6 Linear Relations

General Outcomes

- Use patterns to describe the world and solve problems.

Specific Outcomes

PR1 Generalize a pattern arising from a problem-solving context using linear equations and verify by substitution.

PR2 Graph linear relations, analyze the graph and interpolate or extrapolate to solve problems.

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

Section	Understanding Concepts, Skills, and Processes
6.1	✓ represent pictorial, oral, and written patterns with linear equations
	✓ describe contexts for given linear equations
	✓ solve problems that involve pictorial, oral, and written patterns using a linear equation
	✓ verify linear equations by substituting values
6.2	✓ describe patterns found in graphs
	✓ extend graphs to determine an unknown value
	✓ estimate values between known values on a graph
	✓ estimate values beyond known values on a graph
6.3	✓ graph linear equations
	✓ match equations of linear relations with graphs
	✓ solve problems by graphing a linear relation and analysing the graph

Assessment	Supporting Learning
Assessment *for* Learning	
Method 1: Use the Math Link introduction on page 209 of *MathLinks 9* to activate students' 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 linear relations, including how graphs can be used to represent linear patterns, what the graph of a linear relation looks like, how to graph linear relations, and how graphs of linear relations can be used to solve problems.	• **BLM 6–1 Chapter 6 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 6–2 Chapter 6 Get Ready**, in the *MathLinks 9 Practice and Homework Book*, and at the www.mathlinks9.ca book site.
Assessment *as* Learning	
Literacy Link (page 207) At the beginning of the chapter, work with students to model the use of a sequence chart. After the introduction, have students use the first box to record their definition for linear relation.	• You may wish to provide students with **Master 18 Sequence Chart**, which provides scaffolding for this organizer. • Encourage students to provide an example of a linear relation. • You may wish to provide students with **BLM 6–2 Chapter 6 Get Ready** and have them identify and define familiar terms.
Chapter 6 Foldable As students work on each section in Chapter 6, 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 6–3 Chapter 6 Warm-Up This BLM includes three 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 reinforcement. • Use the warm-up to provide 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 6–4 Chapter 6 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 6 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 293)	Students should be familiar with • describing patterns from data • graphing coordinate points • reading coordinate points off a graph • modelling linear data sets with linear equations • substituting values into a linear equation • solving equations	• sheet of 11 × 17 paper • ruler • sheet of 8.5 × 11 paper • scissors • three sheets of 8.5 × 11 grid paper • stapler	Master 8 Centimetre Grid Paper Master 9 0.5 Centimetre Grid Paper Master 18 Sequence Chart BLM 6–1 Chapter 6 Math Link Introduction BLM 6–2 Chapter 6 Get Ready BLM 6–4 Chapter 6 Problems of the Week		Online Learning Centre	TR page 292 Chapter 6 Foldable, TR page 292	TR page 292	
