8 Integers

General Outcomes

- Develop number sense.

Specific Outcomes

N7 Demonstrate an understanding of multiplication and division of integers, concretely, pictorially and symbolically.

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

Section	Understanding Concepts, Skills, and Processes
8.1	✓ multiply integers using integer chips
8.2	✓ determine integer products using a number line
	✓ apply a sign rule when multiplying integers
8.3	✓ divide integers using integer chips
8.4	✓ determine integer quotients using a number line
	✓ apply a sign rule when dividing integers
8.5	✓ decide when to multiply integers and when to divide integers in solving problems
	✓ apply the order of operations to solve problems involving integers

Assessment	Supporting Learning
Assessment *for* Learning	
Method 1: Use the Math Link introduction on page 285 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 entry to explain what they personally know about integers, including what they look like, as well as anything they know about multiplying and dividing integers.	• **BLM 8–1 Chapter 8 Math Link Introduction** provides scaffolding for the Math Link introduction. • Have students use the What I Need to Work On section 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 8–2 Chapter 8 Get Ready**, in the *MathLinks 8 Practice and Homework Book*, and at the www.mathlinks8.ca book site.
Assessment *as* Learning	
Literacy Link (page 283) At the beginning of the chapter, have students use a KWL chart to identify what they know and want to learn about integers. After completing the chapter, have them identify what they have learned.	• Review the What I **Know** column to assess students' prior knowledge related to integers. • In the What I **Want** to Know column, have students list at least three things they want to know about integers. This should be written in question form and include higher-level questions that cannot be answered with a simple yes or no. • When filling out the What I **Learned** column, model providing details that clearly support what was learned. Use this column to help students realize how much they have learned during the chapter. Discuss how students might now be able to answer their questions in the What I **Want** to Know column and identify which ones still need to be answered.
Chapter 8 Foldable As students work on each section in Chapter 8, have them keep track of any difficulties they are having in the What I Need to Work On section 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 8–3 Chapter 8 Warm-Up This BLM includes five 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.

