

Mathematics
Geometry II Honors
Unit 6: Right Triangles and Trigonometry

Essential Understandings	<ul style="list-style-type: none"> ▪ Right triangles have many real-world applications.
Essential Questions	<ul style="list-style-type: none"> ▪ What is a right triangle? ▪ How to find the geometric mean of two numbers? ▪ What is the Pythagorean Theorem? ▪ What is the converse of the Pythagorean Theorem? ▪ What are special right triangles? ▪ How to find the altitude to the hypotenuse? ▪ What is the “Leg Theorem”? ▪ What is a radical number? ▪ What are the properties of right triangles? ▪ What are the properties of the special right triangles? ▪ What are the three trigonometric ratios? ▪ How to evaluate trigonometric functions of an angle? ▪ How can the three trigonometric ratios and the Pythagorean Theorem be applied in real-life situations?
Essential Knowledge	<ul style="list-style-type: none"> ▪ The Pythagorean Theorem is used to solve right triangle problems. ▪ The Converse of the Pythagorean Theorem is used to determine the types of angles in a triangle ▪ The three trigonometric ratios can be used to solve right triangle problems. ▪ By using the trigonometric functions on a scientific calculator, right triangles can be solved. ▪ Quadratic equations may be used to solve right triangle problems. ▪ The ratio of the lengths of the sides of 30-60-90 triangles and 45-45-90 triangles can be used to find the specific lengths of the sides of these triangles.
Vocabulary	<ul style="list-style-type: none"> ▪ <u>Terms:</u> <ul style="list-style-type: none"> ○ leg, hypotenuse, geometric mean, Pythagorean triples, opposite leg, adjacent leg, sine ratio, cosine ratio, tangent ratio, angle of elevation, angle of depression, the Pythagorean Theorem, the 45-45-90 theorem, the 30-60-90 theorem.
Essential Skills	<ul style="list-style-type: none"> ▪ Use the Pythagorean Theorem to solve right triangle problems. ▪ Determine whether a triangle is right, acute, or obtuse given the lengths of the sides of a triangle. ▪ Find the length of an altitude to the hypotenuse given the lengths of the segments of the hypotenuse. ▪ Use the 30-60-90 theorem to solve problems involving those angles of a right triangle. ▪ Use the 45-45-90 theorem to solve problems involving those angles of a right triangle. ▪ Use the three trigonometric ratios to solve right triangle problems.

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	<ul style="list-style-type: none">▪ Apply all of the above to solve problems involving other figures such as quadrilaterals, pentagons, hexagons, octagons, etc.
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<p>Related Maine Learning Results</p>	<p><u>Mathematics</u> A. Number Real Number A1.Students will know how to represent and use real numbers. a. Use the concept of nth root. b. Estimate the value(s) of roots and use technology to approximate them. c. Compute using laws of exponents. d. Multiply and divide numbers expressed in scientific notation. e. Understand that some quadratic equations do not have real solutions and that there exist other number systems to allow for solutions to these equations.</p>
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Related Maine Learning Results	<p>C. Geometry Geometric Figures</p> <p>C1.Students justify statements about polygons and solve problems.</p> <ul style="list-style-type: none">a. Use the properties of triangles to prove theorems about figures and relationships among figures.b. Solve for missing dimensions based on congruence and similarity.c. Use the Pythagorean Theorem in situations where right triangles are created by adding segments to figures.d. Use the distance formula. <p>C2.Students justify statements about circles and solve problems.</p> <ul style="list-style-type: none">a. Use the concepts of central and inscribed angles to solve problems and justify statements.b. Use relationships among arc length and circumference, and areas of circles and sectors to solve problems and justify statements. <p>C3.Students understand and use basic ideas of trigonometry.</p> <ul style="list-style-type: none">a. Identify and find the value of trigonometric ratios for angles in right triangles.b. Use trigonometry to solve for missing lengths in right triangles.c. Use inverse trigonometric functions to find missing angles in right triangles. <p>Geometric Measurement</p> <p>C4.Students find the surface area and volume of three-dimensional objects.</p> <ul style="list-style-type: none">a. Find the volume and surface area of three-dimensional figures including cones and spheres.b. Determine the effect of changes in linear dimensions on the volume and surface areas of similar and other three-dimensional figures.
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Related Maine Learning Results	<p>D. Algebra Equations and Inequalities D2.Students solve families of equations and inequalities.</p> <ol style="list-style-type: none"> a. Solve systems of linear equations and inequalities in two unknowns and interpret their graphs. b. Solve quadratic equations graphically, by factoring in cases where factoring is efficient, and by applying the quadratic formula. c. Solve simple rational equations. d. Solve absolute value equations and inequalities and interpret the results. e. Apply the understanding that the solution(s) to equations of the form $f(x) = g(x)$ are x-value(s) of the point(s) of intersection of the graphs of $f(x)$ and $g(x)$ and common outputs in table of values. f. Explain why the coordinates of the point of intersection of the lines represented by a system of equations is its solution and apply this understanding to solving problems. <p>D3.Students understand and apply ideas of logarithms.</p> <ol style="list-style-type: none"> a. Use and interpret logarithmic scales. b. Solve equations in the form of $x + b^y$ using the equivalent form $y = \log_b x$. <p>Functions and Relations D4.Students understand and interpret the characteristics of functions using graphs, tables, and algebraic techniques.</p> <ol style="list-style-type: none"> a. Recognize the graphs and sketch graphs of the basic functions. b. Apply functions from these families to problem situations. c. Use concepts such as domain, range, zeros, intercepts, and maximum and minimum values. d. Use the concepts of average rate of change (table of values) and increasing and decreasing over intervals, and use these characteristics to compare functions. <p>D5.Students express relationships recursively and use iterative methods to solve problems.</p> <ol style="list-style-type: none"> a. Express the $(n+1)$st term in terms of the nth term and describe relationships in terms of starting point and rule followed to transform one terms to the next. b. Use technology to perform repeated calculations to develop solutions to real life problems involving linear, exponential, and other patterns of change.
Sample Lessons And	<ul style="list-style-type: none"> ▪ Prove the Pythagorean Theorem ▪ Use the Pythagorean Theorem to find the length of the 3rd side of a right triangle given the lengths of two other sides

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Activities	
Sample Classroom Assessment Methods	<ul style="list-style-type: none">▪ Quizzes▪ Take-home worksheets▪ Tests
Sample Resources	<ul style="list-style-type: none">▪ <u>Publications:</u><ul style="list-style-type: none">○ <u>Geometry</u>, McDougal Littell