Trigonometry and the Unit Circle

4

General Outcome

Develop trigonometric reasoning.

Specific Outcomes

T1 Demonstrate an understanding of angles in standard position, expressed in degrees and radians.

T2 Develop and apply the equation of the unit circle.

T3 Solve problems, using the six trigonometric ratios for angles expressed in radians and degrees.

T5 Solve, algebraically and graphically, first and second degree trigonometric equations with the domain expressed in degrees and radians.

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

Section	Understanding Concepts, Skills, and Processes
4.1	✓ sketch angles in standard position measured in degrees and radians
	✓ convert angles in degree measure to radian measure and vice versa
	✓ determine the measures of angles that are coterminal with a given angle
	✓ solve problems involving arc length, central angle, and the radius in a circle
4.2	✓ develop and apply the equation of the unit circle
	✓ generalize the equation of a circle with centre (0, 0) and radius *r*
	✓ use symmetry and patterns to locate the coordinates of points on the unit circle
4.3	✓ relate the trigonometric ratios to the coordinates of points on the unit circle
	✓ determine exact and approximate values for trigonometric ratios
	✓ identify the measure of angles that generate specific trigonometric values
	✓ solve problems using trigonometric ratios
4.4	✓ algebraically solve first-degree and second-degree trigonometric equations in radians and in degrees
	✓ verify that a specific value is a solution to a trigonometric equation
	✓ identify exact and approximate solutions of a trigonometric equation in a restricted domain
	✓ determine the general solution of a trigonometric equation

Assessment	Supporting Learning
Assessment *for* Learning	
Method 1: Use the introduction on page 164 in *Pre-Calculus 12* 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 trigonometry and the unit circle.	• Have students update their list of what they need to work on and keep track of the skills and processes that need attention. • Students who require activation of prerequisite skills may wish to complete **BLM 4–1 Chapter 4 Prerequisite Skills**. This material is on the Teacher CD of this Teacher's Resource and mounted on the www.mcgrawhill.ca/school/learningcentres book site.
Assessment *as* Learning	
As students work on each section in Chapter 4, 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 4–1 Chapter 4 Prerequisite Skills This master provides a review of prerequisite skills needed for the chapter.	• Use the Prerequisite Skills blackline master to provide additional opportunities for students to demonstrate their readiness for the chapter material.

Chapter 4 Planning Chart

Section/ Suggested Timing	Prerequisite Skills	Materials/Technology	Teacher's Resource Blackline Masters	Exercise Guide	Assessment			Web Link
					Assessment *as* Learning	Assessment *for* Learning	Assessment *of* Learning	www.mcgrawhill.ca/school/learningcentres
Chapter Opener • 30–45 min (TR page 91)			BLM 4–1 Chapter 4 Prerequisite Skills BLM U2–1 Unit 2 Project Checklist					• careers of collision investigators and related educational programs
4.1 Angles and Angle Measure • 90–120 min (TR page 92)	Students should be familiar with • the basics of angles and sketching angles • basic circle geometry and circular measures	• masking tape • sidewalk chalk • string • measuring tape • grid paper (optional) • compass (optional) • protractor (optional) • ruler	Master 3 Centimetre Grid Paper BLM 4–2 Section 4.1 Extra Practice BLM 4–4 The Unit Circle	**Essential:** #1–4, 6–9, 11, 12, 14, 18 **Typical:** #1–3, 5–9, 11–14, one of 15 or 16, 17, 18, 21, C1–C5 **Extension/Enrichment:** #10, 13, 17, two of 19–23, 24–27, C4, C5	TR pages 93, 96	TR pages 95, 96		• angles in standard position and degree and radian measure • gradiant measure and a comparison of turns, degrees, radians, and gradians
4.2 The Unit Circle • 90–120 min (TR page 97)	Students should be familiar with • calculations involving pi • graphing in the coordinate plane • angular concepts and measurement	• can or other cylinder • scissors • tape • grid paper • compass • straight edge • protractor • ruler	Master 3 Centimetre Grid Paper BLM 4–3 Section 4.2 Extra Practice BLM 4–4 The Unit Circle	**Essential:** #1, 2, 3a)–d), 4–6, 9, 11 ,13 **Typical:** #1c), d), 2, 3c)–f), 4–9, 13, C1–C3 **Extension/Enrichment:** one of 15–17, 18–20, C2, C4	TR pages 98, 101	TR pages 100, 101		• a definition of the unit circle with diagrams showing completed unit circle model • a unit circle showing relationship between distance from the *x*-axis and primary radian angles
4.3 Trigonometric Ratios • 90–120 min (TR page 102)	Students should be familiar with • working mathematically with trigonometric ratios • mathematics of right triangles • exact and approximate values • domains and non-permissible values	• grid paper • compass • protractor • ruler • scientific calculator • straight edge	Master 3 Centimetre Grid Paper BLM 4–4 The Unit Circle BLM 4–5 Section 4.3 Extra Practice	**Essential:** #1a)–f), 2a)–f), 3–12, 14 **Typical:** #1a)–f), 2a)–f), 3d)–f), 4–9, 10a), d), 11, 13, 15, 16, 18, 19, 22, C1–C3 **Extension/Enrichment:** #13, 17, 19–23, C2–C4	TR pages 103, 107	TR pages 105–107		• an explanation of trigonometric ratios $\sin\theta$, $\cos\theta$, $\tan\theta$, $\csc\theta$, and $\sec\theta$ • a method for using the palm of the hand to develop trigonometric ratios
4.4 Introduction to Trigonometric Equations • 90–120 min (TR page 108)	Students should be familiar with • methods of solving linear and quadratic equations, including factoring	• grid paper • compass • protractor • ruler • scientific calculator	Master 3 Centimetre Grid Paper BLM 4–4 The Unit Circle BLM 4–6 Section 4.4 Extra Practice	**Essential:** #1–4, 6–12, 15–17 **Typical:** #1–4, 6, 7, 9, 10, 12, 14–18, C1, C2, C4 **Extension/Enrichment:** #18–20, C1–C4	TR pages 109, 111	TR pages 110, 111		• a lecture demonstrating how to solve trigonometric equations • information about the history of the Kwakiutl people • information about the photographer of the opening photo, and to see some of his originals
Chapter 4 Review and Practice Test • 60–135 min each (TR page 112)		• grid paper • compass • protractor • ruler • scientific calculator	Master 3 Centimetre Grid Paper BLM 4–2 Section 4.1 Extra Practice BLM 4–3 Section 4.2 Extra Practice BLM 4–4 The Unit Circle BLM 4–5 Section 4.3 Extra Practice BLM 4–6 Section 4.4 Extra Practice BLM 4–7 Chapter 4 Study Guide BLM 4–8 Chapter 4 Test BLM 4–9 Chapter 4 BLM Answers	Have students do at least one question related to any concept, skill, or process that has been giving them trouble. **Chapter 4 Review Minimum:** #1–5, 7, 9–17, 19a), b), 20a), b), 21 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. **Chapter 4 Practice Test Minimum:** #1–12		TR page 112	TR page 112 BLM 4–8 Chapter 4 Test	