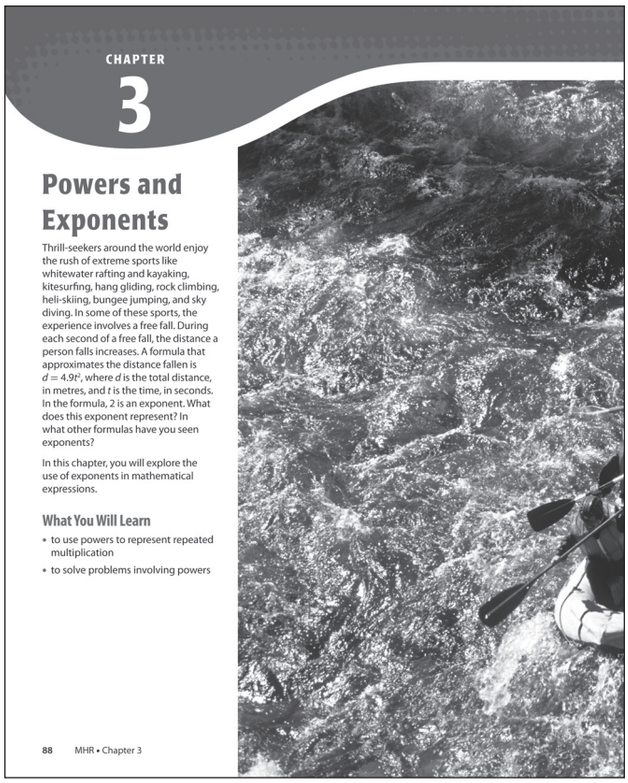
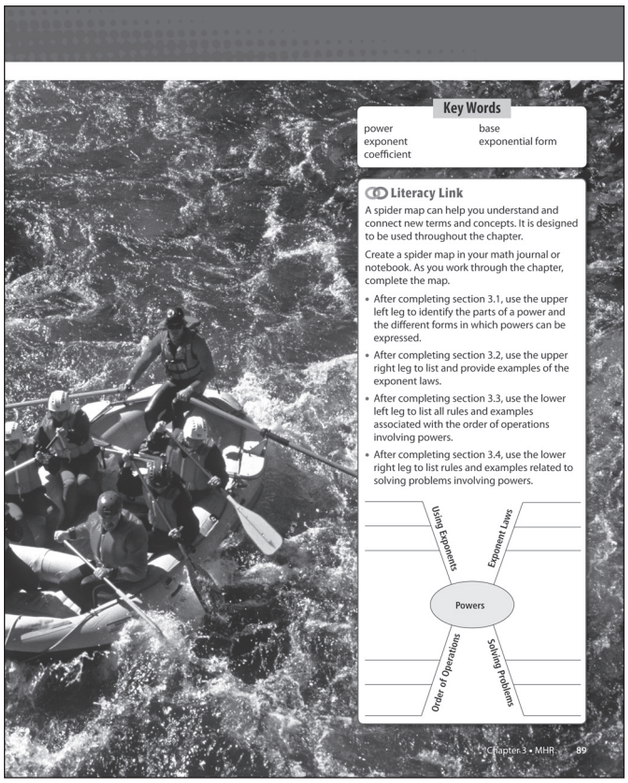




***MathLinks 9*, pages 88–91**

Suggested Timing
40–50 minutes

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

Blackline Masters
Master 17 Spider Map
BLM 3–1 Chapter 3 Math Link Introduction
BLM 3–2 Chapter 3 Get Ready
BLM 3–4 Chapter 3 Problems of the Week

Key Words
power
base
exponent
exponential form
coefficient

What's the Math?

In this chapter, students learn to simplify exponential expressions. They develop the exponent laws for multiplying or dividing powers with like bases, for raising a power to an exponent, for raising a product and a quotient to an exponent, and for powers with an exponent of zero. Next, students apply proper order of operations to simplify expressions that contain powers. Finally, formulas are used and developed to solve exponential growth problems in context.

Planning Notes

Focus students' attention on the white-water rafting in the opening page of the chapter. You may wish to inform them that this photo shows the Maligne River in Jasper National Park, Alberta.

Discuss that the formula that relates distance fallen due to gravity with respect to time contains an exponent. You might wish to ask:
- What is the purpose of the raised 2 in the formula?
- What other formulas do you know that have exponents?
- How is a number with an exponent calculated?

Tell students that they will work with exponential expressions in this chapter.

Literacy Link Spider 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 *powers*.

At the beginning of the chapter, have students create a spider map in their notebook or journal. You may wish to model how to develop the spider map using an overhead copy of **Master 17 Spider Map**.