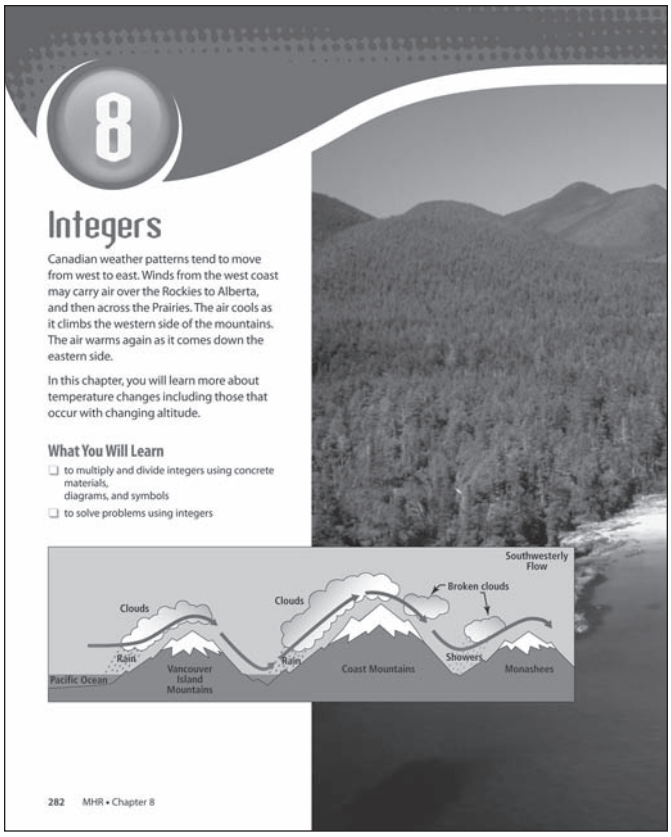
Problems of the Week

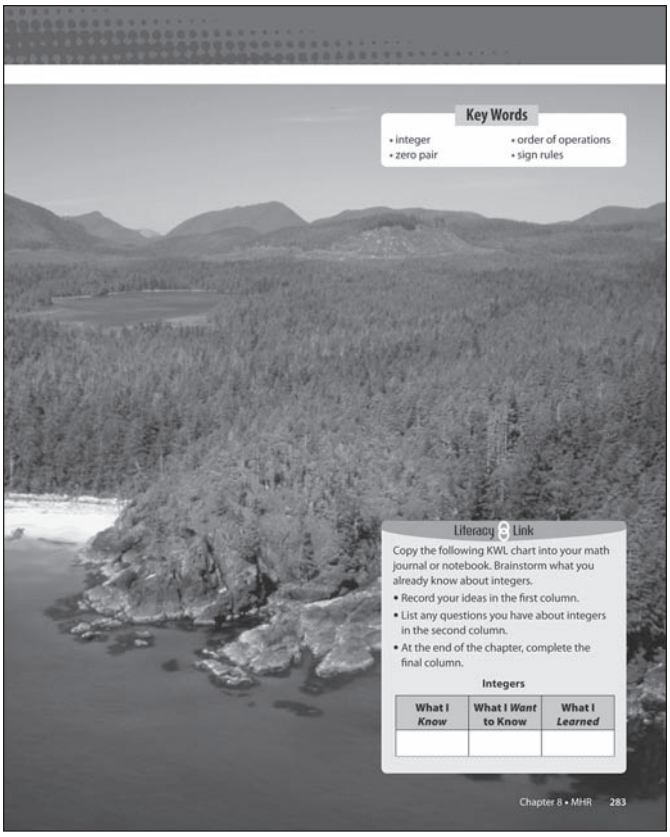
Have all students try at least one of the problems on **BLM 8–4 Chapter 8 Problems of the Week**. Many of these problems require students to think outside the box and experiment with a variety of approaches. Some have definitive answers; others can be answered in more than one way.

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.

