



Geometry - Unit E - Right Triangles and Trigonometry

Unit Focus

Chapter 9 introduces students to the foundational relationships in right triangles, focusing on the Pythagorean Theorem and the development of trigonometric ratios. Students apply these ratios—sine, cosine, and tangent—to solve problems involving right triangles, including those involving angles of elevation and depression. The unit also covers special right triangles ($30^\circ - 60^\circ - 90^\circ$ and $45^\circ - 45^\circ - 90^\circ$) and connects trigonometry to real-world applications such as measurement, design, and navigation. Emphasis is placed on reasoning through diagrams, setting up proportions, and using calculators strategically to approximate values.

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer		
Common Core Mathematics: 9-12 - Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity. (CCSS.MATH.CONTENT.HSG.SRT.B.4) - Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. (CCSS.MATH.CONTENT.HSG.SRT.B.5) - Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles. (CCSS.MATH.CONTENT.HSG.SRT.C.6) - Explain and use the relationship between the sine and cosine of complementary angles. (CCSS.MATH.CONTENT.HSG.SRT.C.7) - Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. (CCSS.MATH.CONTENT.HSG.SRT.C.8) - Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). (CCSS.MATH.CONTENT.HSG.MG.A.1) - Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). (CCSS.MATH.CONTENT.HSG.MG.A.3) - Make sense of problems and persevere in solving them. (CCSS.MATH.MP.1) - Reason abstractly and quantitatively. (CCSS.MATH.MP.2) - Model with mathematics. (CCSS.MATH.MP.4) - Attend to precision. (CCSS.MATH.MP.6) Madison Public Schools Profile of a Graduate - Analyzing: Examining information/data/ evidence from multiple sources to identify possible underlying assumptions, patterns, and relationships in order to make inferences. (POG.1.2)	<i>Students will be able to independently use their learning to...</i> T1 Initiate a plan using a variety of methods/strategies appropriately, execute it, and evaluate the reasonableness and accuracy of the solution. T2 Represent situations using mathematical reasoning and symbols. T3 Apply models to solve problems. T4 Demonstrate fluency with mathematical computations and definitions.		
	Meaning		
	Understanding(s)	Essential Question(s)	
	<i>Students will understand that...</i> U1 The Pythagorean Theorem is fundamental to relationships in right triangles and in coordinate geometry. U2 Trigonometric ratios connect side lengths and angles in right triangles. U3 Trigonometry has practical applications in solving real-world measurement problems.	<i>Students will keep considering...</i> Q1 How do the side lengths in a right triangle relate to each other? Q2 What are sine, cosine, and tangent, and how can they be used to solve problems? Q3 How can trigonometry help us describe and solve problems involving indirect measurement?	
	Acquisition of Knowledge and Skill		
Knowledge	Skill(s)		
<i>Students will know...</i> K1 Definitions of sine, cosine, and tangent. K2 How to set up and solve proportions and trigonometric equations. K3 The relationship between side lengths in a right triangle.	<i>Students will be skilled at...</i> S1 Use the Pythagorean Theorem to solve problems. S2 Use special right triangles to solve real-life problems. S3 Solve for missing values using proportions and trigonometric ratios.		

Stage 1: Desired Results - Key Understandings

	K4 The relationship between side lengths in special right triangles. K5 Vocabulary: • Pythagorean triple • Trigonometric ratio • Angle of Elevation • Angle of Depression • Sine • Cosine • Tangent	S4 Apply trigonometry in real-world contexts. S5 Write and solve proportional equations using trigonometric ratios to solve triangles.
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