The spider map is designed to help students make connections among four important concepts in this chapter. A suggestion is that students keep this graphic organizer at the beginning of their notebook or journal so that they can access it easily at the end of each section. Students will need to use a whole page for their spider map. Have them put the oval in the centre of a page so that the spider map can be expanded as they work through the chapter. Some of the legs of the spider may be quite long because students may be entering phrases or the leg may have several subparts. Caution students to use small printing and to try to be as neat as possible.

Students will complete the spider map as they work on Chapter 3.

- By the end of section 3.1, have students list all the rules and terms they encountered that are associated with powers. Students might include such rules as the sign rules or the effect of parentheses on negative bases. They might include such terms as *repeated multiplication*, *exponent*, and *base*.
- By the end of section 3.2, have students list each of the exponent laws. Encourage them to explain the laws using their own wording and examples.
- By the end of section 3.3, have students list all the rules and terms they learned that are associated with order of operations involving powers. Students might include such rules as order of operations. They might include the terms *coefficient*.
- By the end of section 3.4, have students list all the rules and terms they learned that are associated with solving problems involving powers. Students might include the term *formulas*.

Meeting Student Needs

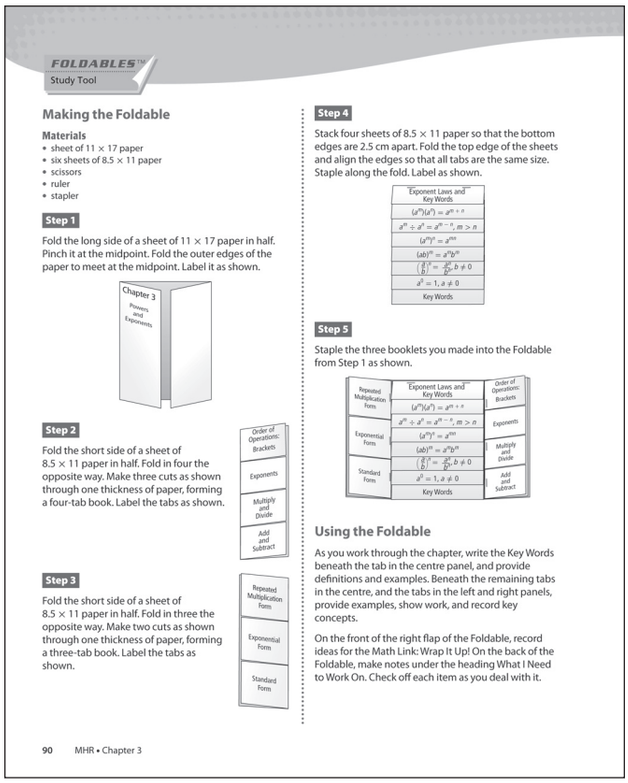
- Consider having students complete the questions on **BLM 3–2 Chapter 3 Get Ready** to activate the prerequisite skills for this chapter.
- Some students may benefit from using **Master 17 Spider Map** for the Literacy Link activity.
- Ensure students understand what white-water rafting is and how it works. Consider showing a video clip. Discuss how the math relates to the chapter.

ELL

- Show the picture of the white-water rafting as you say the term. Have other students describe what they know about *white-water rafting*. Explain what *free falling* is.

Gifted and Enrichment

- Have students research the significance of the constant 4.9 in the equation $d = 4.9t^2$.



FOLDABLES™
Study Tool

Making the Foldable

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

Step 2

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

Step 4

Stack four sheets of 8.5 × 11 paper so that the bottom edges are 2.5 cm apart. Fold the top edge of the sheets and align the edges so that all tabs are the same size. Staple along the fold. Label as shown.

