Understanding Percent

General Outcomes
• Develop number sense.

Specific Outcomes
N3 Demonstrate an understanding of percents greater than or equal to 0%.

By the end of this chapter, students will be able to:

Section	Understanding Concepts, Skills, and Processes
4.1	✓ show percents that are between 0% and 100%
	✓ show percents that are greater than 100%
	✓ show percents involving fractions
4.2	✓ convert between fractions, decimals, and percents
4.3	✓ solve problems that involve percents less than 1%
	✓ solve problems involving percents greater than 100%
	✓ solve problems involving fractional percents
4.4	✓ solve problems involving combined percents

Assessment	Supporting Learning
Assessment *for* Learning	
Method 1: Use the Math Link introduction on page 121 in *MathLinks 8* to activate student prior knowledge about the skills and processes that will be covered in this chapter. **Method 2:** Have students develop a journal to explain what they personally know about the world's fresh and salt water supply. Encourage them to use percents to describe the facts they know.	• **BLM 4–1 Chapter 4 Math Link Introduction** provides scaffolding for the Math Link introduction. • Have students use the What I Need to Work On tab of their chapter Foldable to keep track of the skills and processes that need attention. They can check off each item as they develop the skill or process at an appropriate level. • Students who require activation of prerequisite skills may wish to complete the Get Ready materials available on **BLM 4–2 Chapter 4 Get Ready**, in the *MathLinks 8 Practice and Homework Book*, and at the www.mathlinks8.ca book site.
Assessment *as* Learning	
Literacy Link (page 119) Before starting the chapter, have students develop a concept map showing what they currently know and understand about percents, and provide examples of percents they use.	• Encourage students to use the glossary starting on page 517 to help them. • Brainstorm definitions, comparisons, facts, and examples. Encourage students to use the brainstormed ideas to develop some of their own. • Use the concept maps to identify any misconceptions students may have. Deal with these misconceptions during the appropriate section of the chapter.
Chapter 4 Foldable As students work on each section in Chapter 4, have them keep track of any problems they are having in the What I Need to Work On tab of their chapter Foldable.	• As students complete each section, have them review the list of items they need to work on and check off any that have been handled.
Assessment *for* Learning	
BLM 4–3 Chapter 4 Warm-Up This BLM includes four warm-ups, one to be used at the beginning of each section. Each warm-up provides cumulative review questions for the entire student resource to that point, as well as mental math practice.	• As students complete questions from previous chapters, note which skills they are retaining and which ones may need additional reinforcement. • Use the warm-up to provide additional opportunities for students to demonstrate their understanding of the chapter material. • Have students share their strategies for completing mental math calculations.

Problems of the Week

Have all students try at least one of the problems on **BLM 4–4 Chapter 4 Problems of the Week**. Many of these problems require students to think outside the box and experiment with a variety of approaches. Some have definitive answers; others can be answered in more than one way.

Students can take the problems home and consult with parents or guardians, work with other students when their work is completed, or try them on their own. The questions take a varying amount of time to solve, depending on the particular student and the problem itself. You may wish to give out these problems at the beginning of the chapter and discuss the solutions at appropriate times throughout your work on the chapter.

Meeting Student Needs

Gifted and Enrichment
• Have students do #4 from the Problems of the Week.

