Anoka-Hennepin Secondary Curriculum Unit Plan

Department:	Mathematics	Course:	Geometry (Honors)	Unit 2 Title:	Triangles	Grade Level(s):	8, 9, 10
Assessed Trimester:	Trimester A	Pacing:	High School: 11 - 13 Middle School: 19 - 24	Date Created:	05/22/2014	Last Revision Date:	08/20/2014

Course Understandings: *Students will understand that:*

A. Some problems require proportional thinking in order to be solved.
C. Reasoning skills are required to construct a logical argument.
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 (9.3.2.#):** Construct logical arguments, based on axioms, definitions and theorems, to prove theorems and other results in geometry.
  Benchmark:
  9.3.2.1 Understand the roles of axioms, definitions, undefined terms and theorems in logical arguments.
  9.3.2.4 Construct logical arguments and write proofs of theorems and other results in geometry, including proofs by contradiction. Express proofs in a form that clearly justifies the reasoning, such as two-column proofs, paragraph proofs, flow charts or illustrations.

- **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:
  9.3.3.2 Know and apply properties of angles, including corresponding, exterior, interior, vertical, complementary and supplementary angles, to solve problems and logically justify results.
  9.3.3.3 Know and apply properties of equilateral, isosceles and scalene triangles 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:
  9.3.4.4 Use coordinate geometry to represent and analyze line segments and polygons, including determining lengths, midpoints and slopes of line segments.

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: • formal definitions to classify figures and their attributes exist	**Students will keep considering:** •

- postulates (axioms are postulates) and definitions are used to prove theorems.
- an axiom, definition or theorem may apply to a given situation.
- triangles can be proven congruent using postulates, definitions and theorems.
- they can write the inverse, converse and contrapositive of an "if...then" statement.
- a conditional statement and its converse are not logically equivalent, but that a conditional statement and its contrapositive are logically equivalent.
- Write a formal proof using the two-column, paragraph, or flow chart format.
- Write a formal proof by contradiction.
- Determine a formal statement for a theorem proved by illustration.
- a counterexample can be used to disprove a statement.
- Determine if a given argument is a valid proof.
- Identify and differentiate between corresponding angles, alternate interior angles, same-side supplementary angles and, if necessary, alternate exterior angles, when two lines are cut by a transversal;
- they can determine the relationship between the above angles when the two lines are parallel;
- they can use the above information, and connections with algebra, to solve problems involving angle measures.
- they can compare and contrast properties of scalene, isosceles and equilateral triangles.
- properties exist, in relationship to the type of triangle in order to solve problems.
- Apply the Pythagorean Theorem to calculate the length of a side of a right triangle, given the other two side lengths.
- they can apply the converse of the Pythagorean Theorem to determine whether a triangle is a right triangle.
- they can calculate the missing side lengths of 30-60-90 triangles and 45-45-90 triangles, given one length.
- they can determine which sides of a right triangle are used to form each trigonometric ratio for a given acute angle.
- they can write the ratio for the sine, cosine and tangent of an acute angle in a right triangle;
- they can use the ratio for the sine, cosine, or tangent of an acute angle in a right triangle to determine side lengths of the triangle;
- they can evaluate sine, cosine and tangent using a calculator;
- they can use 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, they can use a trigonometric inverse to determine angle measures.
- they can calculate slope of a line or segment;
- they can calculate the coordinates of a point after an isometry (reflection over an axis, rotation of a multiple of 90 degrees about the origin, translation).
- the distance between two points on a coordinate plane can be determined using various strategies.
- the midpoint of a segment, given the coordinates of the endpoints can be used to determine using various strategies.
- given the equation of a circle, the center and radius of the circle can be determined.
- given the center and radius (or diameter) of a circle, the equation of the circle can be determined.

Acquisition

Knowledge - Students will:

- Understand characteristics of equilateral, isosceles and scalene triangles
- Understand characteristics of obtuse, acute, and right triangles
- Know base angle theorem
- Understand when to use equality vs. congruence
- Identify corresponding parts

Reasoning - Students will:

- Classify a triangle by sides and angles
- Classify a triangle by sides and angles
- Distinguish between various sides of a right triangle
- Prove two figures are congruent

Skills - Students will:

- Use properties of triangles to solve for angle measures or side lengths

Common Misunderstandings

- Students believe that every theorem is biconditional.
- Students believe definitions need to be proved.
- Students confuse properties of shapes with their formal definitions.
- Students believe that there is one and only one correct way to write every proof.
- Students believe that two-column proofs are the only formal proofs.
- Students believe that one example will prove a statement to be true in general.
- Students mislabel diagrams so that every pair of congruent parts is marked in the same way.
- Students make assumptions based on what appears to be true on a diagram.
- Students will need reminders and review of the different types of angles formed by two lines cut by a transversal.
- Students will sometimes mistake angles that are supplementary with angles that are congruent, when two parallel lines are cut by a transversal.
- Students might confuse the different types of triangles as they are defined by their sides.
- Students might incorrectly apply or transfer properties from one type of triangle to a different type.
- 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 often mistake the formula for slope with the formula for midpoint and/or the Distance Formula.

Essential new vocabulary

- alternate exterior angles
- alternate interior angles
- axiom
- conjecture
- corresponding angles
- equilateral
- equiangular
- same-side interior angles (consecutive interior angles)
- theorem
- transversal