Anoka-Hennepin Secondary Curriculum Unit Plan

Department:	Mathematics	Course:	Geometry (Honors)	Unit 5 Title:	Right Triangles	Grade Level(s):	8, 9, 10
Assessed Trimester:	Trimester B	Pacing:	High School: 8 - 11 Middle School: 8 - 13	Date Created:	05/22/2014	Last Revision Date:	08/20/2014

Course Understandings: *Students will understand that:*

B. Coordinate geometry can be used in order to demonstrate spatial relationships.
D. Transformations are performed to affect the figure.
E. Known geometric measurements are used to derive formulas of two- and three- dimensional figures in order to be used in real world situations.
F. Properties of two- and three-dimensional figures can be used in classification and problem solving.
G. Visualization, spatial reasoning and geometric modeling can be used to solve geometric problems.
H. Algebraic models can be used to solve geometric problems.

DESIRED RESULTS (Stage 1) - WHAT WE WANT STUDENT TO KNOW AND BE ABLE TO DO?

Established Goals

Minnesota State/Local/Technology Standard(s) addressed (2007):

- **Standard (9.3.3.#):** Know and apply properties of geometric figures to solve real-world and mathematical problems and to logically justify results in geometry.
  Benchmark:
  9.3.3.4 Apply the Pythagorean Theorem and its converse to solve problems and logically justify results.
  9.3.3.5 Know and apply properties of right triangles, including properties of 45-45-90 and 30-60-90 triangles, to solve problems and logically justify results.

- **Standard (9.3.4.#):** Solve real-world and mathematical geometric problems using algebraic methods.
  Benchmark:
  9.3.4.1 Understand how the properties of similar right triangles allow the trigonometric ratios to be defined, and determine the sine, cosine and tangent of an acute angle in a right triangle.
  9.3.4.2 Apply the trigonometric ratios sine, cosine and tangent to solve problems, such as determining lengths and areas in right triangles and in figures that can be decomposed into right triangles. Know how to use calculators, tables or other technology to evaluate trigonometric ratios.
  9.3.4.3 Use calculators, tables or other technologies in connection with the trigonometric ratios to find angle measures in right triangles in various contexts.

Transfer

Students will be able to independently use their learning to: (product, high order reasoning)

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Meaning

Unit Understanding(s):	Essential Question(s):
Students will understand that: • the Pythagorean Theorem can be used to calculate the length of a side of a right triangle, given the other two side lengths; • the converse of the Pythagorean Theorem can be used to determine whether a triangle is a right triangle; • you can calculate the missing side lengths of 30-60-90 triangles and 45-45-90 triangles, given one	**Students will keep considering:** •

length.
- specific sides of a right triangle are used to form each trigonometric ratio for a given acute angle;
- the ratios for the sine, cosine and tangent of an acute angle in a right triangle;
- Use the ratio for the sine, cosine, or tangent of an acute angle in a right triangle to determine side lengths of the triangle;
- a calculator can be used to evaluate sine, cosine and tangent using
- it is essential to have the measurement of an acute angle and one side length to calculate the other two side lengths in a right triangle;
- given two sides of a right triangle, a trigonometric inverse can be used to determine angle measures.

Acquisition

Knowledge - Students will:
- Understand characteristics of equilateral, isosceles and scalene triangles
- Understand characteristics of obtuse, acute, and right triangles
- Know base angle theorem
- Know Pythagorean Theorem and converse of Pythagorean Theorem
- Identify Pythagorean triples
- Identify 45-45-90 and 30-60-90 triangles
- Know ratios of the side lengths of 45-45-90 and 30-60-90 triangles
- Understand ratios and proportions
- Understand the definition and properties of the trigonometric ratios and their inverses (Sine, Cosine, Tangent)
- Know where to find trigonometric ratios within a calculator or table

Reasoning - Students will:
- Distinguish between various sides of a right triangle
- Classify the type of triangle based on the converse of the Pythagorean Theorem
- Organize right triangle problems into categories (Pythagorean, 30-60-90, 45-45-90, trig)
- Justify which trigonometric ratio to use based on the given information

Skills - Students will:
- Use properties of triangles to solve for angle measures or side lengths
- Use Pythagorean Theorem to find a side length of a right triangle
- Use the converse of the Pythagorean Theorem to classify the type of triangle
- Use ratios to find missing parts of 30-60-90 and 45-45-90 triangles and in real-world problems
- Use calculators to evaluate trig ratios and inverse trig ratios
- Use trig ratios to find side lengths of right triangles
- Use inverse trig ratios to find angles in a right triangle

Common Misunderstandings
- Once students are introduced to 30-60-90 triangles and 45-45-90 triangles, they often assume that the relationships between side lengths hold for any right triangle.
- Once students are introduced to the Pythagorean Theorem, they sometimes assume the relationships between the side lengths hold for any triangle.
- Students get confused about which side of the triangle is the "opposite" and which is the "adjacent," especially when switching between the acute angles.
- Students confuse which trigonometric ratio works for their written proportion.
- Students rely on using SOH-CAH-TOA to remember the trigonometric ratios and then misspell the mnemonic and become more confused.
- Students attempt to use the right angle with the trigonometric definitions and identify the hypotenuse as the "opposite."
- Students do not understand that their calculators can evaluate trigonometric ratios for different angle measurement systems and forget to check that they are using the correct mode.
- Student's misuse cross-multiplication when solving trigonometric equations and invert portions of their answers.

Essential new vocabulary
- cosine
- inverse trigonometric functions
- Pythagorean Theorem
- Pythagorean Triple
- sine
- tangent
- trigonometry