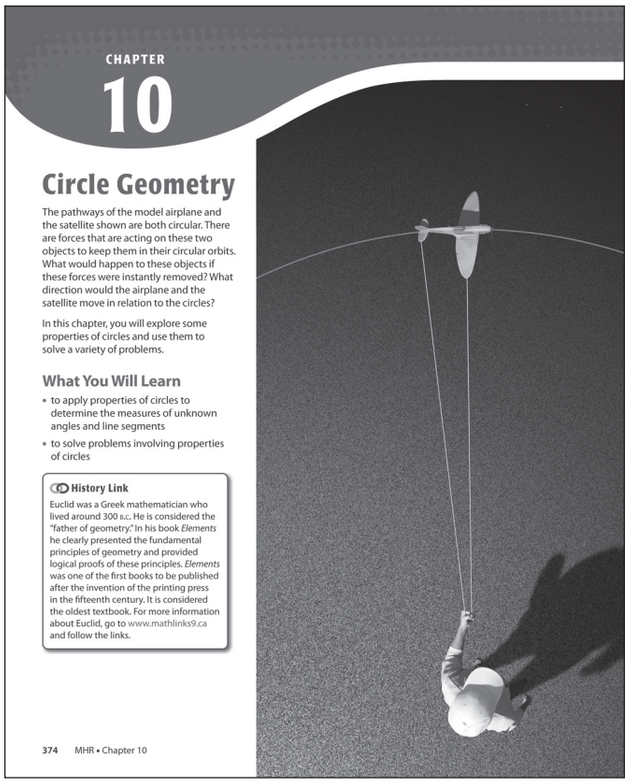
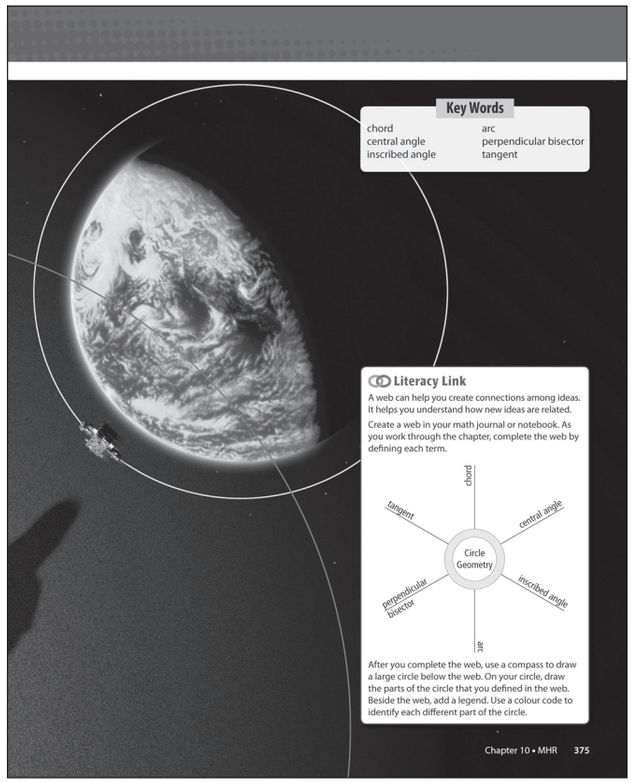




***MathLinks 9*, pages 374–377**

Suggested Timing
40–50 minutes

Materials
- sheet of 11 × 17 paper
- compass
- six sheets of 8.5 × 11 paper
- scissors
- stapler
- ruler
- tracing paper
- protractor

Blackline Masters
BLM 10–1 Chapter 10 Math Link Introduction
BLM 10–2 Chapter 10 Get Ready
BLM 10–4 Chapter 10 Problems of the Week

Key Words

chord	central angle	inscribed angle
arc	perpendicular bisector	tangent

What's the Math?

In this chapter, students will explore some basic properties of circles. First, they will explore the relationship between inscribed and central angles that contain the same arc. Then, students will explore the relationship between a chord, its perpendicular bisector, and the centre of a circle. Finally, students will explore the relationship between tangent lines and the radius of a circle to the point of tangency. There will be many opportunities for students to justify their solutions using these properties as the problems get more complex through the chapter.

Planning Notes

This chapter is very visual. Most problems involve interpreting and/or creating a diagram. The chapter opener provides two real examples of flying objects that travel in circular orbits. Ask students for other examples of objects that travel in circular pathways. Explain that in later science courses students will study the forces that allow these objects to stay in circular orbits.