Chapter 4 Planning Chart

Section/ Suggested Timing	Prerequisite Skills	Materials/Technology	Teacher's Resource Blackline Masters	Exercise Guide	Extra Support	Assessment *as* Learning	Assessment *for* Learning	Assessment *of* Learning
Chapter Opener • 40–50 minutes (TR page 151)	Students should be familiar with • the meaning of the percent symbol • place values to thousandths • converting fractions to percents • calculating percent change	• three sheets of notebook paper • ruler • stapler • three hundred grids • scissors • transparent tape or glue	Master 10 Hundred Grids Master 18 Concept Map BLM 4–1 Chapter 4 Math Link Introduction BLM 4–2 Chapter 4 Get Ready BLM 4–4 Chapter 4 Problems of the Week		Online Learning Centre	TR page 150 Chapter 4 Foldable, TR page 150	TR page 150	
4.1 Representing Percents • 80–100 minutes (TR page 155)	Students should be familiar with • representing percents from 0% to 100% on a hundred grid	• a variety of food and drink labels with information about percents • hundred grids • coloured pencils • camera attached to a television monitor (optional) • several pictures of the same kind of fruit or other food item (optional) • base ten blocks (optional)	Master 2 Two Stars and One Wish Master 10 Hundred Grids BLM 4–3 Chapter 4 Warm-Up BLM 4–5 Section 4.1 Extra Practice BLM 4–6 Section 4.1 Math Link	**Essential:** 1–4, 6, 8, 9, 12, Math Link **Typical:** 1–4, 6, 9–15, Math Link **Extension/Enrichment:** 1–3, 9, 13–16, Math Link	*MathLinks 8 Practice and Homework Book* *MathLinks 8 Solutions Manual*	Master 2 Two Stars and One Wish TR pages 159, 161 Math Learning Log, TR page 164 Chapter 4 Foldable, TR page 164	TR pages 159, 164	
4.2 Fractions, Decimals, and Percents • 80–100 minutes (TR page 165)	Students should be familiar with • converting between fractions, decimals, and percents from 0% to 100%	• hundred grids • calculator (optional)	Master 10 Hundred Grids BLM 4–3 Chapter 4 Warm-Up BLM 4–7 Section 4.2 Explore the Math BLM 4–8 Section 4.2 Extra Practice BLM 4–9 Section 4.2 Math Link	**Essential:** 1, 2, 4, 6, 8, 13, Math Link **Typical:** 1, 2, 4, 6, 8, 13–18, Math Link **Extension/Enrichment:** 1, 2, 10, 17, 21	*MathLinks 8 Practice and Homework Book* *MathLinks 8 Solutions Manual*	Math Learning Log, TR page 175 Chapter 4 Foldable, TR page 175	TR pages 171, 175	
4.3 Percent of a Number • 80–100 minutes (TR page 176)	Students should be familiar with • converting word problems involving percent to math expressions	• calculator • hundred grids	Master 10 Hundred Grids BLM 4–3 Chapter 4 Warm-Up BLM 4–10 Section 4.3 Extra Practice BLM 4–11 Section 4.3 Math Link	**Essential:** 1–3, 5, 7, 10, Math Link **Typical:** 1–3, 5, 8–13, Math Link **Extension/Enrichment:** 1, 2, 14–16, Math Link	*MathLinks 8 Practice and Homework Book* *MathLinks 8 Solutions Manual*	TR pages 179, 180 Math Learning Log, TR page 183 Chapter 4 Foldable, TR page 183	TR pages 179, 183	
4.4 Combining Percents • 80–100 minutes (TR page 184)	Students should be familiar with • adding and multiplying decimals • converting percents to decimals	• sample advertisements featuring percent-off sales • base ten blocks or hundred grids (optional) • calculator	Master 10 Hundred Grids BLM 4–3 Chapter 4 Warm-Up BLM 4–12 Section 4.4 Extra Practice BLM 4–13 Section 4.4 Math Link	**Essential:** 1–4, 6, 8, 10, Math Link **Typical:** 1–4, 6, 8–12, Math Link **Extension/Enrichment:** 1–3, 13, 14, Math Link	*MathLinks 8 Practice and Homework Book* *MathLinks 8 Solutions Manual*	TR pages 187, 189 Math Learning Log, TR page 190 Chapter 4 Foldable, TR page 190	TR pages 187, 190	
Chapter 4 Review • 40–50 minutes (TR page 191)		• hundred grids • coloured pencils • ruler • calculator	Master 10 Hundred Grids Master 18 Concept Map BLM 4–5 Section 4.1 Extra Practice BLM 4–8 Section 4.2 Extra Practice BLM 4–10 Section 4.3 Extra Practice BLM 4–12 Section 4.4 Extra Practice	Have students do at least one question related to any concept, skill, or process that has been giving them trouble.	*MathLinks 8 Practice and Homework Book* *MathLinks 8 CAB*	Chapter 4 Foldable, TR page 192	TR page 192	
Chapter 4 Practice Test • 40–50 minutes (TR page 193)		• hundred grids • coloured pencils • ruler • calculator	Master 10 Hundred Grids BLM 4–14 Chapter 4 Test	Provide students with the number of questions they can comfortably do in one class. Choose at least one question for each concept, skill, or process. **Minimum:** 1–9, 11–13	*MathLinks 8 CAB*	TR page 195		TR page 195 BLM 4–14 Chapter 4 Test
Chapter 4 Wrap It Up! • 80–100 minutes (TR page 196)		• calculator	Master 1 Project Rubric BLM 4–1 Chapter 4 Math Link Introduction BLM 4–6 Section 4.1 Math Link BLM 4–9 Section 4.2 Math Link BLM 4–11 Section 4.3 Math Link BLM 4–13 Section 4.4 Math Link BLM 4–15 Chapter 4 Wrap It Up!		Online Learning Centre			TR page 196 Master 1 Project Rubric
Chapter 4 Math Games • 15–20 minutes (TR page 198)		• scissors • calculator (optional)	BLM 4–16 Number Match Cards				TR page 198	
Chapter 4 Challenge in Real Life • 80–100 minutes (TR page 199)		• poster paper • coloured pencils or markers • calculator	Master 1 Project Rubric BLM 4–17 Buyer's Record BLM 4–18 Seller's Record		Online Learning Centre		TR page 200	TR page 200 Master 1 Project Rubric
Chapters 1–4 Review • 60–75 minutes (TR page 202)		• grid paper • ruler • coloured pencils • compass • protractor • calculator • computer with spreadsheet software • hundred grids	Master 8 Centimetre Grid Paper Master 10 Hundred Grids Master 12 Percent Circles	Provide students with the number of questions they can comfortably do in one class. Choose at least one question for each concept, skill, or process. **Minimum:** 1, 2, 4–6, 8, 10, 12–20, 22, 24, 25	*MathLinks 8 CAB*	TR page 204, Chapters 1, 2, 3, and 4 Foldable Math Learning Log, TR page 204	TR page 204	
Task • 80–100 minutes (TR page 205)		• toy vehicles, such as Hot Wheels® • material for platform (books, chair) • material for ramps (board, stiff cardboard) • metre stick • tape measure • calculator	Master 1 Project Rubric BLM 4–19 Trial Record BLM 4–20 Chapter 4 BLM Answers		Online Learning Centre			TR page 206 Master 1 Project Rubric