Chapter 8 Planning Chart

Section/ Suggested Timing	Prerequisite Skills	Materials/Technology	Teacher's Resource Blackline Masters	Exercise Guide	Extra Support	Assessment		
						Assessment *as* Learning	Assessment *for* Learning	Assessment *of* Learning
Chapter Opener • 40–50 minutes (TR page 387)	Students should be familiar with • positive and negative integers • thermometers • number lines	• 11 × 17 sheet of paper • four sheets of notebook paper • scissors • stapler • red and blue integer chips (optional) • number line (optional)	Master 16 KWL Chart BLM 8–1 Chapter 8 Math Link Introduction BLM 8–2 Chapter 8 Get Ready BLM 8–4 Chapter 8 Problems of the Week		Online Learning Centre	TR page 386 Chapter 8 Foldable, TR page 386	TR page 386	
8.1 Exploring Integer Multiplication • 50–60 minutes (TR page 391)	Students should be familiar with • calculating rates • integer chips • multiplication • modelling equations	• red and blue integer chips • coloured pencils (optional) • scissors (optional) • transparent chips (optional)	Master 2 Two Stars and One Wish Master 20 Integer Chips BLM 8–3 Chapter 8 Warm-Up BLM 8–5 Section 8.1 Extra Practice	**Essential:** 1–4, 5, 7, 9, 13, 14 **Typical:** 1, 2, 4, 5, 7, 9, 14–18 **Extension/Enrichment:** 1, 2, 4, 19, 20	*MathLinks 8 Practice and Homework Book* *MathLinks 8 Solutions Manual*	Master 2 Two Stars and One Wish TR page 394, 395 Math Learning Log, TR page 397 Chapter 8 Foldable, TR page 397	TR page 394, 397	
8.2 Multiplying Integers • 50–60 minutes (TR page 398)	Students should be familiar with • modelling equations • number lines • estimation • patterning	• red and blue integer chips • coloured pencils • red and blue construction paper (optional) • scissors (optional) • transparent plastic strips (optional) • red and blue markers (optional) • calculator (optional)	Master 3 Integer Number Lines Master 4 Vertical and Horizontal Number Lines Master 19 Multiplication Chart BLM 8–3 Chapter 8 Warm-Up BLM 8–6 Section 8.2 Extra Practice BLM 8–7 Section 8.2 Math Link	**Essential:** 1–4, 6, 8, 10, 12, 23, Math Link **Typical:** 1–4, 6, 8, 10, 12–24, Math Link **Extension/Enrichment:** 1–3, 25–29	*MathLinks 8 Practice and Homework Book* *MathLinks 8 Solutions Manual*	TR page 401, 402 Math Learning Log, TR page 405 Chapter 8 Foldable, TR page 405	TR page 401, 405	
8.3 Exploring Integer Division • 50–60 minutes (TR page 406)	Students should be familiar with • calculating mean • division • modelling equations	• red and blue integer chips • coloured pencils (optional) • scissors (optional) • transparent chips (optional)	Master 20 Integer Chips BLM 8–3 Chapter 8 Warm-Up BLM 8–8 Section 8.3 Extra Practice	**Essential:** 1, 3, 5, 7, 10 **Typical:** 1, 3, 5, 7, 10–14 **Extension/Enrichment:** 1, 2, 15, 16	*MathLinks 8 Practice and Homework Book* *MathLinks 8 Solutions Manual*	TR page 410, 411 Math Learning Log, TR page 413 Chapter 8 Foldable, TR page 413	TR page 410, 413	
8.4 Dividing Integers • 50–60 minutes (TR page 414)	Students should be familiar with • elapsed time • number lines • modelling equations • calculators • calculating rates	• red and blue integer chips • coloured pencils • red and blue construction paper (optional) • scissors (optional) • transparent plastic strips (optional) • red and blue markers (optional) • calculator (optional)	Master 4 Vertical and Horizontal Number Lines Master 19 Multiplication Chart BLM 8–3 Chapter 8 Warm-Up BLM 8–9 Section 8.4 Extra Practice BLM 8–10 Section 8.4 Math Link	**Essential:** 1–3, 5, 7, 9, 11, 19, Math Link **Typical:** 1–3, 5, 7, 9, 11–20, Math Link **Extension/Enrichment:** 1–4, 21, 22	*MathLinks 8 Practice and Homework Book* *MathLinks 8 Solutions Manual*	TR page 418, 420 Math Learning Log, TR page 422 Chapter 8 Foldable, TR page 422	TR page 418, 422	
8.5 Applying Integer Operations • 50–60 minutes (TR page 423)	Students should be familiar with • order of operations • calculating mean	• calculator (optional)	BLM 8–3 Chapter 8 Warm-Up BLM 8–11 Section 8.5 Extra Practice	**Essential:** 1–4, 6, 8, 12, 15 **Typical:** 1–4, 6, 8–21 **Extension/Enrichment:** 1–3, 22–24	*MathLinks 8 Practice and Homework Book* *MathLinks 8 Solutions Manual*	TR page 426, 427 Math Learning Log, TR page 430 Chapter 8 Foldable, TR page 430	TR page 426, 430	
Chapter 8 Review • 50–60 minutes (TR page 431)		• red and blue integer chips	BLM 8–5 Section 8.1 Extra Practice BLM 8–6 Section 8.2 Extra Practice BLM 8–8 Section 8.3 Extra Practice BLM 8–9 Section 8.4 Extra Practice BLM 8–11 Section 8.5 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 8 Foldable, TR page 432	TR page 432	
Chapter 8 Practice Test • 40–50 minutes (TR page 433)		• red and blue integer chips	BLM 8–12 Chapter 8 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:** 1–4, 6, 9, 11–13, 15	*MathLinks 8 CAB*	TR page 434		TR page 434 BLM 8–12 Chapter 8 Test
Chapter 8 Wrap It Up! • 80–100 minutes (TR page 435)		• red and blue integer chips	Master 1 Project Rubric BLM 8–1 Chapter 8 Math Link Introduction BLM 8–7 Section 8.2 Math Link BLM 8–10 Section 8.4 Math Link BLM 8–13 Chapter 8 Wrap It Up!		Online Learning Centre			TR page 435 Master 1 Project Rubric
Chapter 8 Math Games • 30–40 minutes (TR page 437)		• two dice per pair or group of students • counter of a distinctive colour per student • red and blue integer chips (optional)	Master 11 Hundred Chart				TR page 437	
Chapter 8 Challenge in Real Life • 40–50 minutes (TR page 438)		• ruler • red and blue integer chips	Master 1 Project Rubric		Online Learning Centre		TR page 439	TR page 439 Master 1 Project Rubric
Chapters 5–8 Review • 60–75 minutes (TR page 441)		• grid paper • isometric dot paper • ruler • calculator • fraction strips • pattern blocks • centimetre cubes • models of right prisms and cylinders • red and blue integer chips	Master 7 Isometric Dot Paper Master 8 Centimetre Grid Paper Master 13 Pattern Blocks Master 14 Fraction Strips Master 20 Integer Chips	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:** 1–5, 8–11, 13, 17, 18, 20, 22, 25, 28, 29, 31	*MathLinks 8 CAB*	TR page 443 Chapters 5, 6, 7, and 8 Foldable, TR page 443 Math Learning Log, TR page 443	TR page 443	
Chapter 8 Task • 60–75 minutes (TR page 444)		• glue • scissors • ruler	Master 1 Project Rubric Master 8 Centimetre Grid Paper BLM 8–14 Net for Cubes BLM 8–15 Fraction Set Tables BLM 8–16 Chapter 8 BLM Answers		Online Learning Centre			TR page 445 Master 1 Project Rubric