Before starting the chapter, help students activate prior knowledge of measuring central angles in circles and identifying types of triangles (scalene, isosceles, and equilateral).

Literacy Link Webs are graphic organizers that help students to remember 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 *circle geometry*.

The web is designed to help students make connections between six new vocabulary words in this chapter. Suggest that students keep this graphic organizer at the beginning of their notes or journal so that they can access it easily at the end of each section. The arms of the web have branches that allow students to put their notes in point form.

After students have completed the web, it is recommended that they use a compass to draw a circle about half a page in diameter. Then, using colour coding, a ruler, a protractor, and a legend, students draw the shapes of the terms they defined in their web.

Students will complete the web as they work on Chapter 10.

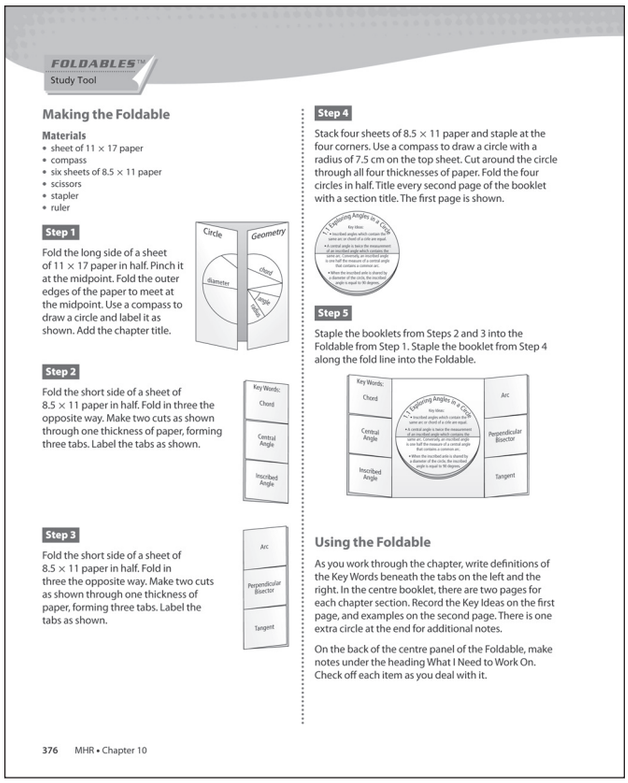
- After completing section 10.1, brainstorm and discuss as a class information that can be added to the web. Section 10.1 contains most of the terms that students are required to know in this chapter. Note that at the end of section 10.1 students are to fill out as much of the web as possible. It is important that all students be reminded of the correct format for identifying angles before proceeding.
- Note that at the end of section 10.2 students are to fill out as many terms as possible in the web. After completing Section 10.2, brainstorm and discuss as a class information that they might add.

Meeting Student Needs

- Consider having students complete the questions on **BLM 10–2 Chapter 10 Get Ready** to activate the prerequisite skills for this chapter.
- Some students will need extra assistance with determining central angles using a protractor.
- To reactivate students' geometry skills, discuss vocabulary related to circles and angles, including *radius*, *vertex*, *congruent*, *perpendicular*, and *measure of an angle*.
- Briefly discuss the terms that will be introduced in this chapter, and include the term *subtend*.

ELL

- Some students may benefit from discussing the terms *pathways*, *model airplane*, *satellite*, *circular*, *orbit*, *forces*, *line segment*, and *compass*.
- Discuss with students the terms *rely*, *medicine wheel*, *principles*, *endpoints*, *crease*, and *protractor*, and how they relate to the chapter concepts.



FOLDABLES™
Study Tool

Making the Foldable

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

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. Use a compass to draw a circle and label it as shown. Add the chapter title.

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 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 4

Stack four sheets of 8.5 × 11 paper and staple at the four corners. Use a compass to draw a circle with a radius of 7.5 cm on the top sheet. Cut around the circle through all four thicknesses of paper. Fold the four circles in half. Title every second page of the booklet with a section title. The first page is shown.