4

Understanding Percent

Water is crucial to the health of Earth and to your own health. About 71% of Earth's surface is covered by water. Of all the water on Earth, 97.5% is salt water, and the remaining 2.5% is fresh water. About 70% of the fresh water is permanently frozen. Only about 0.007% of all water on Earth is fresh water that is accessible for direct human use.

The human body is 60% water. To maintain a healthy balance, it is recommended that humans drink plenty of water each day. Maintaining adequate body water content during illness contributes significantly to the recovery process.

In this chapter, you will use percents to explore and learn more about the world's most valuable liquid—water. Think of some facts you already know about water. How are percents used to describe these facts?

What You Will Learn

❑ to describe a situation where a percent may be more than 100%, may be between 0% and 1%, or contains a fractional portion
❑ to use grids to represent percents that are between 0% and 1%, and those that are greater than 100%
❑ to find the percent represented by a given shaded region on a grid and record it in decimal, fraction, and percent form
❑ to convert between percents, fractions, and decimals
❑ to solve problems involving percents and combined percents

118   MHR • Chapter 4

Key Words
• percent   • combined percents
• fractional percent

Literacy Link

You can use a concept map to visually organize your understanding of a math concept such as percent.

Copy the concept map below into your math journal or notebook. Make each shape large enough to write in. Write what you already know about percents.
• Definition: What is a percent?
• Comparisons: What can you compare percents to?
• Facts: What are some facts or characteristics you know about percents?
• Examples: What are some examples of percents?

Share your ideas with a classmate. You may wish to add to or correct what you have written.

Chapter 4 • MHR   119

What's the Math?

In this chapter, students focus on percents that are less than 1% or greater than 100%. Students extend their representations, procedural understanding, and problem-solving abilities from previous work, which focused on percents from 1% to 100%, by working with percents, decimals, and fractions with components that are less than 1 and greater than 100. They start by representing percents. Next, students convert between fractions, decimals, and percents. Then, they solve problems involving percents less than 1%, greater than 100%, fractional percents, combined percents, and percents of percents.

