8 Solving Linear Equations

General Outcomes

- Represent algebraic expressions in multiple ways.

Specific Outcomes

PR3 Model and solve problems using linear equations of the form:

- $ax = b$
- $\frac{x}{a} = b, a \neq 0$
- $ax + b = c$
- $\frac{x}{a} + b = c, a \neq 0$
- $ax = b + cx$
- $a(x + b) = c$
- $ax + b = cx + d$
- $a(bx + c) = d(ex + f)$
- $\frac{a}{x} = b, x \neq 0$

where a, b, c, d, e and f are rational numbers.

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

Section	Understanding Concepts, Skills, and Processes
8.1	✓ model problems with linear equations that can be solved using multiplication and division
	✓ solve linear equations with rational numbers using multiplication and division
8.2	✓ model problems with linear equations involving two operations
	✓ solve linear equations with rational numbers using two operations
8.3	✓ model problems with linear equations that include grouping symbols on one side
	✓ solve linear equations that include grouping symbols on one side
8.4	✓ model problems with linear equations that include variables on both sides
	✓ solve linear equations that include variables on both sides

Assessment	Supporting Learning
Assessment *for* Learning	
Method 1: Use the Math Link introduction on page 291 in *MathLinks 9* 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 solving linear equations, including the use of opposite operations, the reverse order of operations, and the distributive property.	• **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 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 9 Practice and Homework Book*, and at the www.mathlinks9.ca book site.
Assessment *as* Learning	
Literacy Link (page 289) At the beginning of the chapter, work with students to model the use of a concept map.	• After completing an introduction to the chapter, have students brainstorm ideas about what sorts of information they may include in their concept map as they progress through the chapter.
Chapter 8 Foldable As students work on each section in Chapter 8, have them keep track of any problems they are having in the What I Need to Work On section of their 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 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 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 399)	Students should be familiar with • modelling and solving problems using equations of the form $ax = b$; $\frac{x}{a} = b$, $a \neq 0$; $ax + b = c$; $\frac{x}{a} + b = c$, $a \neq 0$; and $a(x + b) = c$, where a, b, and c are integers	• sheet of 11 × 17 paper • ruler • four sheets of 8.5 × 11 paper • scissors • stapler • index cards	Master 20 Multiplication 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 398 Chapter 8 Foldable, TR page 398	TR page 398	
8.1 Solving Equations: $ax = b$, $\frac{x}{a} = b$, $\frac{a}{x} = b$ • 80–100 minutes (TR page 403)	Students should be familiar with • modelling and solving problems using equations of the form $ax = b$ and $\frac{x}{a} = b$, $a \neq 0$, where a and b are integers • operations on rational numbers • verifying solutions by substitution	• coins or items to represent coins of different denominations • paper cups or small containers • paper clips	Master 2 Communication Peer Evaluation Master 4 Number Lines Master 8 Centimetre Grid Paper Master 9 0.5 Centimetre Grid Paper Master 14 Coin Models BLM 8–3 Chapter 8 Warm-Up BLM 8–5 Canadian Coins and Their Values BLM 8–6 Section 8.1 Extra Practice BLM 8–7 Section 8.1 Math Link	**Essential**: #1, 4–6, 8, 10, 12, Math Link **Typical**: #1, 4–6, 8, 11, 12, 14, 17, 19, 23, Math Link **Extension/Enrichment**: #1, 20, 21, 23–29	*MathLinks 9 Practice and Homework Book* *MathLinks 9 Solutions Manual*	Master 2 Communication Peer Evaluation TR pages 407, 416 Math Learning Log, TR page 416 Chapter 8 Foldable, TR page 416	TR page 412, 416	
