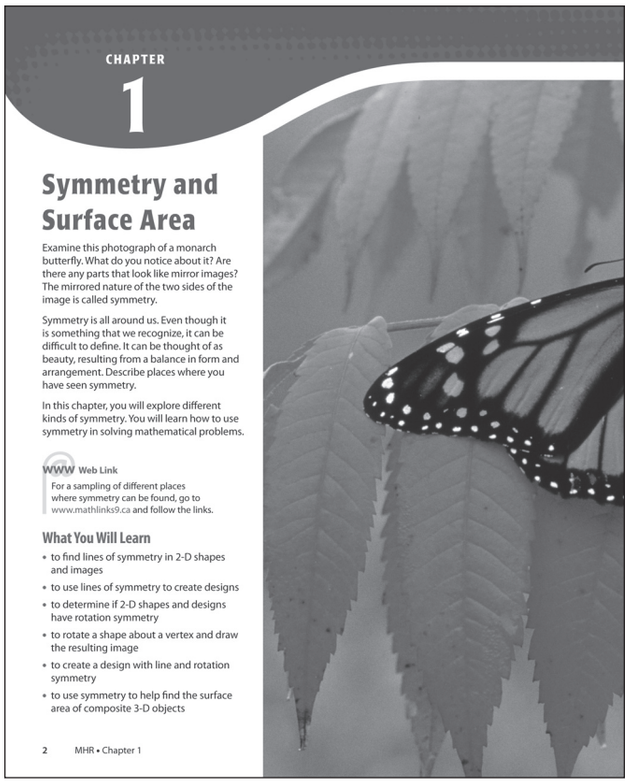
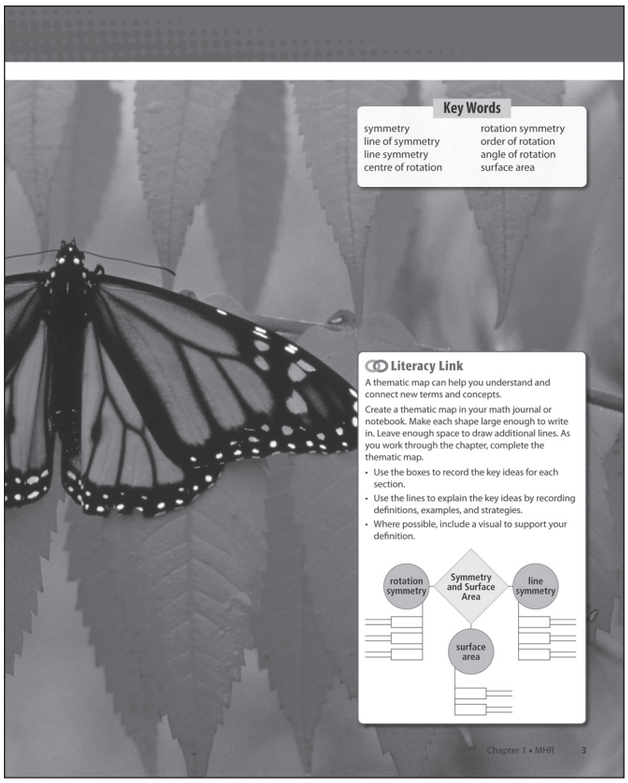




***MathLinks 9*, pages 2–5**

Suggested Timing

40–50 minutes

Materials

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

Blackline Masters

Master 15 Thematic Map
BLM 1–1 *MathLinks 9* Scavenger Hunt
BLM 1–2 Chapter 1 Math Link Introduction
BLM 1–3 Chapter 1 Get Ready
BLM 1–4 Chapter 1 Warm-Up
BLM 1–5 Chapter 1 Problems of the Week

Key Words

symmetry	line of symmetry	line symmetry
centre of rotation	rotation symmetry	order of rotation
angle of rotation	surface area	

What's the Math?

In this chapter, students are introduced to a study of symmetry and surface area. They start by learning about line symmetry and rotation symmetry in the context of the real world and pure mathematical applications. Symmetry is compared with the geometry of transformations (translation, reflection, and rotation).

