Exponents and Radicals

4

General Outcome

Develop algebraic reasoning and number sense.

Specific Outcomes

AN1 Demonstrate an understanding of factors of whole numbers by determining the:
- prime factors
- greatest common factor
- least common multiple
- square root
- cube root.

AN2 Demonstrate an understanding of irrational numbers by:
- representing, identifying and simplifying irrational numbers
- ordering irrational numbers.

AN3 Demonstrate an understanding of powers with integral and rational exponents.

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

Section	Understanding Concepts, Skills, and Processes
4.1	✓ determine the square root of a perfect square and explain the process
	✓ determine the cube root of a perfect cube and explain the process
	✓ solve problems involving square roots or cube roots
4.2	✓ apply the exponent laws to expressions using rational numbers or variables as bases and integers as exponents
	✓ convert a power with a negative exponent to an equivalent power with a positive exponent
	✓ solve problems that involve powers with integral exponents
4.3	✓ apply the exponent laws to expressions using rational numbers or variables as bases and rational exponents
	✓ solve problems that involve powers with rational exponents
4.4	✓ represent, identify, and simplify irrational numbers
	✓ convert between powers with rational exponents and radicals
	✓ convert between mixed radicals and entire radicals
	✓ solve problems involving radicals

Assessment	Supporting Learning
Assessment *as* Learning	
Use the Before column of **BLM 4–1 Chapter 4 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 back to it during the chapter.	• During work on the chapter, have students keep track of what they need to work on in the What I Need to Work On section of their Foldable. 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 150 in *Mathematics 10* 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 exponents and powers. You might provide the following prompts: • Where have you encountered exponents and powers? • Why might exponents be important, and to whom? • In what instances in your life did you need to know about exponents and powers?	• 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 **BLM 4–2 Chapter 4 Prerequisite Skills**. This material is on the Teacher CD of this Teacher's Resource and mounted on the www.mhrmath10.ca book site.
Assessment *as* Learning	
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 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. • 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.
Assessment *for* Learning	
BLM 4–3 Chapter 4 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 understanding of the chapter material. • Have students share their strategies for completing math calculations.

Chapter 4 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 113)	Students should be familiar with • prime factors • operations on powers with integral bases and whole number exponents • calculating area of squares and volume of cubes		BLM 4–1 Chapter 4 Self-Assessment BLM 4–2 Chapter 4 Prerequisite Skills BLM 4–4 Chapter 4 Foldable BLM 4–5 Chapter 4 Unit 2 Project BLM U2–2 Unit 2 Project Checklist		TR page 112 Chapter 4 Foldable, TR page 112	TR page 112	
4.1 Square Roots and Cube Roots • 80–100 min (TR page 115)	Students should be familiar with • square roots • perfect squares • prime factors • calculating area of squares and volume of cubes	• square dot paper • isometric dot paper • ruler	Master 3 Square Dot Paper Master 4 Isometric Dot Paper BLM 4–3 Chapter 4 Warm-Up BLM 4–5 Chapter 4 Unit 2 Project BLM 4–6 Section 4.1 Extra Practice	**Essential:** #1, 4, 5, 7, 9, 10, 13, 15, 20 **Typical:** #1, 4, 6–10, 11 *or* 12, four of 13–17, 20, 21 **Extension/Enrichment:** #1, 4, 6, 7, 13, 15, 18–21	TR pages 117, 122 Chapter 4 Foldable, TR page 112	TR pages 120, 122	
4.2 Integral Exponents • 80–100 min (TR page 123)	Students should be familiar with • integers and operations with integers • order of operations • powers with integral bases and whole number exponents • exponent laws for powers with integral bases and whole number exponents	• ruler	BLM 4–3 Chapter 4 Warm-Up BLM 4–4 Chapter 4 Foldable BLM 4–7 Section 4.2 Extra Practice	**Essential:** #2, 4, 5, 9, 10, 11, 14, 21, 25, 26 **Typical:** #1, 2, 4, 5, 7, 9–11, 13–15, 17, 19–21, 25–27 **Extension/Enrichment:** #1, 3, 5, 8–10, two of 11–13, 16, 18–27	TR pages 125, 133 Chapter 4 Foldable, TR page 112	TR pages 130, 133	
4.3 Rational Exponents • 80–100 min (TR page 134)	Students should be familiar with • rational numbers and operations with rational numbers • powers with integral bases and whole number exponents • exponent laws for powers with integral bases and whole number exponents		BLM 4–3 Chapter 4 Warm-Up BLM 4–8 Section 4.3 Extra Practice	**Essential:** #1, 3a)–c), 4a), c), e), 5a)–c), 6, 7, 9–11, 18, 19 **Typical:** #1, 3a)–c), 4a), c), e), 5a)–c), 6 *or* 7, two of 8, 10, 12 *or* 13, three of 9, 11, 14 *or* 15, 18, 19 **Extension/Enrichment:** #3–5, 7, two of 11–15, 16–19	TR pages 135, 140 Chapter 4 Foldable, TR page 112	TR pages 138, 140	
4.4 Irrational Numbers • 100–120 min (TR page 141)	Students should be familiar with • powers with rational and variable bases and integral and rational exponents • exponent laws • approximating and calculating square roots and cube roots	• ruler • compasses • square dot paper	Master 3 Square Dot Paper BLM 4–3 Chapter 4 Warm-Up BLM 4–5 Chapter 4 Unit 2 Project BLM 4–9 Section 4.4 Extra Practice	**Essential:** #1a)–c), 2b)–d), 3, 4a)–c), 5a)–c), 6a)–c), 7a)–c), 8, 10, 11, 13, 21, 24 **Typical:** #1a)–c), 2a)–d), 3, 4a)–c), 5a)–c), 6a)–c), 7a)–c), 8, 10, 13, three of 12–17, 21, 22 *or* 23, 24 **Extension/Enrichment:** #1d), 2a), d), 3c), d), 4e), f), 5d), f), 6c), d), 7c)–f), 9, 13, 18, 19 *or* 20, 19, 21, 22 *or* 23, 24	TR pages 143, 150 Chapter 4 Foldable, TR page 112	TR pages 143, 146, 147, 150	
Chapter 4 Review • 60–90 min (TR page 151)			BLM 4–6 Section 4.1 Extra Practice BLM 4–7 Section 4.2 Extra Practice BLM 4–8 Section 4.3 Extra Practice BLM 4–9 Section 4.4 Extra Practice	Have students do at least one question related to each concept, skill, or process that has been giving them trouble.	Chapter 4 Foldable, TR page 112	TR page 151	
Chapter 4 Practice Test • 40–50 min (TR page 152)			BLM 4–10 Chapter 4 Test BLM 4–11 Chapter 4 BLM Answers	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, 4–7, 9–13	TR page 153		TR page 153 BLM 4–10 Chapter 4 Test