Unit A - *A Introduction to Geometry*

Overview

This unit introduces students to the majority of terminology used in Geometry. Constructions, transformations, logical thinking and proofs are all part of the unit and will be referred to throughout the course. Students will be able to complete a two-column geometric proof by the end of the unit. Geometric software, along with compass and straightedge, will be used for constructions and transformations.

21st Century Capacities: Analyzing, Synthesizing

Stage 1 - Desired Results

ESTABLISHED GOALS/ STANDARDS

MP 1 Make sense of problems and persevere in solving them
MP3 Construct viable arguments and critique the reasoning of others
MP6 Attend to precision
MP7 Look for and make use of structure

CCSS.MATH.CONTENT.HSA.CED.A.1
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.REI.B.3
Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
CCSS.MATH.CONTENT.HSA.REI.B.4
Solve quadratic equations in one variable.
CCSS.MATH.CONTENT.HSA.REI.B.4.B
Solve quadratic equations by inspection (e.g., for x^2

Transfer:

Students will be able to independently use their learning in new situations to...

1. Draw conclusions about graphs, shapes, equations, or objects. (Analyzing)
2. Make sense of a problem, initiate a plan, execute it, and evaluate the reasonableness of the solution. (Synthesizing)
3. Justify reasoning using clear and appropriate mathematical language. (Synthesizing)

Meaning:

UNDERSTANDINGS: *Students will understand that:*

1. Mathematicians analyze characteristics and properties of geometric shapes to develop mathematical arguments about geometric relationships.
2. Mathematicians apply transformations and/or use symmetry to analyze mathematical situations and solve problems.
3. Mathematicians compare the effectiveness of various arguments, by

ESSENTIAL QUESTIONS: *Students will explore & address these recurring questions:*

A. How can I use symbols to communicate?
B. How does classifying bring clarity?
C. How do transformations affect shapes?
D. How can I use what I know to help me find what is missing?
E. What do I need to support my answer?

= 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. **Experiment with transformations in the plane** CCSS.MATH.CONTENT.HSG.CO.A.1 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.2 Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch). CCSS.MATH.CONTENT.HSG.CO.A.5 Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another. **Understand congruence in terms of rigid motions** CCSS.MATH.CONTENT.HSG.CO.B.6 Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.	analyzing and critiquing solution pathways. 4. Mathematicians flexibly use different tools, strategies, symbols, and operations to build conceptual knowledge or solve problems.	
	Acquisition:	
	Students will know…. 1. That lines and planes are sets of points 2. The Pythagorean Theorem 3. The distance formula and that it comes from the Pythagorean Theorem 4. The definition of congruence in terms of transformations 5. what betweenness means 6. the midpoint formula 7. which assumptions we can and cannot make from a diagram 8. that vertical angles are congruent 9. the relationship between special pairs of angles when two parallel lines are cut by a transversal (corresponding angles, alternate interior, same-side interiors, alternate exterior) 10. Vocabulary: point, line, ray, plane, angles, line segment, betweenness, acute, obtuse, right, straight, vertical angles, adjacent angles, complement, supplement, perpendicular, parallel, skew, conditional, converse, bisect, set, postulate, theorem, transversal, skew	*Students will be skilled at…* 1. Naming points, lines, rays, planes, angles, line segment, triangles 2. Finding the distance between two points on number line or on the coordinate plane using subtraction and absolute value 3. Applying the Pythagorean Theorem to use the distance formula 4. Using the concept of midpoint to find missing coordinates 5. Transforming shapes on the coordinate plane (reflect, translate, rotate, dilate) 6. Comparing transformations that preserve distance and angles to those that do not 7. Making the following constructions: a. copy a segments b. copy an angle c. bisect a segment d. bisect an angle e. construct perpendicular lines f. construct a line parallel to a line through a point 8. Measuring and classifying angles as acute, obtuse, right or straight 9. Identifying angle pairs a. vertical angles b. adjacent c. complement d. supplement

CCSS.MATH.CONTENT.HSG.CO.C.9 Prove theorems about lines and angles. *Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints*. **Make geometric constructions** CCSS.MATH.CONTENT.HSG.CO.D.12 Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.).*Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line*. CCSS.MATH.CONTENT.HSG.GPE.B.6 Find the point on a directed line segment between two given points that partitions the segment in a given ratio.		10. Conditional statements (include converse and that not all statements are reversible)