Planning Notes

As a class, read the information and draw students' attention to the visual. Encourage them to mention facts about water and water use percents to describe these facts. Try to elicit ideas from all class members. This chapter focuses on percents less than 1% and greater than 100%. Some students may not be familiar with the use of fractional percents. Others may have difficulty with the concept of percents less than 1% or greater than 100%. Highlight the importance of percents less than 1% by pointing out that the percent of fresh water available for consumption is much less than 1% of Earth's total water supply. Highlight the importance of percents greater than 100% by pointing out that some measures, such as the amount of carbon dioxide in the atmosphere, are growing, and so each year is more than 100% of the previous year's measure.

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 an alternative to traditional outlining and note taking and supports all students by providing both visual and written information.

Model how to develop a concept map by working with students to complete the concept map on percent at the beginning of this chapter. Brainstorm and discuss as a class the information needed to complete the map. You might use sticky notes to identify details and add them to a copy of the map on chart paper. Or, consider using markers and an overhead copy of **Master 18 Concept Map**. See the partially completed map that follows.

Have students fill in their own concept map using their own definitions, comparisons, facts, and examples.

Have students revisit the concept map just before they do the practice test. They could develop a second concept map about percents showing what they know at the end of the chapter and compare it with their earlier map.
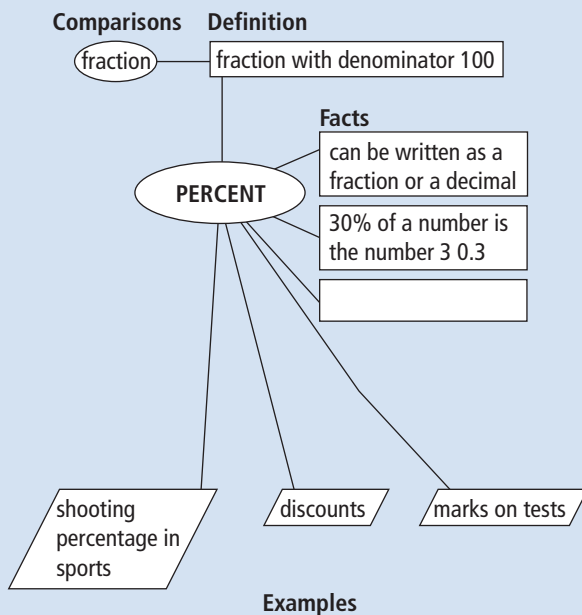
Meeting Student Needs

- Consider having students complete the questions on **BLM 4–2 Chapter 4 Get Ready** to activate the prerequisite skills for this chapter. Alternatively, help reactivate students' skills, which include dividing decimals by 10, converting percents to fractions and decimals, and reducing fractions to lowest terms.
- Students may benefit from using **Master 18 Concept Map** to create their concept map.
- Encourage students who have additional information to enlarge or change the concept map outline. Alternatively, they can create their own template.

ELL

- English language learners may have difficulty with terms such as *crucial*, *salt water*, *fresh water*, *permanently frozen*, *accessible*, *adequate*, and *recovery process*. Have students add any new terms to their dictionary.
- Consider displaying Key Words on a math word wall. Encourage students to create their own vocabulary/picture dictionary. Matching a picture with a key word and its definition helps reinforce students' understanding of vocabulary.

Web Link

For interesting facts about water, go to www.mathlinks8.ca and follow the links.

Making the Foldable

Materials
• three sheets of notebook paper
• ruler
• stapler
• three hundred grids
• scissors
• transparent tape or glue

Step 1
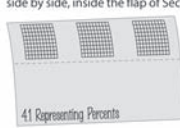Collect three sheets of paper and place them 2 cm apart. Keep the edges straight.

Step 2
Fold the top edge of the paper. Stop 2 cm from the bottom edge of the top sheet. This makes all tabs the same size. Staple together along the fold.

2 cm

Step 2
Label the tabs as shown.

Chapter 4
Understanding Percent
4.1 Representing Percents
4.2 Fractions, Decimals, and Percents
4.3 Percent of a Number
4.4 Combining Percents
What I Need to Work On

Step 3
Cut out three hundred grids. Tape or glue them, side by side, inside the flap of Section 4.1.

4.1 Representing Percents

Using the Foldable

As you work through Chapter 4, make notes about Key Words, examples, and Key Ideas under the appropriate tab. Use the hundred grids to show what you learn about percents in section 4.1.

On the last tab, make notes for the heading What I Need to Work On. Check off each item as you deal with it.

Use the back of the Foldable to record your ideas for the Wrap It Up!

