Absolute Value and Reciprocal Functions

7

General Outcome

Develop algebraic reasoning and number sense.

Specific Outcomes

AN1 Demonstrate an understanding of the absolute value of real numbers.

General Outcome

Develop algebraic and graphical reasoning through the study of relations.

Specific Outcomes

RF2 Graph and analyze absolute value functions (limited to linear and quadratic functions) to solve problems.

RF11 Graph and analyze reciprocal functions (limited to the reciprocal of linear and quadratic functions).

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

Section	Understanding Concepts, Skills, and Processes
7.1	✓ determine the absolute values of numbers and expressions
	✓ explain how distance between two points on a number line can be expressed in terms of absolute value
	✓ compare and order the absolute values of real numbers in a given set
7.2	✓ create a table of values for $y = \lvert f(x) \rvert$, given a table of values for $y = f(x)$
	✓ sketch the graph of $y = \lvert f(x) \rvert$ and determine its intercept(s), domain, and range
	✓ generalize a rule for writing absolute value functions in piecewise notation
7.3	✓ solve an absolute value equation graphically, with or without technology
	✓ solve algebraically an equation with a single absolute value and verify the solution
	✓ explain why the absolute value equation $\lvert f(x) \rvert = b$ for $b < 0$ has no solution
7.4	✓ graph the reciprocal of a given function
	✓ analyse the graph of the reciprocal of a given function
	✓ compare the graph of a function to the graph of the reciprocal of that function
	✓ identify the values of x for which the graph of $y = \frac{1}{f(x)}$ has vertical asymptotes

Assessment	Supporting Learning
Assessment *as* Learning	
Use the Before column of **BLM 7–1 Chapter 7 Self-Assessment** to provide students with the big picture for this chapter and help them identify what they already know, understand, and can do. You may wish to have students keep this master in their math portfolio and refer to it during the chapter.	• During work on the chapter, have students keep track of what they need to work on. They can check off each item as they develop the skill or process at an appropriate level.
Assessment *for* Learning	
Method 1: Use the introduction on page 356 in *Pre-Calculus 11* 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 and quadratic functions. You might ask them to identify characteristics of the graph of a quadratic function representing a situation, such as the trajectory of a basketball thrown through a hoop. Prompt them to consider the direction of opening, the coordinates of the vertex, the maximum or minimum value, the equation of the axis of symmetry, the x-intercept(s) and y-intercept(s), and the domain and range.	• Have students use their list of what they need to work on 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 **BLM 7–2 Chapter 7 Prerequisite Skills**. This material is on the Teacher CD of this Teacher's Resource and mounted on the www.mhrprecalc11.ca book site.
Assessment *as* Learning	
As students work on each section in Chapter 7, have them keep track of any problems they are having.	• 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. • Encourage students to write definitions for the Key Terms in their own words, including reminder tips that may be helpful for review throughout the chapter. • Encourage students to write examples of their own in their notebook or math portfolio. Students should have an example for each method that is covered in the chapter.
Assessment *for* Learning	
BLM 7–3 Chapter 7 Warm-Up This reproducible master includes a warm-up to be used at the beginning of each section. Each warm-up provides a review of prerequisite skills needed for the section.	• As students complete questions, 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 readiness for the chapter material. • Have students share their strategies for completing mathematics calculations.

