2 Trigonometry

Key Terms

acute triangle

angle of depression

angle of elevation

contained angle

oblique triangle

obtuse triangle

primary trigonometric ratios

standard position

Chapter Curriculum Specific Expectations

Solving Problems Involving Trigonometry

In this chapter, students will

GT3.01 solve problems in two dimensions using metric or imperial measurements, including problems that arise from real-world applications (e.g., surveying, navigation, building construction), by determining the measures of the sides and angles of right triangles using the primary trigonometric ratios, and of acute triangles using the sine law and the cosine law

GT3.02 make connections between primary trigonometric ratios (i.e., sine, cosine, tangent) of obtuse angles and of acute angles, through investigation using a variety of tools and strategies (e.g., using dynamic geometry software to identify an obtuse angle with the same sine as a given acute angle; using a circular geoboard to compare congruent triangles; using a scientific calculator to compare trigonometric ratios for supplementary angles)

GT3.03 determine the values of the sine, cosine, and tangent of obtuse angles

GT3.04 solve problems involving oblique triangles, including those that arise from real-world applications, using the sine law (in non-ambiguous cases only) and the cosine law, and using metric or imperial units

GT3.05 gather, interpret, and describe information about applications of trigonometry in occupations, and about college programs that explore these applications

Teaching Suggestions

Chapter Opener

- Have students read the chapter opener. As a class, discuss that trigonometry has its roots in ancient astronomy.
- Ask students if they recognize any of the key terms.
- Consider having students begin a KWL chart on trigonometry. Use **BLM 2-1 KWL Chart**.

Career Profile

Have students discuss what they know about a career as an electronics engineering technician. As an extension to the discussion, have students research this career and other careers that are related to trigonometry, and present their findings to the class. You may wish to use **BLM A-4 Presentation Checklist** to assess students' presentations.

Using their research, have students discuss:
- The tasks of an electronics engineering technician.
- The type of education and training needed for this career.
- Other careers that use trigonometry.
- The differences in the training and education required for a similar career.

You may wish to have students include their research in their Portfolios.

Chapter 2 Planning Chart

Section Suggested Timing	Student Text Page(s)	Teacher's Resource Blackline Masters	Assessment	Tools
Chapter 2 Opener • 5 min	70–71	• BLM 2-1 KWL Chart	• BLM A-4 Presentation Checklist	
Prerequisite Skills • 40–80 min	72–73	• BLM 2-2 Prerequisite Skills	• BLM 2-3 Prerequisite Skills Self Assessment Checklist	• scientific calculators
2.1 Trigonometric Ratios With Acute Angles • 80 min	74–83	• BLM 2-4 Section 2.1 Trigonometric Ratios With Acute Angles	• BLM 2-5 Section 2.1 Achievement Check Rubric • BLM A-10 Observation General Scoring Rubric	• scientific calculators
2.2 Trigonometric Ratios With Obtuse Angles • 80 min	84–95	• BLM 2-6 Section 2.2 Trigonometric Ratios With Obtuse Angles • BLM G-1 Grid Paper • BLM T-2 *The Geometer's Sketchpad*® 3 • BLM T-3 *The Geometer's Sketchpad*® 4	• BLM A-6 Knowledge and Understanding General Scoring Rubric	• grid paper • protractors • scientific calculators • computers with *The Geometer's Sketchpad*®
2.3 Sine Law • 80 min	96–103	• BLM 2-7 Section 2.3 Sine Law	• BLM A-8 Application General Scoring Rubric	• scientific calculators • computers with *The Geometer's Sketchpad*®
2.4 Cosine Law • 80 min	104–119	• BLM 2-8 Section 2.4 Cosine Law	• BLM 2-9 Section 2.4 Achievement Check Rubric • BLM A-9 Communication General Scoring Rubric	• scientific calculators • computers with *The Geometer's Sketchpad*® *Optional* • TI-Nspire™ CAS graphing calculators • TI-84 Plus graphing calculators
2.5 Applications of Trigonometry • 80 min	120–129	• BLM 2-10 Section 2.5 Applications of Trigonometry	• BLM 2-11 Section 2.5 Achievement Check Rubric • BLM A-5 Problem Solving Checklist	• scientific calculators *Optional* • TI-Nspire™ CAS graphing calculators • TI-84 Plus graphing calculators • computers with *The Geometer's Sketchpad*® • linking cubes
Chapter 2 Review • 60–80 min	130–131	• BLM 2-12 Chapter 2 Literacy • BLM 2-13 Chapter 2 Review • BLM G-1 Grid Paper		• grid paper • scientific calculators
Chapter 2 Practice Test • 40–80 min	132–133		• BLM 2-14 Chapter 2 Practice Test • BLM 2-15 Chapter 2 Test	• scientific calculators
Chapter Problem Wrap-Up • 80–160 min	133		• BLM 2-16 Chapter 2 Problem Wrap-Up Rubric	• computers with Internet access
Chapters 1 and 2 Review • 80 min	134–135		• BLM A-13 Self-Assessment Recording Sheet • BLM A-14 Self-Assessment Checklist	• scientific calculators
Chapter 2 Task • 80 min	136		• BLM 2-17 Chapter 2 Task Rubric	• computers with Internet access • scientific calculators

