Understanding by Design: School ___MHHS_____

Designer Name(s): Jan Hughes Date:

Subject Area: Geometry Grade Level(s):

Unit Title/Focus: Transformations

Estimated Amount of Instructional Time: ~6-10 days

Stage 1 – (Desired Results)

State Content and Skill Standards:

G.CO.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 vs. horizontal stretch).

G.CO.3 Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.

G.CO.4 Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.

G.CO.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.

G.CO.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.

G.CO.7 Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.

G.CO.8 Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.

G.SRT.1 Verify experimentally the properties of dilations given by a center and a scale factor:

a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.

b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.

Enduring Understandings: (what are the big ideas, what are the specific understandings desired)	*Essential Questions: (what questions will foster inquiry, understanding, and transfer of learning)*
- You can change the position of a geometric figure so that the angle measures and the distance between any two points of a figure stay the same. - When you reflect a figure across a line, each point of the figure maps to another point the same distance from the line but on the other side. The orientation of the figure reverses. - Rotations preserve distance, angle measures, and orientation of figures. - You can express all isometries as compositions of reflections. - You can use compositions of rigid motions to understand congruence. - You can use scale factor to make a larger or smaller copy of a figure that is also similar to the original figure.	- How can you change a figure's position without changing its size and shape? - How can you represent a transformation in the coordinate plane? - How do you recognize congruence and similarity in figures?
What Students will know: (what knowledge will they acquire)	*What Students will be able to do: (what will they eventually be able to do as a result of their skills learned/knowledge)*
- Key terms: angle of rotation, center of rotation, component form, congruence transformation, image, initial point, isometry, pre-image, line of reflection, reflection, rigid motion, rotation, terminal point, transformation, translation, vector -Rigid motions preserve: distance, angle measure, betweenness, and collinearity	- Identify rigid motions (isometries) and types of symmetry - Find and draw translation, reflection, and rotation images of figures - Describe translations using components and vectors - Classify isometries - Find compositions of isometries, including glide reflections - Identify congruence transformations - Prove triangle congruence using isometries

Stage 2 - Assessment Evidence (acceptable assessment evidence that students understand)	
Performance Tasks: (what authentic performance task (s) will students demonstrate understanding; by what criteria will it be judged?)	*Other Evidence: (quizzes, tasks, academic prompts, homework, observations)*

Stage 3 - Learning Plan (sequence of teaching and learning activities that will produce desired understandings, engagement and development) Use WHERETO elements to help you:

Learning Activities:

Day 1 – Introduction to Transformations – *On Core 2-1, Saxon 67*
- Introducing transformations
- Classifying transformations
- Identifying rigid motions

Day 2 – Translations – *Pearson 9-1, On Core 2-5, Saxon 71*
- Naming images and corresponding parts
- Finding the image of a translation
- Writing a rule (component form) to describe a translation
- Compositions of translations

Day 3 – Reflections – *Pearson 9-2, On Core 2-2, Saxon 74*
- Reflecting a point across a line
- Properties of reflections
- Reflections in the coordinate plane
- Writing a reflection rule
- Using reflections to prove statements about figures

Day 4 – Rotations – *Pearson 9-3, On Core 2-6, Saxon 78*
- Rotating an image about a point
- Drawing a rotation image
- Rotations in the coordinate plane
- Using properties of rotations

Day 5 – Compositions of Isometries – *Pearson 9-4, Saxon 90*
- Reflecting across parallel lines
- Reflecting across intersecting lines
- Glide reflections

(Day 6 – optional – Congruence Transformations – *Pearson 9-5*)
- Using transformations to identify congruent figures

Day 7 – Dilations – *Pearson 9-6, On Core 5-1,5-2, Saxon 84*
- Properties of dilations
- Finding a scale factor
- Finding a dilation image
- Using scale factors

Additional Investigations in Transformations – *Mathematics Vision Project Module 5*
- Leaping Lizards – Developing the definitions of rigid motion transformations (isometries)
- Leap Frog – Determining which isometries carry one image onto another congruent image
- Leap Year – Writing & applying formal definitions of the rigid-motion transformations
- Symmetries of Quadrilaterals – Finding rotational symmetry and lines of symmetry in quadrilaterals
- Symmetries of Regular Polygons – Examining characteristics of regular polygons that emerge from rotational symmetry and lines of symmetry
- Quadrilaterals Beyond Definition – Making & justifying properties of quadrilaterals using symmetry transformations
- Can You Get There From Here? – Describing the sequence of transformations that carry

W=help the students know WHERE the unit is going and WHAT is expected/Help teacher to know where the students are coming from (prior knowledge, interests)
H=HOOK all students and hold their interest
E=EQUIP students, help them EXPERIENCE the key ideas and EXPLORE the issue
R=Provide opportunities to RETHINK and REVISE their understanding/work
E (2)=Allow students to EVALUATE their work

T=Be TAILORED (personalized) to different needs, interests, and abilities of learners
O=Be ORGANIZED to maximize initial and sustained engagement as well as effective learning

Assessment Tasks that Provide Evidence for Claims including DOK	**Claim #1/DOK 1, 2, 3, 4 (circle one):**
	Claim #2/DOK 1, 2, 3, 4 (circle one):
	Claim #3/DOK 1, 2, 3, 4 (circle one):
	Claim #4/DOK 1, 2, 3, 4 (circle one):
Achievement Level Descriptors	**ALD #1: ALD #2: ALD #3: ALD #4: (circle one):**
Materials/Resources	