Anoka-Hennepin Secondary Curriculum Unit Plan

Department:	Mathematics	Course:	Geometry (Honors)	Unit 1 Title:	Lines & Angles	Grade Level(s):	8, 9, 10
Assessed Trimester:	Trimester A	Pacing:	High School: 13-15 Middle School: 17-20	Date Created:	05/22/2014	Last Revision Date:	08/20/2014

Course Understandings: *Students will understand that:*

C. Reasoning skills are required to construct a logical argument.
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.
  9.3.2.2 Accurately interpret and use words and phrases such as "if…then," "if and only if," "all," and "not." Recognize the logical relationships between an "if…then" statement and its inverse, converse and contrapositive.
  9.3.2.3 Assess the validity of a logical argument and give counterexamples to disprove a statement.
  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:
  9.3.3.1 Know and apply properties of parallel and perpendicular lines, including properties of angles formed by a transversal, to solve problems and logically justify results.
  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.

- **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)

- Construct a complete proof including all statements and reasons.

Meaning

Unit Understanding(s):	Essential Question(s):
Students will understand that: • one can 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	**Students will keep considering:** •

transversal. ● the relationship between the above angles when two lines are parallel can be determined. ● using the above information, and connections with algebra, problems involving angle measures can be solved. ● a formal proof using the two-column, paragraph, or flow chart format can be used to prove a statement. ● inverse, converse and contrapositive statements can be written for any conditional statement (an "if...then" statement). ● that a conditional statement and its converse are not logically equivalent, but that a conditional statement and its contrapositive are logically equivalent. ● a counterexample can be used to disprove a statement.	

Acquisition

Knowledge - Students will: ● To know logical relationships: ○ Conditional statements (If…then) ○ Converse ○ Inverse ○ Contrapositive ○ Biconditional (If and only if) ○ Negation ● Understand language of Geometry: ○ Counterexample ○ Theorems ○ Postulates and Axioms ○ Corollaries ○ Properties of Equality ○ Undefined Terms ● Know types of proof: ○ two column or ○ paragraph or ○ flow ● Names of angles formed by transversals ● Properties of the angles ● Properties of parallel and perpendicular lines ● Identify names and properties of angles: ○ Corresponding ○ Exterior ○ Interior ○ Vertical ○ Linear pair	**Reasoning - Students will:** ● Organize statements and reasons in a logical order to support a hypothesis ● Provide a counterexample for a statement ● Evaluate the validity of a statement ● Deduce angle relationships and measures given properties of angles ● Hypothesize and prove relationships of angles using parallel and perpendicular line properties ● Hypothesize and prove lines are parallel using angle relationships and properties ● Justify the reasoning for angle relationships **Skills - Students will:** ● Use counterexamples to disprove statements ● Construct proofs using postulates, proven statements, and logic ● Set up and solve algebraic equations using properties of angles formed by parallel and perpendicular lines ● Use the distance formula to find lengths of segments ● Use the midpoint formula to bisect a segment

○ Complementary ○ Supplementary ● Use tools of construction: ○ Compass ○ Straightedge ● Know the distance and midpoint formulas	

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.

Essential new vocabulary

- alternate exterior angles
- alternate interior angles.
- axiom
- biconditional statement
- complementary angles
- conclusion (If and only if)
- conditional statements (If…then)
- conjecture
- contrapositive
- converse
- corresponding angles
- counterexample
- exterior angles
- flow-chart proof.
- if-then statement
- Interior angles
- inverse
- linear pair
- midpoint
- negation
- paragraph
- parallel notation
- perpendicular notation
- postulates
- proof
- proof by contradiction
- properties of equality
- same-side interior angles (consecutive interior angles)
- supplementary angles
- theorems
- transversal
- two column proof
- paragraph proof
- flowchart proof
- undefined terms
- vertical angles

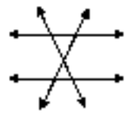
EVIDENCE OF LEARNING (Stage 2) - HOW WILL WE KNOW THEY HAVE LEARNED IT?