Chapter 2 Blackline Masters Checklist

	Title	Purpose
Chapter 2 Opener		
BLM 2-1	KWL Chart	Literacy
BLM A-4	Presentation Checklist	Assessment
Prerequisite Skills		
BLM 2-2	Prerequisite Skills	Practice
BLM 2-3	Prerequisite Skills Self-Assessment Checklist	Self-Assessment
2.1 Trigonometric Ratios With Acute Angles		
BLM 2-4	Section 2.1 Trigonometric Ratios With Acute Angles	Practice
BLM 2-5	Section 2.1 Achievement Check Rubric	Assessment
BLM A-10	Observation General Scoring Rubric	Assessment
2.2 Trigonometric Ratios With Obtuse Angles		
BLM 2-6	Section 2.2 Trigonometric Ratios With Obtuse Angles	Practice
BLM A-6	Knowledge and Understanding General Scoring Rubric	Assessment
BLM G-1	Grid Paper	Student Support
BLM T-2	*The Geometer's Sketchpad® 3*	Technology
BLM T-3	*The Geometer's Sketchpad® 4*	Technology
2.3 Sine Law		
BLM 2-7	Section 2.3 Sine Law	Practice
BLM A-8	Application General Scoring Rubric	Assessment
2.4 Cosine Law		
BLM 2-8	Section 2.4 Cosine Law	Practice
BLM 2-9	Section 2.4 Achievement Check Rubric	Assessment
BLM A-9	Communication General Scoring Rubric	Assessment
2.5 Applications of Trigonometry		
BLM 2-10	Section 2.5 Applications of Trigonometry	Practice
BLM 2-11	Section 2.5 Achievement Check Rubric	Assessment
BLM A-5	Problem Solving Checklist	Assessment
Chapter 2 Review		
BLM 2-12	Chapter 2 Literacy	Literacy
BLM 2-13	Chapter 2 Review	Review
BLM G-1	Grid Paper	Student Support
Chapter 2 Practice Test		
BLM 2-14	Chapter 2 Practice Test	Diagnostic Assessment
BLM 2-15	Chapter 2 Test	Summative Assessment
Chapter 2 Problem Wrap-Up		
BLM 2-16	Chapter 2 Problem Wrap-Up Rubric	Summative Assessment
Chapters 1 and 2 Review		
BLM A-13	Self-Assessment Recording Sheet	Assessment
BLM A-14	Self-Assessment Checklist	Assessment
Chapter 2 Task		
BLM 2-17	Chapter 2 Task Rubric	Summative Assessment
BLM 2-18	Chapter 2 BLM Answers	

Prerequisite Skills

Common Errors

• Some students substitute values incorrectly when applying the Pythagorean theorem.

R_x Have students identify the hypotenuse before substituting values into the Pythagorean theorem. Have students reflect on their answer. Does the side opposite the right angle have the longest length?

• Some students may not know which steps to apply in which order when solving equations.

R_x Have students consider opposite operations that will lead to the isolation of the variable, and apply these operations to both sides. Students may find a CAS graphing calculator helpful. Have students enter the equation and then instruct the CAS on each step that should be performed. If the equation looks more complicated after performing a step, this may indicate that a different operation should have been applied.

Accommodations

Motor—remind students of the correct order for keystrokes on their calculator for **questions 7 and 8**

Perceptual—provide students with worked examples for part a) of **questions 9 and 10** to review key algebraic skills

Memory—start a Word Wall with definitions for acute triangle, obtuse triangle, the Pythagorean theorem, and the primary trigonometric ratios. You may also wish to have students develop and use a mnemonic, such as SOH-CAH-TOA, to remember the primary trigonometric ratios.

Teaching Suggestions
• Consider having students work through these problems in pairs or small groups. Students could use CAS graphing calculators to check their work.
• Encourage students to estimate or calculate mentally and then use a calculator to check. This will help them further develop their number sense.
• For **questions 7 and 8**, different scientific and graphing calculators require different keystrokes for evaluating trigonometric functions. Students should learn the characteristics of their personal calculators. Provide assistance as needed, and have students refer to the owner's manual, if necessary.
• For **question 9**, students may find it helpful to use cross-multiplication.
• For **question 10**, some students may benefit from using a CAS graphing calculator.
• All BLMs referred to throughout this chapter can be found on the *Foundations for College Mathematics 12: Teacher's Resource CD ROM.*

Assessment
• Assess student readiness to proceed by informal observation as students are working on the questions. A formal test is inappropriate since this material is not part of the grade 12 curriculum for this chapter.
• Student self-assessment is also an effective technique; students can place a checkmark beside topics in the Get Ready in which they feel confident with the necessary skills. Use **BLM 2-3 Prerequisite Skills Self-Assessment Checklist** as a self-assessment for students.
• Remedial action can be taken in small groups or with a whole-class skills review.

Extra Practice
• Use **BLM 2-2 Prerequisite Skills** for extra practice or remediation.

Chapter Problem
• The Chapter Problem is introduced on page 73. Have students discuss their understanding of power distribution (for example, power lines and hydro towers). You may wish to have students complete the Chapter Problem revisits that occur throughout the chapter. These questions are designed to help students move toward the Chapter 2 Problem Wrap-Up on page 133.
• Alternatively, you may wish to assign the Chapter Problem questions and Chapter Problem Wrap-Up when students have completed the chapter, as part of a summative assessment.