



Geometry Level 1 - Unit E - Right Triangles

Unit Focus

This unit is an exploration of families of right triangles, the Pythagorean theorem, and right triangle trigonometry. It includes the 30-60-90 and 45-45-90 right triangles and the relationship between the lengths of their sides. Word problems focus on angles of elevation and angles of depression.

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer	
Common Core Mathematics: 9-12 - Rewrite expressions involving radicals and rational exponents using the properties of exponents. (CCSS.MATH.CONTENT.HSN.RN.A.2) - Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. (CCSS.MATH.CONTENT.HSA.CED.A.1) - Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. (CCSS.MATH.CONTENT.HSA.REI.A.2) - Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as a $\pm bi$ for real numbers a and b. (CCSS.MATH.CONTENT.HSA.REI.B.4.B) - Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. (CCSS.MATH.CONTENT.HSG.CO.A.1) - Prove theorems about triangles. (CCSS.MATH.CONTENT.HSG.SRT.B.4) - 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)	<i>Students will be able to independently use their learning to...</i> T1 draw conclusions about graphs, shapes, equations, or objects. T2 make sense of a problem, initiate a plan, execute it, and evaluate the reasonableness of the solution. T3 apply familiar mathematical concepts to a new problem or apply a new concept to rework a familiar problem.	
	Meaning	
	Understanding(s)	Essential Question(s)
	<i>Students will understand that...</i> U1 Mathematicians identify relevant tools, strategies, relationships, and/or information in order to draw conclusions. U2 Mathematicians apply the mathematics they know to solve problems occurring in everyday life. U3 Mathematicians examine relationships to discern a pattern, generalizations, or structure. U4 Mathematicians analyze characteristics and properties of geometric shapes to develop mathematical arguments about geometric relationships.	<i>Students will keep considering...</i> Q1 How can understanding a pattern help me? Q2 How can I use what I know to help me find what is missing? Q3 How can constructing and deconstructing help me know what to do?
	Acquisition of Knowledge and Skill	
	Knowledge	Skill(s)
<i>Students will know...</i> K1 the Pythagorean Theorem K2 the distance formula K3 some Pythagorean Triplets (3,4,5)(5,12,13)	<i>Students will be skilled at...</i> S1 simplifying rational numbers S2 multiplying rational numbers S3 solving quadratic equations	

Stage 1: Desired Results - Key Understandings

- 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)
- Make sense of problems and persevere in solving them.
(CCSS.MATH.MP.1)
- Reason abstractly and quantitatively. (CCSS.MATH.MP.2)
- Construct viable arguments and critique the reasoning of others.
(CCSS.MATH.MP.3)

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- Inquiry: Posing, pursuing, and refining significant questions to deepen understanding about a topic or issue. (POG.1.1)
- Analyzing: Examining information/data/ evidence from multiple sources to identify possible underlying assumptions, patterns, and relationships in order to make inferences. (POG.1.2)

K4 the ratio (and location) of the sides of 30-60-90 and 45-45-90 triangles
K5 the three trigonometric ratios (sine = opp/ hyp and cosine = adj/opp and tangent = opp/adj)
K6 the relationship between the sine and the cosine of complementary angles
K7 Vocabulary: faces, edges, diagonals solids, base, vertex, altitude, slant height, trigonometry, opposite, adjacent, angle of elevation, angle of depression

S4 applying the Pythagorean Theorem to 2D and 3D problems
S5 using the converse of the Pythagorean Theorem to classify triangles as acute, right or obtuse
S6 applying the distance formula to solve problems
S7 using Pythagorean triplets to solve triangles
S8 solving problems involving 30-60-90 and 45-45-90 triangles
S9 solving angle of elevation (depression) problems
S10 solving problems using right triangle trigonometry (find a side, find an angle)
S11 using a table or technology to find the inverse of a trigonometric function