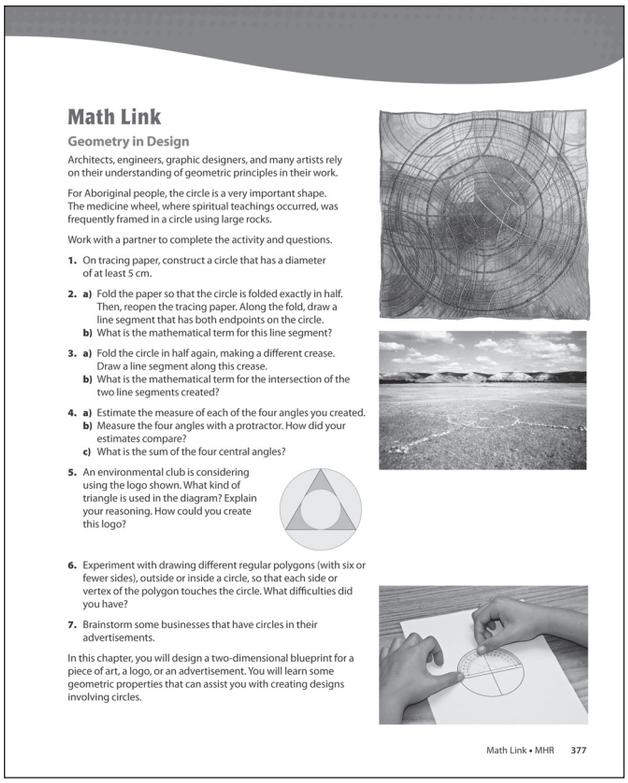
Step 5

Staple the booklets from Steps 2 and 3 into the Foldable from Step 1. Staple the booklet from Step 4 along the fold line into the Foldable.

Using the Foldable

As you work through the chapter, write definitions of the Key Words beneath the tabs on the left and the right. In the centre booklet, there are two pages for each chapter section. Record the Key Ideas on the first page, and examples on the second page. There is one extra circle at the end for additional notes.

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



Math Link

Geometry in Design

Architects, engineers, graphic designers, and many artists rely on their understanding of geometric principles in their work.

For Aboriginal people, the circle is a very important shape. The medicine wheel, where spiritual teachings occurred, was frequently framed in a circle using large rocks.

Work with a partner to complete the activity and questions.

1. On tracing paper, construct a circle that has a diameter of at least 5 cm.
2. **a)** Fold the paper so that the circle is folded exactly in half. Then, reopen the tracing paper. Along the fold, draw a line segment that has both endpoints on the circle.
   b) What is the mathematical term for this line segment?
3. **a)** Fold the circle in half again, making a different crease. Draw a line segment along this crease.
   b) What is the mathematical term for the intersection of the two line segments created?
4. **a)** Estimate the measure of each of the four angles you created.
   b) Measure the four angles with a protractor. How did your estimates compare?
   c) What is the sum of the four central angles?
5. An environmental club is considering using the logo shown. What kind of triangle is used in the diagram? Explain your reasoning. How could you create this logo?

6. Experiment with drawing different regular polygons (with six or fewer sides), outside or inside a circle, so that each side or vertex of the polygon touches the circle. What difficulties did you have?
7. Brainstorm some businesses that have circles in their advertisements.

In this chapter, you will design a two-dimensional blueprint for a piece of art, a logo, or an advertisement. You will learn some geometric properties that can assist you with creating designs involving circles.

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 back 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

As a class, discuss different logos that are used by companies to identify them.

In #6, students may need assistance in determining how to construct regular polygons with five sides (pentagon) and six sides (hexagon). Help students determine the value of each interior angle in a regular pentagon and hexagon. Ask students how many triangles can be mapped onto a pentagon (or hexagon) where one vertex of the pentagon contains one vertex of each triangle. You may also wish to ask:

- What is the sum of the interior angles of one triangle?
- What is the sum of the interior angles of a pentagon (or hexagon)?
- What is the measure of each interior angle of a regular pentagon (or hexagon)?

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 Math Link: Wrap It Up! on page 407 to give them a sense of where the Math Link is heading. The Math Link: Wrap It Up! problem is a summative assessment.

Meeting Student Needs

- It may be beneficial to help students remember how to find perpendicular bisectors of a line in order to locate the centre of a regular pentagon (or hexagon) in order to succeed with #6.
- When adding definitions and/or visuals to their Foldables, some students may benefit from using different colours to outline and label different lines that make angles.
- To help them get started, some students may benefit from using **BLM 10–1 Chapter 10 Math Link Introduction**, which provides scaffolding for this activity.

Common Errors

- Some students may need assistance with brainstorming common logos for companies.

R_x It may be worth searching for some of these before class to have on hand. Question #6 will likely be most difficult for students. See the comments in the previous two sections.

Answers

Math Link

4. **c)** 360°

5. Equilateral triangle. Example: The three sides are equal and the three angles have equal measures.