Students are then introduced to finding the surface area of composite solids using connections to symmetry. They solve problems with 3-D objects that combine rectangular prisms, triangular prisms, and cylinders.

Planning Notes

Introduce students to the various features of the *MathLinks 9* student resource by having them complete **BLM 1–1 MathLinks 9 Scavenger Hunt**.

Begin a discussion on symmetry. You might ask some general questions, such as:

- What does symmetry mean to you?
- What are some examples of symmetry you can presently see?
- Does symmetry apply to 2-D shapes or 3-D objects?
- What symmetry do you see on the opening two-page spread for Chapter 1 in this student resource?

Remind students that aspects of symmetry are everywhere but that all symmetry in nature may not be perfect. Symmetry in the photo would include the leaves, butterfly (shape, wing patterns, colour), and parts of the diagram in the Literacy Link.

Draw students' attention to the Literacy Link as a visual technique for making notes on this chapter. Ask students how they might change the diagram to make it more symmetrical.

Literacy Link Thematic maps are graphic organizers that help students to remember essential characteristics of a concept, and to make connections that show how information is related. The map is designed to be used throughout the chapter to help students connect to the terms *symmetry* and *surface area*.

Suggest that students keep this organizer at the beginning of their notes or journal so that they can access it easily at the end of each section. The map has spaces that allow students to put their notes in point form.

Meeting Student Needs

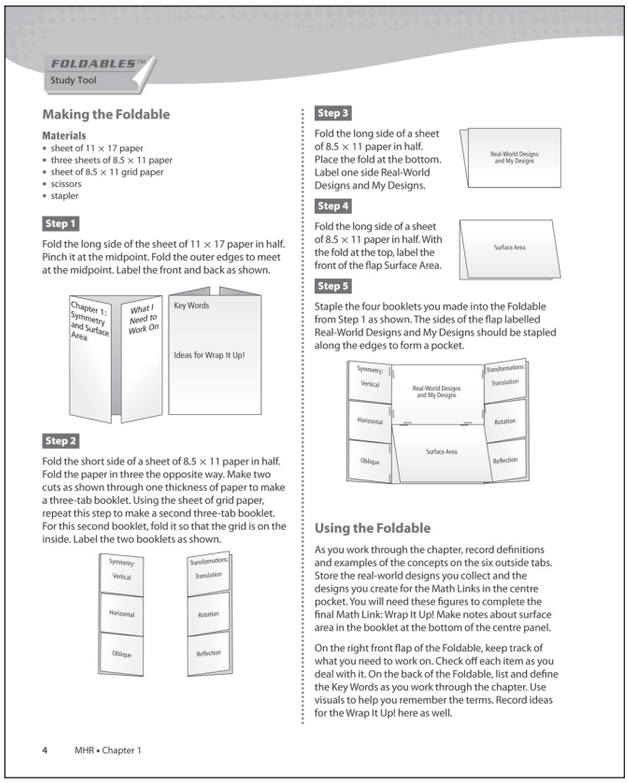
- Consider having students complete the questions on **BLM 1–3 Chapter 1 Get Ready** to activate the prerequisite skills for this chapter.
- Some students may have difficulty seeing the symmetry. Encourage them to split shapes into two halves and to check if opposite halves are alike. Begin with the square, circles, and rectangles in the Literacy Link. Encourage students to create the shapes and fold them in half to see if opposite halves are similar.
- When looking for symmetry, have students first consider the outline of a shape or a figure. Then, move to internal markings or design. Finally, look at colour patterns.
- Briefly discuss the terms that will be introduced in this chapter.
- Help reactivate students' skills with coordinates and graphing.
- You may wish to provide students with **Master 15 Thematic Map**.

ELL

- Teach the following word in context: *balance*.

Gifted and Enrichment

- Challenge students to investigate the connections between the beauty of art and the beauty of mathematics. Encourage students to either produce art that shows symmetry or find examples of art that express symmetry in their presentation.