8.2 Solving Equations: $ax + b = c$, $\frac{x}{a} + b = c$ • 80–100 minutes (TR page 417)	Students should be familiar with • modelling and solving problems using equations of the form $ax + b = c$ and $\frac{x}{a} + b = c$, $a \neq 0$, where a, b, and c are integers • operations on rational numbers • verifying solutions by substitution	• coins or items to represent coins of different denominations • cups or small containers • paper clips	Master 2 Communication Peer Evaluation Master 4 Number Lines Master 8 Centimetre Grid Paper Master 9 0.5 Centimetre Grid Paper Master 14 Coin Models BLM 8–3 Chapter 8 Warm-Up BLM 8–5 Canadian Coins and Their Values BLM 8–8 Section 8.2 Extra Practice BLM 8–9 Section 8.2 Math Link	**Essential**: #1–3, 5–7, 9, 11, 13, 15, Math Link **Typical**: #1–3, 5–7, 9, 11, 13, 15 , 16, 19, Math Link **Extension/Enrichment**: #1–3, 19, 20, 23, 26–32	*MathLinks 9 Practice and Homework Book* *MathLinks 9 Solutions Manual*	Master 2 Communication Peer Evaluation TR pages 420, 428 Math Learning Log, TR page 428 Chapter 8 Foldable, TR page 428	TR page 423, 428	
8.3 Solving Equations: $a(x + b) = c$ • 80–100 minutes (TR page 428)	Students should be familiar with • modelling and solving problems using equations of the form $a(x + b) = c$, where a, b, and c are integers • the distributive property • operations on rational numbers • verifying solutions by substitution	• coins or items to represent coins of different denominations • paper cups or small containers • paper clips	Master 2 Communication Peer Evaluation Master 4 Number Lines Master 14 Coin Models BLM 8–3 Chapter 8 Warm-Up BLM 8–5 Canadian Coins and Their Values BLM 8–10 Section 8.3 Extra Practice BLM 8–11 Section 8.3 Math Link	**Essential**: #1, 4, 5, 6, 8, 10, 12, 14, 15, 17, Math Link **Typical**: #1, 4, 5, 6, 8, 10, 12, 14, 15, 17, 20, 22, Math Link **Extension/Enrichment**: #1, 4, 10, 20, 23–28	*MathLinks 9 Practice and Homework Book* *MathLinks 9 Solutions Manual*	Master 2 Communication Peer Evaluation TR pages 431, 439 Math Learning Log, TR page 439 Chapter 8 Foldable, TR page 439	TR page 434, 439	
8.4 Solving Equations: $ax = b + cx$, $ax + b = cx + d$, $a(bx + c) = d(ex + f)$ • 80–100 minutes (TR page 440)	Students should be familiar with • modelling and solving problems using equations involving integers • the distributive property • operations on rational numbers • verifying solutions by substitution	• coins or items to represent coins of different denominations • paper cups or small containers • paper clips	Master 2 Communication Peer Evaluation Master 14 Coin Models BLM 8–3 Chapter 8 Warm-Up BLM 8–5 Canadian Coins and Their Values BLM 8–12 Section 8.4 Extra Practice BLM 8–13 Section 8.4 Math Link	**Essential**: #1–6, 8, 10, 14, 15, Math Link **Typical**: #1–6, 8, 10, 14, 15, 18, 25, Math Link **Extension/Enrichment**: #1–3, 16, 18, 22, 23, 24, 26–30	*MathLinks 9 Practice and Homework Book* *MathLinks 9 CAB*	Master 2 Communication Peer Evaluation TR pages 442, 429 Math Learning Log, TR page 449 Chapter 8 Foldable, TR page 449	TR page 445, 449	
Chapter 8 Review • 40–50 minutes (TR page 450)		• ruler	Master 4 Number Line BLM 8–6 Section 8.1 Extra Practice BLM 8–8 Section 8.2 Extra Practice BLM 8–10 Section 8.3 Extra Practice BLM 8–12 Section 8.4 Extra Practice	Have students do at least one question related to any concept, skill, or process that has been giving them trouble.	*MathLinks 9 Practice and Homework Book* *MathLinks 9 CAB*		TR page 451	
Chapter 8 Practice Test • 40–50 minutes (TR page 452)		• ruler	Master 4 Number Line BLM 8–14 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, 2, 6, 7, 9, 11, 12, 15	*MathLinks 9 CAB*	TR page 453		TR page 453 BLM 8–14 Chapter 8 Test
Chapter 8 Math Link: Wrap It Up! • 40–50 minutes (TR page 454)			Master 1 Project Rubric BLM 8–1 Chapter 8 Math Link Introduction BLM 8–7 Section 8.1 Math Link BLM 8–9 Section 8.2 Math Link BLM 8–11 Section 8.3 Math Link BLM 8-13 Section 8.4 Math Link BLM 8–15 Chapter 8 Math Link: Wrap It Up!		Online Learning Centre			TR page 455 Master 1 Project Rubric
Chapter 8 Challenge: School Store • 40–50 minutes (TR page 457)		• calculator • spreadsheet program (optional)	Master 1 Project Rubric		Online Learning Centre		TR page 458	TR page 458 Master 1 Project Rubric
Chapter 8 Challenge: Pair Up, Create, and Solve • 30–40 minutes (TR page 460)		• scissors • stopwatch per pair of students (optional)	Master 1 Project Rubric BLM 8–16 Chapter 8 BLM Answers				TR page 460	