***MathLinks 8*, pages 282–285**

Suggested Timing
40–50 minutes

Materials
- 11 × 17 sheet of paper
- four sheets of notebook paper
- scissors
- stapler
- red and blue integer chips (optional)
- number line (optional)

Blackline Masters
Master 16 KWL Chart
BLM 8–1 Chapter 8 Math Link Introduction
BLM 8–2 Chapter 8 Get Ready
BLM 8–4 Chapter 8 Problems of the Week

Key Words
integer zero pair order of operations sign rules

What's the Math?

In this chapter, students learn to multiply and divide two integers. Students model each of these operations using integer chips and a number line, then determine and apply sign rules. Throughout the chapter, students symbolically record the results of these operations in multiplication and division statements. Students apply these operations in creating and solving word problems. Students also solve problems that require them to use the order of operations.

Planning Notes

As a class, have students read the information about weather patterns in the student resource. You might ask students to describe the general effect that the prevailing westerly winds have on the climate in your community (e.g., temperatures, precipitation). You might also ask students to give examples of situations in which people need to allow for the cooling of air as it rises. Answers might include decisions about what clothing to wear when hot-air ballooning or mountain climbing.

Literacy Link KWL charts are an excellent way to assess students' understanding and to check for misconceptions. Students worked with adding and subtracting integers in *MathLinks 7*. What they remember from that work will assist them with understanding multiplying and dividing integers in *MathLinks 8*. Use a KWL chart to help students recall what they already know and to motivate them to consider the next steps in their learning. You may wish to use **Master 16 KWL Chart** to assist with this activity.

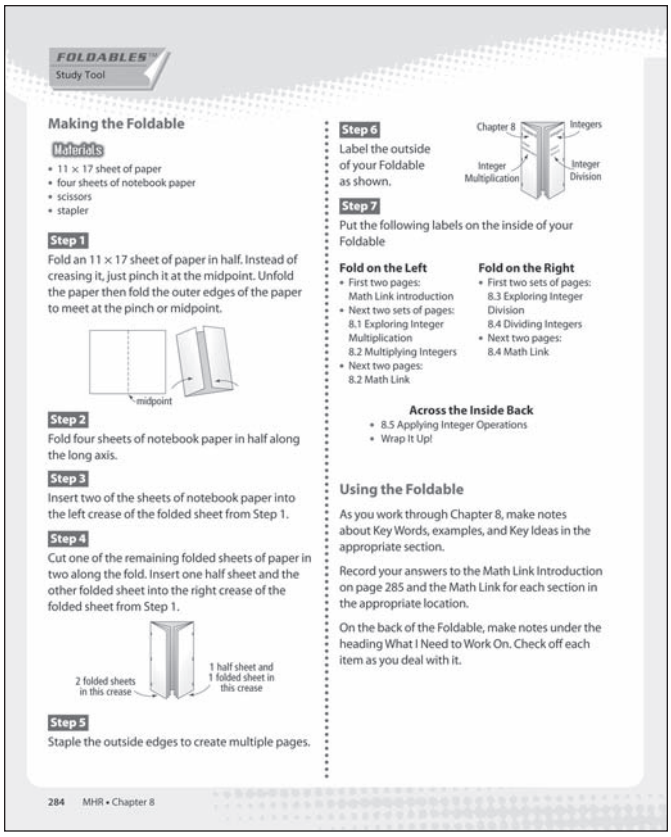
- Have students brainstorm what they already know in pairs or in a small group and record this information in the What I **Know** column.
- To reinforce previous skills, you may wish to have a class discussion about what could be written in the first column. This discussion could help some students fill in the second column as well.
- Ask students to list any interesting questions they may have about the topic in the What I **Want** to Know column. Challenge them to consider what other processes could be performed with integers (i.e., multiplying and dividing).
- Before completing the Chapter 8 Practice Test, ask students to complete the What I **Learned** column.