120   MHR • Chapter 4

MATH LINK

Water Conservation
Conserving water is a key step to making a difference to the world's fresh water supply.

Read the following article.

THE DAILY NEWS

Rainforest Town Suffers Water Shortages

Residents and businesses in Tofino, a small seaside town on Vancouver Island, have been asked to restrict their water use. This popular resort town attracts 15 000 to 20 000 visitors a day during the summer, doubling water consumption rates. The old water reservoir is not large enough to deal with such demands.

Rather than shut down the popular resort, residents have been asked to restrict their water usage, including no watering of gardens and lawns, or washing of sidewalks, driveways, and vehicles. Ironically, this seaside town is one of the wettest places in Canada, receiving more than three metres of precipitation each year. Most of the rain falls during the winter, however.

1. Why might Tofino need to restrict water use?
2. Why might other communities have water restrictions?
3. What kinds of water restrictions might there be?
4. If you usually shower for 20 min, what percent of water would you save by showering for 1 min less?
5. What percent savings in water might there be if you change from a 10 L/min showerhead to an 8.5 L/min showerhead?

In this chapter, you will use percents to learn about one of our most valuable resources—water. What ways can you think of to conserve water at home and at school?

Math Link • MHR   121

Foldables Study Tool

Have students make the Foldable in the student resource to keep track of the information in the chapter. Have each pair of students share a copy of **Master 10 Hundred Grids** for Step 3. Have them record the Key Ideas for each section in the Notes on the back of the Foldable. Filling in the What I Need to Work On tab as they progress through the chapter will assist them in identifying and solving any difficulties with concepts, skills, and processes.

Have students store the Foldable in a binder by punching holes in the same place as the staples were put. You may also wish to provide students with a plastic envelope that fits into their binder.

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 above.

Math Link

The Math Link for this chapter is about water conservation. Read the Math Link introduction on page 121 as a class. Discuss the following ways to conserve water: keeping showers to a minimum and using the 30 s rule: getting wet, turning off the water, sudsing up and rinsing off; not taking baths or using soaker tubs as they use five times the water of a shower; keeping toilet flushing to a minimum; closing down hot tubs; and monitoring daily water use. Have students answer and then discuss the questions.

The Math Links for this chapter integrate mathematical understandings with water conservation. Research other examples of the use of percents that relate to water.

Have students read the Wrap It Up! on page 153 to give them a sense of where the Math Link introduction is heading. The Wrap It Up! problem is a summative assessment. As students work through the chapter, have them complete all of the related Math Links. These Math Links will assist them in doing the Wrap It Up! problem.

Meeting Student Needs

- Consider creating the chapter Foldable ahead of time to use as a model.
- Some students who live in the Yukon, the Northwest Territories, and Nunavut will be less familiar with water consumption patterns in other parts of Canada. Consider using the following prompts to help students answer the questions:
  – Identify the ways that water is used in Tofino.
  – Identify the ways that tourists might use water.
  – Compare how water is used in Tofino to how it is used in your community.
- Have students work individually or in pairs to complete the Math Link.
- To help them to get started, some students may benefit from using **BLM 4–1 Chapter 4 Math Link Introduction**, which provides scaffolding for this activity.

ELL

- Consider reading the Math Link out loud as a class.

Gifted and Enrichment

- Consider having students research and present examples of percents less than 1% or greater than 100% that relate to real-life topics they find interesting.
- Have students research how Canada's Aboriginal peoples provide traditional ecological knowledge to help scientists understand the effects of climate change on northern environments, lakes, rivers, and oceans. Traditional Ecological Knowledge (or TEK) is a system of understanding one's environment. This knowledge is gained over the years from people who depend on land and water for their food, materials, and culture.

WWW Web Link

For more information about Traditional Ecological Knowledge (TEK), go to www.mathlinks8.ca and follow the links.

Answers

Math Link

1. The town's old water reservoir is not large enough to meet the demands in the summer months with increased tourism.

2. Answers will vary. Look for at least two reasons such as the following:
   - A drought may cause water supplies to dwindle.
   - A new manufacturing plant may use a lot of water.
   - The water supply may become contaminated and need to be replaced.

3. Answers may vary. Example: A community might limit watering of gardens and lawns, and washing of sidewalks, driveways, and vehicles.

4. 5%

5. 15%