Course: Geometry **Unit 1 - Foundations of Geometry**	**Year of Implementation:** 2021-2022

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Stage One - Desired Results

Link(s) to New Jersey Student Learning Standards for this course:
https://www.state.nj.us/education/cccs/2020/

Unit Standards:
G-CO.A.1-6, G-CO.D.12, G-GPE.B.6, G-CO.C.9, G-CO.C.10, G-CO.C.11, G-MG.A.1, G.MG.A.3, G-GPE.B.5, G-SRT.A.1.A, G-SRT.A.1.B

9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas
9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities

Transfer Goal: Students will be able to independently use their learning to apply and transfer basic geometric concepts and problem-solving techniques to unfamiliar, varied and real-world situations.

As aligned with LRHSD Long Term Learning Goal(s):
Problem-Solving: apply and transfer autonomously and collaboratively mathematical concepts and problem-solving techniques to unfamiliar, varied and real-world situations
Reasoning: reason abstractly and quantitatively by applying mathematical representations, symbols and estimation techniques when engaging in problem-solving
Critical Thinking: construct and effectively communicate valid conclusions and critique the reasoning of others
Modeling: demonstrate mastery of concepts by evaluating models that others have constructed or by creating appropriate models of their own
Tools: identify the correct tools to solve problems, if applicable
Precision: determine an answer's appropriateness as a means of determining its validity, while using proper mathematical notation and units
Structure: use multiple representations, critical thinking skills, and prior knowledge to solve problems in new situations
Habits of Mind: approach new situations with curiosity, persistence, resourcefulness, and confidence; take risks, monitor their

progress, accept and learn from setbacks, make adjustments, and reflect on their performance	
<u>Enduring Understandings</u> Students will understand that. . . *EU 1* *mathematical notation and language is necessary for a strong foundation in Geometry.* *EU 2* *geometric relationships and definitions can be used to construct geometric figures and solve real world problems.* *EU 3* *good decision making requires logical reasoning based on known facts.* *EU 4* *an object in a plane can be oriented in an infinite number of ways while maintaining its original size or shape.* *EU 5* *transformations can be achieved and represented in a variety of ways.*	*<u>Essential Questions</u>* *EU 1* ● *What is the significance of proper notation in the study of Geometry?* ● *Why is there a need for undefined terms?* *EU 2, EU 3* ● *How does what we measure influence how we measure?* ● *Why is it important to think logically and systematically?* *EU 3* ● *What is proof?* ● *What are the benefits of informal proofs versus formal proofs?* *EU 4, EU 5* ● *How do the various transformations affect the properties of polygons?* ● *How are transformations used in various careers?*

Knowledge Students will know . . .	*Skills* Students will be able to. . .
EU 1 ● *undefined terms serve as the building blocks of other mathematical terms. (G-CO.A.1)* *EU 1, 2, 3, 4* ● *special angle pairs can be used to identify geometric relationships and to find angle measures. (G-CO.C.9)* *EU 2* ● *the special angle pairs formed by parallel lines and a transversal are either congruent or supplementary. (G-CO.C.9)* *EU 3* ● *by comparing the slopes of two lines it can be determined whether the lines are parallel or perpendicular. (G-GPE.B.5)* *EU 3, 4* ● *the appropriate method to use to identify the midpoint and distance of a segment in the coordinate plane. (G-GPE.B.6)* ● *certain angle pairs can be used to determine whether two lines are parallel. (G-GPE.B.4)* *EU 4, 5* ● *how transformations affect the properties of polygons (G-CO.A.5)* *EU 5* ● *dilations are similarity transformations. (G-CO.A.2-5)*	*EU 1, 2* ● *identify and model points, lines, planes and their relationships.* ● *identify and classify angles and their relationships including those formed by parallel lines and a transversal.* ● *utilize correct mathematical language and notation to communicate ideas about geometric figures (G-CO.A.1)* *EU 2* ● *determine slopes of parallel and perpendicular lines. (G-GPE.B.5)* *EU 3, 4* ● *identify the length and midpoint of any segment in the coordinate plane (G-GPE.B.6)* *EU 4, 5* ● *represent transformations visually and in the coordinate plane. (G-CO.A.5)* *EU 5* ● *specify a sequence of transformations that will carry a given figure onto another. (G-CO.A.5)*

Stage Two - Assessment

Other Evidence:

- *Assessments and activities to include: identifying similarity transformations; naming and identifying points, lines, planes, and angles; finding distance and midpoints on a number line and in the coordinate plane; writing and solving algebraic equations about segment relationships and angle relationships; prove theorems about segment relationships, angle relationships, parallel lines and the angles formed by a transversal; constructions of/with segments, parallel lines, angles, bisectors, and perpendicular lines*
- *Assessed elements from the Performance Task*
- *Other teacher–graded evaluations*
- *Warm-Ups/Exit Tickets*
- *Desmos Activity, Transformation Golf: Rigid Motion*
  https://teacher.desmos.com/activitybuilder/custom/59b01d08f4d48d0a0ee7526e
  **Students use one or more transformations to transform a pre-image to the image.*

Stage Three - Instruction

Learning Plan: **Suggested Learning Activities to Include Differentiated Instruction and Interdisciplinary Connections: Each learning activity listed must be accompanied by a learning goal of A= Acquiring basic knowledge and skills, M= Making meaning and/or a T= Transfer.**

- *Desmos Activity, Introduction to Geometry Proofs (A, M, EU 1, 3)*
  https://teacher.desmos.com/activitybuilder/custom/58012626a1924c7c08b7d94d
  **Students will be introduced to two column proofs.*
  **Students will complete algebraic, segment, and angle proofs.*
- *Desmos Activity, Slopes of Parallel and Perpendicular Lines (A, EU 2)*
  https://teacher.desmos.com/activitybuilder/custom/560bf52723f5c00206277850
  **Students discover relationships between parallel and perpendicular lines.*

**Students modify equations to meet given requirements of parallel and perpendicular lines.*

- *3-Act Task - Introduction to angles created by parallel lines (A, M, EU 2)*
  https://tapintoteenminds.com/3act-math/railing-reconstruction/

- *Desmos Activity, Proving Lines are Parallel (A, M, EU 2,3,4)*
  https://teacher.desmos.com/activitybuilder/custom/581b309af01558ea0542f205

- *Geometric constructions using www.geogebra.org (A, M, EU 2)*

The following is the suggested sequence of learning activities:

Approximate Timeline: 35 days

- Reflections and translations
- Rotations and dilations
- Identify and model points, lines and planes
- Find segment lengths
- Find distance and midpoint given two points
- Find measures of and classify angles
- Identify and use special angle pairs
- Identify and use basic postulates about points, lines, and planes
- Conditional statements
- Prove theorems about lines, segments and angles
- Identify angle pairs formed by two lines and a transversal
- Use theorems to determine relationships between angles formed by parallel lines and transversals
- Find slope of lines and use it to identify parallel and perpendicular lines
- Prove theorems about parallel lines
- Allow days for aforementioned activities, assessments, and constructions (of congruent angles, congruent segments, perpendicular lines, bisecting segments/angles, a line parallel to a given line through a point not on a line)