Meeting Student Needs

- Consider having students complete the questions on **BLM 8–2 Chapter 8 Get Ready** to activate the prerequisite skills for this chapter.
- Prompt students to recall the math language for multiplication and division (e.g., product, dividend) before beginning the chapter. They also may need assistance to reactivate their integer and rules of operations skills.
- Provide students with **Master 18 KWL Chart** to complete the KWL chart.

ELL

- During the introduction, give examples of the meaning of *weather*, *altitude*, and *temperature*.



FOLDABLES™
Study Tool

Making the Foldable

Materials
- 11 × 17 sheet of paper
- four sheets of notebook paper
- scissors
- stapler

Step 1
Fold an 11 × 17 sheet of paper in half. Instead of creasing it, just pinch it at the midpoint. Unfold the paper then fold the outer edges of the paper to meet at the pinch or midpoint.

midpoint

Step 2
Fold four sheets of notebook paper in half along the long axis.

Step 3
Insert two of the sheets of notebook paper into the left crease of the folded sheet from Step 1.

Step 4
Cut one of the remaining folded sheets of paper in two along the fold. Insert one half sheet and the other folded sheet into the right crease of the folded sheet from Step 1.

2 folded sheets in this crease
1 half sheet and 1 folded sheet in this crease

Step 5
Staple the outside edges to create multiple pages.

Step 6
Label the outside of your Foldable as shown.

Chapter 8
Integers
Integer Multiplication
Integer Division

Step 7
Put the following labels on the inside of your Foldable

Fold on the Left
- First two pages: Math Link introduction
- Next two sets of pages: 8.1 Exploring Integer Multiplication, 8.2 Multiplying Integers
- Next two pages: 8.2 Math Link

Fold on the Right
- First two sets of pages: 8.3 Exploring Integer Division, 8.4 Dividing Integers
- Next two pages: 8.4 Math Link

Across the Inside Back
- 8.5 Applying Integer Operations
- Wrap It Up!

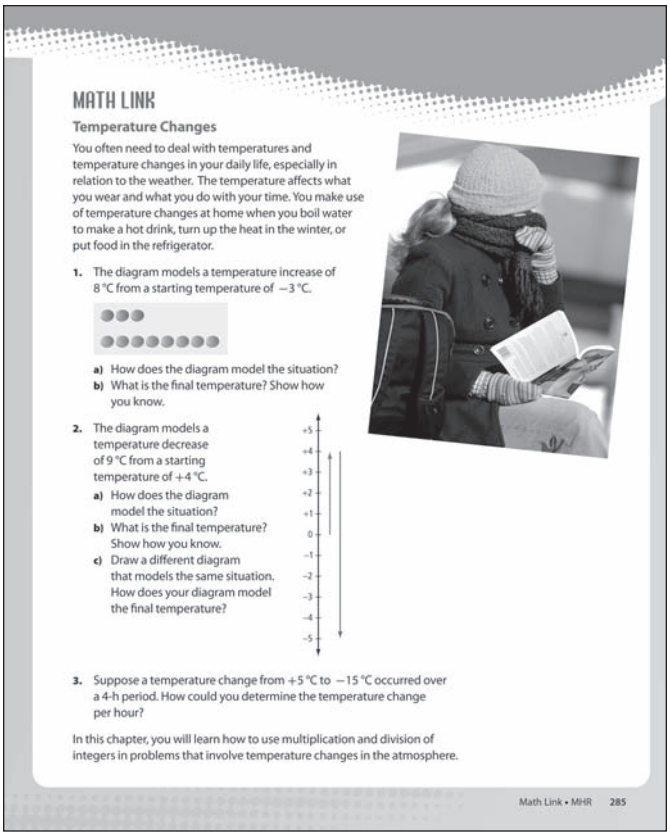
Using the Foldable

As you work through Chapter 8, make notes about Key Words, examples, and Key Ideas in the appropriate section.

