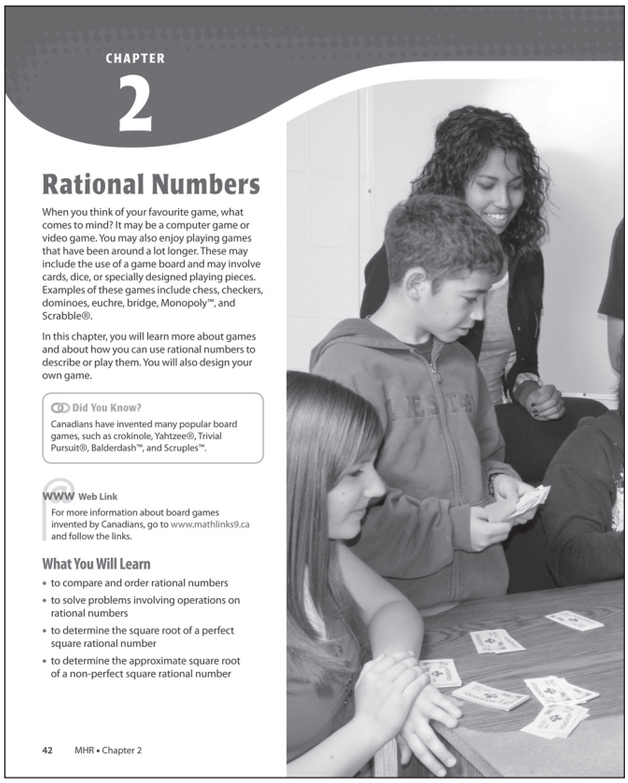
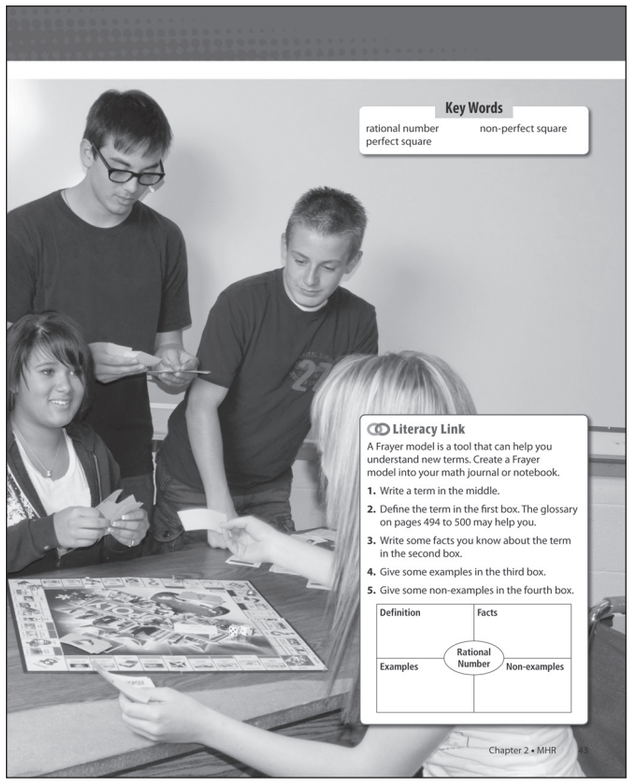




***MathLinks 9*, pages 42–43**

Suggested Timing

40–50 minutes

Materials

- sheet of 11 × 17 paper
- ruler
- three sheets of 8.5 × 11 paper
- scissors
- sheet of grid paper
- stapler

Blackline Masters

Master 16 Frayer Model
BLM 2–1 Chapter 2 Math Link Introduction
BLM 2–2 Chapter 2 Get Ready
BLM 2–4 Chapter 2 Problems of the Week

Key Words

rational number
perfect square
non-perfect square

What's the Math?

In this chapter, students develop an understanding of rational numbers by extending their knowledge of fractions and decimals to include those with negative signs. Students begin by comparing and ordering rational numbers and identifying a rational number that is between two given rational numbers. Students also learn to perform operations on rational numbers, including negative decimals and negative fractions, and to solve problems that involve rational numbers in decimal form and in fraction form. Students determine exact square roots of positive rational numbers that are perfect squares and determine approximate square roots of positive rational numbers that are non-perfect squares.