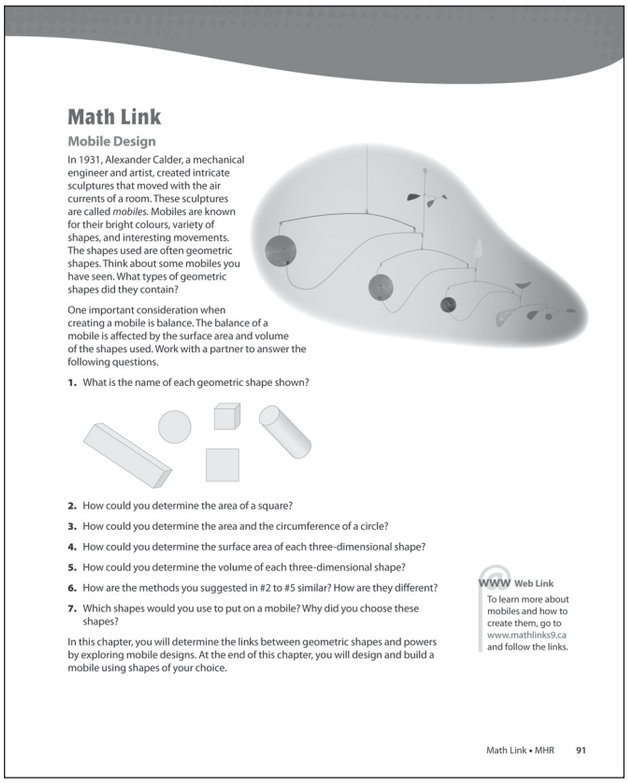
Step 5

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

Using the Foldable

As you work through the chapter, write the Key Words beneath the tab in the centre panel, and provide definitions and examples. Beneath the remaining tabs in the centre, and the tabs in the left and right panels, provide examples, show work, and record key concepts.

On the front of the right flap of the Foldable, record ideas for the Math Link: Wrap It Up! 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.



Math Link

Mobile Design

In 1931, Alexander Calder, a mechanical engineer and artist, created intricate sculptures that moved with the air currents of a room. These sculptures are called *mobiles*. Mobiles are known for their bright colours, variety of shapes, and interesting movements. The shapes used are often geometric shapes. Think about some mobiles you have seen. What types of geometric shapes did they contain?

One important consideration when creating a mobile is balance. The balance of a mobile is affected by the surface area and volume of the shapes used. Work with a partner to answer the following questions.

1. What is the name of each geometric shape shown?

2. How could you determine the area of a square?
3. How could you determine the area and the circumference of a circle?
4. How could you determine the surface area of each three-dimensional shape?
5. How could you determine the volume of each three-dimensional shape?
6. How are the methods you suggested in #2 to #5 similar? How are they different?
7. Which shapes would you use to put on a mobile? Why did you choose these shapes?

In this chapter, you will determine the links between geometric shapes and powers by exploring mobile designs. At the end of this chapter, you will design and build a mobile using shapes of your choice.

WWW Web Link
To learn more about mobiles and how to create them, go to www.mathlinks9.ca and follow the links.

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. This will assist them in identifying and solving any difficulties with concepts, skills, and processes.

Math Link

The Math Links for this chapter are related to designing a mobile. Discuss with the class what a mobile is. Direct students' attention to the photo of a mobile in the student resource. Ideally, you would also provide some pictures of a mobile, or even an actual mobile, for students to see. Ask:
- What is the difference between the two-dimensional and three-dimensional shapes shown in #1?
- Can both types of shapes be used to make a mobile?

Discuss as a class some of the formulas related to measuring area and volume of shapes. You might ask:
- What do the exponents represent?
- Are they necessary?

Have students complete the questions.

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 123 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 3–1 Chapter 3 Math Link Introduction**, which provides scaffolding for this activity.
- Have students research Alexander Calder. Consider partnering with the art teacher and doing a joint project on the artist and his mobiles.
- It may be a good idea to assist students in reactivating their understanding in the following areas before beginning the chapter:
  – vocabulary related to the chapter
  – working with exponents
  – the rules for working with signs
- For the Math Link, some students may need assistance in recalling how to calculate area, circumference, surface area, and volume.

- Consider relating the shapes in the Math Link to real-life objects that are relevant to students' culture and/or everyday lives. For example, show an example of an Aboriginal parfleche folder for a cylinder, a beaded medallion for a circle, and a star quilt for a square.

ELL

- As a student reads the Foldable instructions, model each step.
- Teach the following terms in context: *mobile*, *intricate*, *balance*, *surface area*, and *volume*.
- Give students a list of the names of the geometric shapes, or have them name them in their first language. Afterwards, it may be easier for students to ask for the missing vocabulary in English.

Common Errors

- Some students may confuse the formulas for different geometric shapes, or they may confuse surface area and volume formulas.

R_x Encourage students to draw diagrams and label the parts with variables to help them understand how the formulas relate to the shapes.

Answers

Math Link

1. The figures from left to right are right rectangular prism, circle, square, cube, and right cylinder.
2. Example: Multiply the side measurement by itself.
3. The area of a circle is the radius measurement multiplied by itself, multiplied by π. The circumference is the measurement of the diameter multiplied by π.
4. Example: Find the sum of the areas of each face.
5. Example: Multiply the area of the base by the height.
6. Example: A similarity is that the methods involve multiplying. The differences are that some methods involve adding as well as multiplying and some methods involve using the constant value π.