Chapter 7 Planning Chart

Section/ Suggested Timing	Prerequisite Skills	Materials/Technology	Teacher's Resource Blackline Masters	Exercise Guide	Assessment		
					Assessment *as* Learning	Assessment *for* Learning	Assessment *of* Learning
Chapter Opener • 30–40 min (TR page 247)	Students should be familiar with • functions and function notation • characteristics of graphs of linear and quadratic functions, such as intercepts, domain, and range • set notation	• current exchange rates for a variety of countries	BLM 7–1 Chapter 7 Self-Assessment BLM 7–2 Chapter 7 Prerequisite Skills BLM U3–1 Unit 3 Project Checklist				
7.1 Absolute Value • 60–90 min (TR page 250)	Students should be familiar with • real numbers • order of operations	• grid paper • ruler	Master 2 Centimetre Grid Paper BLM 7–3 Chapter 7 Warm-Up BLM 7–4 Section 7.1 Extra Practice	**Essential:** #1, 2, 4–7, two of 8–12, 21, 23 **Typical:** #1, 3–7, three of 8–14, 20–24 **Extension/Enrichment:** #6, 10, 13, 15–19, 21, 23–25	TR pages 251, 255	TR pages 253, 255	
7.2 Absolute Value Functions • 90–130 min (TR page 256)	Students should be familiar with • simplifying expressions with absolute values • graphing linear and quadratic functions with and without technology • analysing quadratic functions (intercepts, minimum values, domain, and range) • multiplying polynomials • factoring trinomials • completing the square • set notation	• grid paper • ruler • Mira™ (optional)	Master 2 Centimetre Grid Paper BLM 7–3 Chapter 7 Warm-Up BLM 7–5 Section 7.2 Extra Practice	**Essential:** #1–5, 6a), c), f), 7, 8a), b), f), 9, 10a), b), 11a), b), 12, 13, 27 **Typical:** #1–5, 7, 8a), b), f), 9, 10b), c), 12, 14–17, 19, 20, 27, 29 **Extension/Enrichment:** #9, 11, 15, 18, 20–27, 29	TR pages 257, 261	TR pages 259, 261	
7.3 Absolute Value Equations • 130–180 min (TR page 262)	Students should be familiar with • solving equations • graphing absolute value functions with and without technology	• grid paper • ruler • graphing calculator or computer with graphing software	Master 2 Centimetre Grid Paper BLM 7–3 Chapter 7 Warm-Up BLM 7–6 Section 7.3 Extra Practice	**Essential:** #1, 2b), c), 3, 4a), d), 5a), b), 6a)–d), 7, two of 8–12, 15, 23 **Typical:** #1a), b), 2b), c), 3, 4a), d), 5a), b), 6a)–d), 7, three of 8–14, 15, 23, 24 **Extension/Enrichment:** #5d), e), 6d), e), 13, 14, 16–20, 22, 23	TR pages 263, 267	TR pages 265–267	
7.4 Reciprocal Functions • 130–180 min (TR page 268)	Students should be familiar with • graphing functions with and without technology • analysing graphs of functions • solving equations	• graphing calculator • grid paper • ruler	Master 2 Centimetre Grid Paper BLM 7–3 Chapter 7 Warm-Up BLM 7–7 Section 7.4 Extra Practice	**Essential:** #1–5, 7a), b), 8a), d), 9, 10, 12, 19, and 22 **Typical:** #2–9, 10 or 11, three of 13–16, 19, and 22 **Extension/Enrichment:** #3, 6, 9, 15–22	TR pages 270, 276	TR pages 275, 276	
Chapter 7 Review • 90–120 min (TR page 277)		• grid paper • ruler	Master 2 Centimetre Grid Paper BLM 7–4 Section 7.1 Extra Practice BLM 7–5 Section 7.2 Extra Practice BLM 7–6 Section 7.3 Extra Practice BLM 7–7 Section 7.4 Extra Practice	Have students do at least one question related to any concept, skill, or process that has been giving them trouble.		TR page 277	
Chapter 7 Practice Test • 45–60 min (TR page 278)		• grid paper • ruler	Master 2 Centimetre Grid Paper BLM 7–8 Chapter 7 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	TR page 278		TR page 278 BLM 7–8 Chapter 7 Test
Unit 3 Project Wrap-Up • 60–90 min plus individual time (TR page 279)			Master 1 Project Rubric BLM U3–1 Unit 3 Project Checklist BLM U3–2 Unit 3 Project Rubric — Option 1 BLM U3–3 Unit 3 Project Rubric — Option 2 BLM U3–4 Unit 3 Project Rubric — Option 3				TR page 280 Master 1 Project Rubric
Unit 3 Cumulative Review and Test • 60–90 min (TR page 281)		• grid paper • ruler	Master 2 Centimetre Grid Paper BLM U3–5 Unit 3 Test BLM 7–9 Chapter 7 BLM Answers	Have students do at least one question related to any concept, skill, or process that has been giving them trouble.		TR page 281	TR page 281