Planning Notes

Use the opening paragraph of the chapter to initiate a discussion of students' favourite games. No doubt, many students will mention computer or video games. Examples of other games are listed in the opening paragraph. The Did You Know? box lists some popular games invented by Canadians. You might ask:

- Which of the games mentioned in the chapter opener do you enjoy playing?
- What are some other examples of traditional games that you like?

Point out that, at the end of the chapter, students will use their new skills to create and play a game of their own design.

Literacy Link Frayer models provide a useful strategy for assessing students' understanding of terms. They also help students deepen their understanding of a term by analysing its essential characteristics and by communicating examples and non-examples.

At the beginning of the chapter, use the term *rational number* to demonstrate how to use a Frayer model. Consider using an overhead copy of **Master 16 Frayer Model**. Explain the purpose of each part of the model.

- Definition — Work with students to develop a clear definition. They may wish to check the *MathLinks 9* glossary on pages xx to xx.
- Examples — From the definition they developed, ask students to come up with some examples of rational numbers in the form of integers, fractions, and decimals.
- Non-Examples — Students may need some assistance as there are only a few non-rational examples that they may have heard of (e.g., the square root of 2 or π).
- Facts – This is the last area for students to fill in after they have a firm understanding of the definition, and examples and non-examples of rational numbers.

During the chapter, have students use the Frayer model to show their understanding of fractions and decimals. Have them develop a Frayer model to show what they know about integers at the beginning of section 2.1. Then, have them develop a Frayer model to show what they know about decimals at the beginning of section 2.2, and develop another Frayer model to show what they know about fractions at the beginning of section 2.3. Then, have them finish the chapter by developing a Frayer model for the term *square root*. You may wish to have them revisit their Frayer models at the end of each section.

Meeting Student Needs

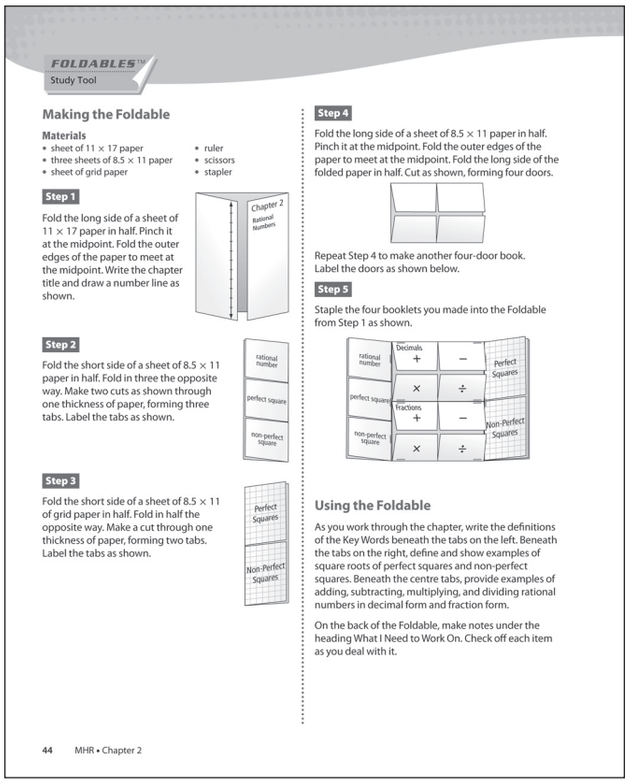
- Consider having students complete the questions on **BLM 2–2 Chapter 2 Get Ready** to activate the prerequisite skills for this chapter.
- Some students may benefit from assistance in reactivating their skills and knowledge related to the following concepts:
  - operations with positive fractions
  - operations with integers
  - squares and square roots
  - the Pythagorean relationship
  - area of a square
  - changing fractions to decimals, and decimals to fractions
  - equivalent fractions
  - integers
- Have students talk about games that are relevant to their community or culture. For example, students in the North may describe Inuit games that they are familiar with. Ask:
  - What features do these games have in common?
  - How are they different from the board games listed in the chapter opener?
  - What purposes do Inuit games serve?
  - What purposes do board games serve?
- You might discuss the Key Words for this chapter with the class. As you discuss the term *perfect square*, ask students to use their prior knowledge to provide examples of whole-number perfect squares.
- Consider preteaching the Key Words for this chapter. Then, have students match the words to their definitions, make up a crossword puzzle for the words for other students to play, or have students play a memory game with the terms.
- You may wish to provide students with copies of **Master 16 Frayer Model**.
- Have students use small cards for their Frayer models. If students make a Frayer model for each key vocabulary term in the chapter, they can develop a deck of cards that will be useful for review.
- Have students brainstorm problem-solving skills they know. Consider displaying a poster of different techniques for solving problems in the classroom. Have students add to the list as new techniques are used.
- Since this chapter involves estimating, have students brainstorm how they might use estimating in their lives. For example, Aboriginal students might work in small groups to estimate the time it would take to make a beaded outfit for a powwow dance. Then, have them estimate how long it would take to make five beaded outfits.