FOLDABLES™
Study Tool

Making the Foldable

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

Step 1

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

Step 2

Fold the short side of a sheet of 8.5 × 11 paper in half. Fold the paper in three the opposite way. Make two cuts as shown through one thickness of paper to make a three-tab booklet. Using the sheet of grid paper, repeat this step to make a second three-tab booklet. For this second booklet, fold it so that the grid is on the inside. Label the two booklets as shown.

Step 3

Fold the long side of a sheet of 8.5 × 11 paper in half. Place the fold at the bottom. Label one side Real-World Designs and My Designs.

Step 4

Fold the long side of a sheet of 8.5 × 11 paper in half. With the fold at the top, label the front of the flap Surface Area.

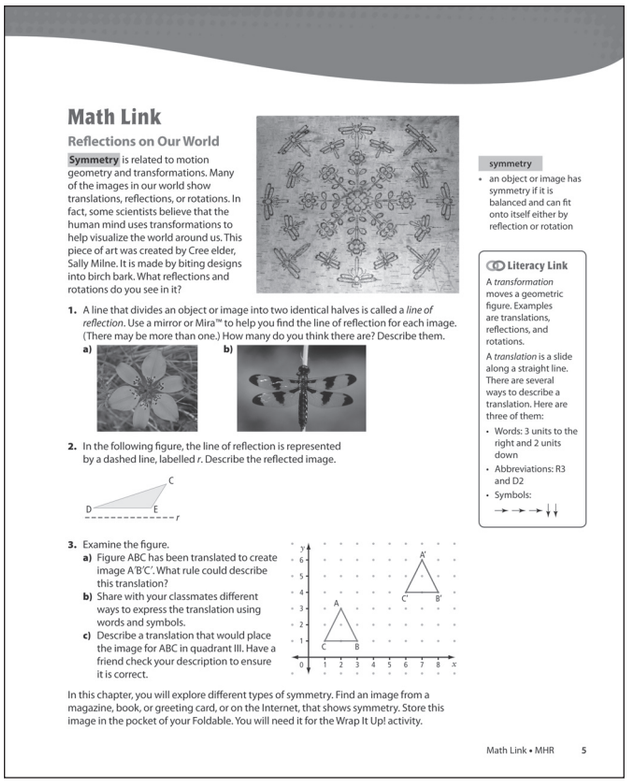
Step 5

Staple the four booklets you made into the Foldable from Step 1 as shown. The sides of the flap labelled Real-World Designs and My Designs should be stapled along the edges to form a pocket.

Using the Foldable

As you work through the chapter, record definitions and examples of the concepts on the six outside tabs. Store the real-world designs you collect and the designs you create for the Math Links in the centre pocket. You will need these figures to complete the final Math Link: Wrap It Up! Make notes about surface area in the booklet at the bottom of the centre panel.

On the right front flap of the Foldable, keep track of what you need to work on. Check off each item as you deal with it. On the back of the Foldable, list and define the Key Words as you work through the chapter. Use visuals to help you remember the terms. Record ideas for the Wrap It Up! here as well.



Math Link

Reflections on Our World

Symmetry is related to motion geometry and transformations. Many of the images in our world show translations, reflections, or rotations. In fact, some scientists believe that the human mind uses transformations to help visualize the world around us. This piece of art was created by Cree elder, Sally Milne. It is made by biting designs into birch bark. What reflections and rotations do you see in it?

1. A line that divides an object or image into two identical halves is called a *line of reflection*. Use a mirror or Mira™ to help you find the line of reflection for each image. (There may be more than one.) How many do you think there are? Describe them.

a)

b)

2. In the following figure, the line of reflection is represented by a dashed line, labelled *r*. Describe the reflected image.

3. Examine the figure.
- **a)** Figure ABC has been translated to create image A'B'C'. What rule could describe this translation?
- **b)** Share with your classmates different ways to express the translation using words and symbols.
- **c)** Describe a translation that would place the image for ABC in quadrant III. Have a friend check your description to ensure it is correct.