Record your answers to the Math Link Introduction on page 285 and the Math Link for each section in the appropriate location.

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.

284 MHR • Chapter 8



MATH LINK

Temperature Changes

You often need to deal with temperatures and temperature changes in your daily life, especially in relation to the weather. The temperature affects what you wear and what you do with your time. You make use of temperature changes at home when you boil water to make a hot drink, turn up the heat in the winter, or put food in the refrigerator.

1. The diagram models a temperature increase of 8 °C from a starting temperature of −3 °C.
   a) How does the diagram model the situation?
   b) What is the final temperature? Show how you know.
2. The diagram models a temperature decrease of 9 °C from a starting temperature of +4 °C.
   a) How does the diagram model the situation?
   b) What is the final temperature? Show how you know.
   c) Draw a different diagram that models the same situation. How does your diagram model the final temperature?

+5 +4 +3 +2 +1 0 −1 −2 −3 −4 −5

3. Suppose a temperature change from +5 °C to −15 °C occurred over a 4-h period. How could you determine the temperature change per hour?

In this chapter, you will learn how to use multiplication and division of integers in problems that involve temperature changes in the atmosphere.

Math Link • MHR 285

Foldables Study Tool

Have students make the Foldable in the student resource to keep track of the information in the chapter. As students progress through the chapter, have them record notes about what they need to work on using the back of this Foldable. This will assist them in identifying and solving any difficulties with concepts, skills, and processes.

For Step 4, have two students share the folded sheet of paper that was cut in half.

The Foldable allows students to keep track of their progress on the chapter problem worked on during the Math Link introduction on page 285 and the section Math Links on pages 299 and 311.

Math Link

Have students use #1 in the Math Link introduction as an opportunity to recall and discuss their prior knowledge of integer operations. Many students will name subtraction as the operation needed to determine the temperature decrease. Some students may mention addition, because subtraction can be carried out by adding the opposite. You may wish to use integer chips or a number line to model the problem, in preparation for the modelling of integer multiplication and division in this chapter.

Use #3 in the Math Link to introduce students to the idea that integer operations are not limited to addition and subtraction. Students should be aware that the temperature change per hour is determined by dividing the temperature change by the time period. Students need not complete the calculation at this stage. However, some students should be able to determine the rate of temperature decrease as 5 °C/h without thinking in terms of integers.

Have students read the Wrap It Up! on page 321 to give them a sense of where the Math Link is heading. The Wrap It Up! problem is a summative assessment. As they work through the chapter, consider having students complete the related Math Links in sections 8.2 and 8.4. These Math Links are particularly useful for students who need assistance with the chapter, because they will assist students in doing the Wrap It Up! problem. Alternatively, you may wish to assign only the Wrap It Up! problem when students have completed Chapter 8.

Meeting Student Needs

- Have students work individually, in pairs, or as a whole class to complete the Math Link introduction, depending on the needs of your class.
- Invite a community member or an Elder to talk to the class, or have students research how their ancestors may have survived and lived in the wilderness in all seasons. Record the different temperatures they would have had to endure. Have the community member or Elder talk about eagles, salmon, caribou, or other animals' patterns of migration.
- To help them get started, some students may benefit from using **BLM 8–1 Chapter 8 Math Link Introduction**, which provides scaffolding for this activity.

Answers

Math Link

1. a) Answers may vary. Example: The three blue chips represent −3 °C and the eight red chips represent 8 °C.

b) 5 °C. Explanations may vary. Example: Pairing each blue chip with a red chip leaves five red chips, which represent 5 °C.

2. a) Answers may vary. Example: The red arrow indicates the starting temperature of 4 °C, and the blue arrow indicates a decrease of 9 °C.

b) −5 °C. Explanations may vary. Example: Counting down nine units on the number line from +4 finishes at −5 °C.

c) Answers may vary. Example: The diagram could use four red chips to represent the starting temperature and nine blue chips to represent the decrease of 9 °C. Pairing each red chip with a blue chip leaves five blue chips. These chips represent −5 °C.

3. Answers may vary. Example: The total temperature change is −20 °C. Represent this change with 20 blue chips. Divide the 20 chips into four groups. Each group will contain five blue chips. Therefore, the temperature change would be −5 °C/h.