ELL

- Invite new Canadians to activate prior knowledge by having them describe games they played in their former country of residence.

Gifted and Enrichment

- Invite students to research boards games invented by Canadians and present their findings in a format of their choice. They may find the Web Link in the student resource helpful.



FOLDABLES™
Study Tool

Making the Foldable

Materials
- sheet of 11 × 17 paper
- three sheets of 8.5 × 11 paper
- sheet of grid paper
- ruler
- 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. Write the chapter title and draw a number line as shown.

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 paper, forming three tabs. Label the tabs as shown.

Step 3

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

Step 4

Fold the long side of a sheet of 8.5 × 11 paper in half. Pinch it at the midpoint. Fold the outer edges of the paper to meet at the midpoint. Fold the long side of the folded paper in half. Cut as shown, forming four doors.

Repeat Step 4 to make another four-door book. Label the doors as shown below.

Step 5

Staple the four booklets you made into the Foldable from Step 1 as shown.

Using the Foldable

As you work through the chapter, write the definitions of the Key Words beneath the tabs on the left. Beneath the tabs on the right, define and show examples of square roots of perfect squares and non-perfect squares. Beneath the centre tabs, provide examples of adding, subtracting, multiplying, and dividing rational numbers in decimal form and fraction form.

On the back of the Foldable, make notes under the heading What I Need to Work On. Check off each item as you deal with it.

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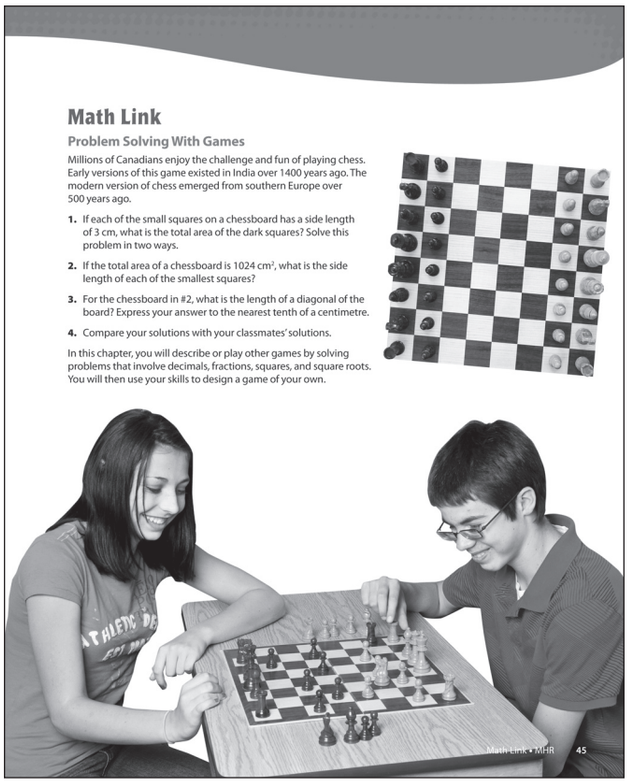

Math Link

Problem Solving With Games

Millions of Canadians enjoy the challenge and fun of playing chess. Early versions of this game existed in India over 1400 years ago. The modern version of chess emerged from southern Europe over 500 years ago.