In this chapter, you will explore different types of symmetry. Find an image from a magazine, book, or greeting card, or on the Internet, that shows symmetry. Store this image in the pocket of your Foldable. You will need it for the Wrap It Up! activity.

symmetry
- an object or image has symmetry if it is balanced and can fit onto itself either by reflection or rotation

Literacy Link

A *transformation* moves a geometric figure. Examples are translations, reflections, and rotations.

A *translation* is a slide along a straight line. There are several ways to describe a translation. Here are three of them:
- Words: 3 units to the right and 2 units down
- Abbreviations: R3 and D2
- Symbols:

Foldables Study Tool

Have students make the Foldable in the student resource to keep track of the information in the chapter. They may wish to use the right front flap of the Foldable to keep track of what they need to work on as they progress through the chapter to assist them in identifying and solving any difficulties with concepts, skills, and processes.

Math Link

Have students read the Math Link introduction. Ask students why they think the subtitle Reflections on Our World was included. Ask students where they have seen symmetry and how it is beneficial. (It is thought that the human brain constantly uses symmetry whenever we visualize shapes and objects, scanning for similarity in opposite sides. This carries over into our mathematical symbols and computations.)

Discuss the work of Sally Milne and other Aboriginal artists practising birch-bark bitings. Have students carefully examine the photo of Milne's work, looking for the symmetry in individual dragonflies as well as on opposite halves of the artwork. Ask students how the artist might be able to complete such detailed symmetry.

Have students work in small groups to answer the questions in the Math Link. The questions are intended to reactivate students' knowledge and understanding of the properties of translations and reflections. After a few minutes, discuss possible answers, having students demonstrate their findings.

The Math Links for this chapter are about designing artwork for a playing card, or notepad, or novelty item that demonstrates line and/or rotation symmetry. As students work through the chapter, it is recommended that they complete all of the Math Links. These Math Links will assist them in doing the Math Link: Wrap It Up! problem. Have students read the MathLink: Wrap It Up! on page 39 to give them a sense of where the Math Link is heading. The Math Link: Wrap It Up! problem is a summative assessment.

Literacy Link Have students read the Literacy Link on page 5, which helps them to recall their understanding of transformations, including reflections, translations, and rotations. Have students provide examples of each type of transformation. Then, for the translation examples, have students demonstrate how to use the different methods for describing a translation.

Meeting Student Needs

- Have students consider how difficult it is to create art or a design from bitings.
- Have students work in small groups on the Math Link questions. Encourage each student to individually try each question and then to participate in the group discussions.
- To help them get started, some students may benefit from using **BLM 1–2 Chapter 1 Math Link Introduction**, which provides scaffolding for this activity.

ELL

- Teach the following terms in context: *translations*, *reflections*, *rotations*, *piece of art*, *birch bark*, and *halves*.
- If English language learners are very new to Canada, they may have never had the opportunity to use a Mira^{TM}. Explain and demonstrate how to use one.
- You may wish to pair English language learners up with English-speaking partners to do the Math Link.

Common Errors

- Some students identify too many lines of reflection for a given shape.

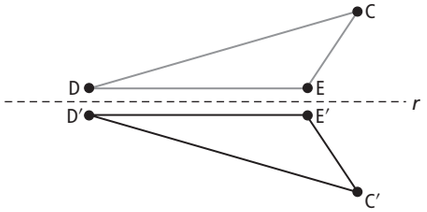
R_x Have students use a thin ruler or plastic triangle as their line of reflection. Then, they can look over the ruler to see whether opposite sides are identical. In #1a), point out that there are two sizes of petals in the flower that alternate from smaller to larger or vice versa.

Answers

Math Link

1. a) Four **b)** One

2.



3. a) Move each point of the figure 5 units to the right and 3 units up.

b) Example: Five rights and three ups or 5R, 3U

c) Example: Placing a negative sign in front of each coordinate would place the image in the third quadrant.