6.1 Representing Patterns • 80–100 minutes (TR page 298)	Students should be familiar with • creating a table of values using coordinate data • describing the relationship between the variables in a graph	• grid paper • ruler • coloured pencils • algebra tiles	Master 8 Centimetre Grid Paper Master 9 0.5 Centimetre Grid Paper Master 11 Algebra Tiles BLM 6–3 Chapter 6 Warm-Up BLM 6–5 Section 6.1 Extra Practice BLM 6–6 Section 6.1 Math Link	**Essential:** #1, 2, 4, 7, 10a), c), 11, 12, Math Link **Typical:** #1, 2, 4, 6, 7, 10a), c), 11, 13, Math Link **Extension/Enrichment:** #1, 3, 8, 9, 14–18	*MathLinks 9 Practice and Homework Book* *MathLinks 9 Solutions Manual*	TR pages 300, 307 Math Learning Log, TR page 307 Chapter 6 Foldable, TR page 307	TR pages 304, 307	
6.2 Interpreting Graphs • 80–100 minutes (TR page 308)	Students should be familiar with • determining the missing value in an ordered pair for a linear equation • describing the relationship between the variables in a graph	• grid paper • ruler • spreadsheet program (optional) • globe (optional)	Master 2 Communication Peer Evaluation Master 8 Centimetre Grid Paper Master 9 0.5 Centimetre Grid Paper BLM 6–3 Chapter 6 Warm-Up BLM 6–7 Section 6.2 Extra Practice BLM 6–8 Section 6.2 Math Link	**Essential:** #1, 2, 4, 7, 8, 11, 14, 15, Math Link **Typical:** #1, 2, 4, 7, 8, 11, 13–15, Math Link **Extension/Enrichment:** #1, 3, 10, 11, 15–19	*MathLinks 9 Practice and Homework Book* *MathLinks 9 Solutions Manual*	Master 2 Communication Peer Evaluation TR pages 310, 317 Math Learning Log, TR page 317 Chapter 6 Foldable, TR page 317	TR pages 313, 317	
6.3 Graphing Linear Relations • 80–100 minutes (TR page 318)	Students should be familiar with • constructing a graph from a linear equation using integers • graphing points from a table of values	• grid paper • ruler	Master 8 Centimetre Grid Paper Master 9 0.5 Centimetre Grid Paper BLM 6–3 Chapter 6 Warm-Up BLM 6–9 Method 3: Use a Graphing Calculator BLM 6–10 Section 6.3 Extra Practice BLM 6–11 Section 6.3 Math Link	**Essential:** #2–4, 6–8, 10, 12a), b), 13, Math Link **Typical:** #2–4, 6–8, 10, 12a, b), 13, Math Link **Extension/Enrichment:** #2, 3, 7, 16–21, Math Link	*MathLinks 9 Practice and Homework Book* *MathLinks 9 Solutions Manual*	TR pages 319, 328 Math Learning Log, TR page 328 Chapter 6 Foldable, TR page 328	TR pages 324, 328	
Chapter 6 Review • 40–50 minutes (TR page 329)		• grid paper • ruler	Master 8 Centimetre Grid Paper Master 9 0.5 Centimetre Grid Paper BLM 6–5 Section 6.1 Extra Practice BLM 6–7 Section 6.2 Extra Practice BLM 6–10 Section 6.3 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*	Chapter 6 Foldable, TR page 329	TR page 330	
Chapter 6 Practice Test • 40–50 minutes (TR page 331)		• grid paper • ruler	Master 8 Centimetre Grid Paper Master 9 0.5 Centimetre Grid Paper BLM 6–12 Chapter 6 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:** #1–10	*MathLinks 9 CAB*	TR page 333		TR page 333 BLM 6–12 Chapter 6 Test
Chapter 6 Math Link: Wrap It Up! • 80–100 minutes (TR page 334)		• grid paper • ruler	Master 1 Project Rubric Master 8 Centimetre Grid Paper Master 9 0.5 Centimetre Grid Paper BLM 6–1 Chapter 6 Math Link Introduction BLM 6–6 Section 6.1 Math Link BLM 6–8 Section 6.2 Math Link BLM 6–11 Section 6.3 Math Link BLM 6–13 Chapter 6 Math Link: Wrap It Up!		Online Learning Centre			TR page 335 Master 1 Project Rubric
Chapter 6 Challenge: Hot-Air Ballooning • 60–80 minutes (TR page 337)		• grid paper • ruler	Master 1 Project Rubric Master 9 0.5 Centimetre Grid Paper		Online Learning Centre		TR page 338	TR page 338 Master 1 Project Rubric
Chapter 6 Challenge: Opening a Fitness Club • 40–50 minutes (TR page 340)		• grid paper • ruler	Master 1 Project Rubric Master 9 0.5 Centimetre Grid Paper BLM 6–14 Chapter 6 BLM Answers		Online Learning Centre		TR page 341	TR page 341 Master 1 Project Rubric