1. If each of the small squares on a chessboard has a side length of 3 cm, what is the total area of the dark squares? Solve this problem in two ways.
2. If the total area of a chessboard is 1024 cm², what is the side length of each of the smallest squares?
3. For the chessboard in #2, what is the length of a diagonal of the board? Express your answer to the nearest tenth of a centimetre.
4. Compare your solutions with your classmates' solutions.

In this chapter, you will describe or play other games by solving problems that involve decimals, fractions, squares, and square roots. You will then use your skills to design a game of your own.

Foldables Study Tool

Have students make the Foldable in the student resource to keep track of the information in the chapter. Have students record the definitions for the Key Words beneath the tabs on the left.

Have students use the tabs on the right to define and show examples of square roots of perfect squares and non-perfect squares. They can use the centre tabs to provide examples of adding, subtracting, multiplying, and dividing rational numbers in decimal and fraction form.

They may wish to use the back of the Foldable to keep track of what they need to work on as they progress through the chapter. This will assist them in identifying and solving any difficulties with concepts, skills, and processes.

Math Link

The Math Link focuses on the problem-solving skills that students developed in grade 8 with squares, square roots, and the Pythagorean relationship. Before students solve the problems, you might have them discuss how squares and square roots can be modelled by the areas and side lengths of squares.

A possible method for solving #1 is to determine the area of each of the smallest squares and then multiply this area by the number of dark squares. An alternative might be to determine the side length of the whole playing surface, square it, and divide the result by 2. One approach to #2 is to divide the total area by the number of small squares to determine the area of each of these squares, and then take the square root. An alternative is to take the square root first to determine the side length of the whole playing surface, and then divide by the number of squares along each side of the board. Before students complete #3, you may wish to have them identify the need for, and discuss their knowledge of, the Pythagorean relationship.

Encourage students to compare their solutions to the Math Link problems, choose the solution methods they prefer, and explain their choices.

The individual Math Links in this chapter help develop the skills needed to complete the Wrap It Up! at the end of the chapter. Have students read the Wrap It Up! on page 85 to give them a sense of where the Math Link is heading. The Wrap It Up! problem is a summative assessment.

Meeting Student Needs

- To help them to get started, some students may benefit from using **BLM 2–1 Chapter 2 Math Link Introduction**, which provides scaffolding for this activity.
- Most students should be familiar with the board used to play chess or checkers. If not, you might point out the photo before students complete the Math Link questions. You might ask:
  – How many small squares are there on the board?
  – How many of them are light?
  – How many of them are dark?
  – How do the areas of all the small squares compare?
- Suggest that students brainstorm the criteria of what makes a good game. Possible answers include skill, luck, strategy, and the time it takes to play it. Students could then create a list of criteria for a rubric for the Wrap It Up! at the end of the chapter. Ask students to collect ideas throughout the chapter on ways to create a good game that involves players using the skills learned in the chapter.
- Some students may find it helpful to draw diagrams to assist them in answering the Math Link questions.
- You may wish to begin by giving students a real chessboard to measure and base their calculations on.

Common Errors

- Some students may not understand that the solution to Math Link #3 involves the Pythagorean relationship.

R_x Encourage students to draw a diagram and to identify a right triangle created by two adjacent sides of the board and a diagonal. Have students mark the side length of the board on the two equal sides of the triangle in the diagram.

- Some students may have difficulty in correctly evaluating a square root in Math Link #3.

R_x Remind students of how to use the square root key correctly on their calculator.

Answers

Math Link

1. 288 cm^2. Example: Multiply 32 by the area of one square, or divide the area of the chessboard by 2.

2. 4 cm

3. 45.3 cm