Evaluative Criteria	Sample Progress Monitoring
Performance Tasks:	Sample Performance Tasks (Transfer and Meaning) •
Other Evidence:	Other Sample Evidence (Meaning and Acquisition) •

Sample Unit Pre-assessment:
Sample Formative Unit Assessment:
Common Summative Assessment: anoka.k12.mn.us/csa

INSTRUCTIONAL PLANNING (Stage 3) – WHAT WILL WE DO IF THEY HAVEN'T LEARNED... OR THEY KNOW IT ALREADY?

MATH (2014-15) Geometry (Honors) - Unit 01 Lines & Angles

Priority in Pacing Order	No.	Standard/ Benchmark	Sample Student Friendly Learning Targets	Sample Activities/ Resources	Sample Modifications/ Interventions	Sample Enrichments/ Extensions
HIGH	9.3.4.4	Use coordinate geometry to represent and analyze line segments and polygons, including determining lengths, midpoints and slopes of line segments.	**1-1** I can find the midpoint of a segment and bisect a segment and an angle.	**Glencoe:** Sect 1.5& 1.4 **McD-L:** Sect 1.5		Unit 1 Extensions
HIGH	9.3.3.1 9.3.3.2	Know and apply properties of parallel and perpendicular lines, including properties of angles formed by a transversal, to solve problems and logically justify results. Know and apply properties of angles, including corresponding, exterior, interior, vertical, complementary and supplementary angles, to solve problems and logically justify results. 	**1-2** I can solve problems involving supplementary, complementary, perpendicular and vertical angles. Embed linear pairs, angle addition postulate and angle bisector.	**Glencoe:** Sect 1.5 & 2.8 **McD-L:** Sect 1.6 & 2.6		
HIGH	9.3.3.1 9.3.3.2	Know and apply properties of parallel and perpendicular lines, including properties of angles formed by a transversal, to solve problems and logically justify results. Know and apply properties of angles, including corresponding, exterior, interior, vertical, complementary and supplementary angles, to solve problems and logically justify results.	**1-3** I can identify and use the properties of parallel lines to determine congruent or supplementary angles. I can also use algebra to find these angles.	**Glencoe:** Sect 3.1 & 3.2 **McD-L:** Sect 3.1 & 3.3		
LOW	9.3.2.1 9.3.2.3 9.3.2.4	Understand the roles of axioms, definitions, undefined terms and theorems in logical arguments. Assess the validity of a logical argument and give counterexamples to disprove a statement. 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.	**1-4** I can identify and apply properties of equality to use them in an algebraic proof.	**Glencoe:** Sect 2.6 **McD-L:** Sect 2.4		
HIGH	9.3.2.2 9.3.2.3	Accurately interpret and use words and phrases such as "if...then," "if and only if," "all," and "not." Recognize the logical relationships between an "if...then" statement and its inverse, converse and contrapositive. Assess the validity of a logical argument and give counterexamples to disprove a statement.	**1-5** I can make conjectures based on inductive reasoning, find counter examples. and analyze conditional statements (inverse, converse , contrapositive and biconditional statements).	**Glencoe:** Sect 2.1 & 2.3 **McD-L:** Sect 2.1 & 2.2 Biconditional statements --writing and evaluating		
HIGH	9.3.2.4 9.3.3.1 9.3.3.2	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. Know and apply properties of parallel and perpendicular lines, including properties of angles formed by a transversal, to solve problems and logically justify results. Know and apply properties of angles, including corresponding, exterior, interior, vertical, complementary and supplementary angles, to solve problems and logically justify results.	**1-6** I can create a proof using the properties of parallel lines.	**Glencoe:** Sect 3.5 **McD-L:** Sect 3.4		
			Unit 1 Review	Unit Review		