08- Geometric Figures

Content Area: **Math**
Course(s):
Time Period: **Full Year**
Length: **3 weeks**
Status: **Published**

General Overview, Course Description or Course Philosophy

Pre-Algebra 7A units were created and organized in line with the areas of focus as identified by the New Jersey Student Learning Standards. Each unit consists of standards that are considered major content along with standards that are supporting and/or additional content. The expectation is that students will have many opportunities to develop fluency with rational number arithmetic and solving multi-step problems (including those involving positive and negative rational numbers and word problems leading to one variable equations) throughout the school year. This course prepares students to take Algebra 1 in Grade 8 by addressing a combination of Grade 7 and Grade 8 standards in one school year.

In this unit, students will draw on their knowledge of lines and angles, equivalent ratios, and three-dimensional figures to gain understanding of angles, parallel lines, triangles, and scale drawings. They will use this understanding to develop fluency with vertical, adjacent, complementary, and supplementary angles, angle relationships and triangles, classifying and drawing triangles, scale drawings and three-dimensional figures. This unit will provide opportunities for students to use proportional reasoning in real life situations. This unit will also help students conceptualize the difference between addition situations and multiplicative situations through the use of proportions and scale factors. Students will investigate and explore similar figures, enlarging and reducing shapes, and the relationship between similarity and ratios.

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

Objectives:

Relationships Among Angles:

- Investigate techniques for estimating and measuring angles
- Explore patterns among interior and exterior angles of triangles
- Reason about the properties of angles formed by parallel lines and transversals
- Use information about supplementary, complementary, vertical, and adjacent angles in a shape to solve for an unknown angle in a multi-step problem

Constructing Polygons:

- Draw or sketch polygons with given conditions by using various tools and techniques such as freehand, use of a ruler and protractor, and use of technology
- Determine what conditions will produce a unique polygon, more than one polygon, or no polygon
- Recognize the special properties of polygons, such as angle sum, side-length relationships, and symmetry, that make them useful in building, design, and nature
- Visualize three-dimensional shapes and the effects of slicing those shapes by planes
- Solve problems that involve properties of shapes

Similar Figures:

- Understand what it means for figures to be similar
- Identify similar figures by comparing corresponding sides and angles
- Use scale factors and ratios to describe relationships among the side lengths, perimeters, and areas of similar figures
- Generalize properties of similar figures
- Recognize the role multiplication plays in similar relationships
- Recognize the relationship between scale factor and ratio in similar figures
- Use informal methods, scale factors, and geometric tools to construct similar figures (scale drawings)

Essential Questions:

- How can lines, angles, and shapes be described, analyzed, and classified?
- Why are geometry and geometric figures relevant and important?
- How does geometry help to describe objects?
- What are the major classifications and relationships of angles, polygons and solids?
- How can a shape that meets given conditions be drawn?
- How can you determine when it is possible to draw a triangle given certain conditions?
- When two parallel lines are cut by a transversal, what can be said about the eight angles that are formed?
- How are angles formed by intersecting lines related?
- How can you use algebra to find missing angles?
- What does it mean for two figures to be similar?
- How can you decide whether or not two shapes are similar?
- How can you use scale factors to draw similar figures in real-world projects?
- How do certain professions utilize scale drawings?

Enduring Understandings:

- The sum of the interior angles of a polygon relates to the number of triangles that are formed by drawing diagonals from one vertex.
- Triangles have 3 sides, but not every combination of 3 side lengths will make a triangle.
- As with triangles, specific combinations of side lengths of a polygon can produce congruent copies of the polygon.
- Angles can be classified by their size, their location in relation to each other in a figure

or design, and their combined angle measure.
- Angle classification by location or combined angle measure can help you write equations to find unknown angle measures.
- Similar figures have congruent corresponding angles and corresponding sides lengths are in a proportional relationship.
- The scale factor for two similar figures is established by finding the ratio of a pair of corresponding sides. Scale factor used with other tools allows you to make drawings of similar figures and to compare the perimeters and areas of similar figures.
- If two figures are similar, then you can use a proportional relationship between corresponding sides to find unknown side lengths.
- Slicing prisms vertically, horizontally, or on a slant can expose different shapes of cross-sections, depending on which of the original edges are intersected.

CONTENT AREA STANDARDS

7.G

A. Draw, construct, and describe geometrical figures and describe the relationships between them

B. Solve real-life and mathematical problems involving angle measure, area, surface area, and volume

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.7.RP.A.2	Recognize and represent proportional relationships between quantities.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.7.RP.A.2b	Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.7.RP.A.3	Use proportional relationships to solve multistep ratio and percent problems.
MA.K-12.7	Look for and make use of structure.
MA.K-12.8	Look for and express regularity in repeated reasoning.
MA.7.NS.A.3	Solve real-world and mathematical problems involving the four operations with rational numbers.
MA.7.EE.B.3	Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.
MA.7.EE.B.4a	Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare

	an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.
MA.7.G.A.1	Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.
MA.7.G.A.2	Draw (with technology, with ruler and protractor, as well as freehand) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.
MA.7.G.A.3	Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.
MA.8.G.A.5	Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles.
MA.7.G.B.5	Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.

RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)

9.1.8.FP.1: Describe the impact of personal values on various financial scenarios. • 9.1.8.FP.2: Evaluate the role of emotions, attitudes, and behavior (rational and irrational) in making financial decisions.

WRK.K-12.P.4	Demonstrate creativity and innovation.
WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
WRK.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.
WRK.K-12.P.9	Work productively in teams while using cultural/global competence.

STUDENT LEARNING TARGETS

Declarative Knowledge

Students will:

- Understand supplementary, complimentary, vertical and adjacent angles.
- Understand angle relationships formed by parallel lines cut by a transversal.
- Understand what it means for two figures to be similar
- Understand how to find the scale factor of two similar figures

Procedural Knowledge

Students will be able to:

- Identify vertical and adjacent angles.
- Identify complementary and supplementary angles.
- Recall facts about supplementary, complimentary, vertical and adjacent angles to write and solve equations to find missing angles measures.
- Examine relationships of angles formed by parallel lines cut by a transversal.
- Solve for unknown angle measures created by parallel lines cut by a transversal.
- Write and solve simple equations to find unknown angles in figures in multi-step problems.
- Construct triangles given three measures of angles or sides.
- Draw triangles freehand, with a ruler and protractor, and with technology.
- Examine relationships among the angles in a triangle.
- Draw geometric shapes with given conditions.
- Solve problems involving scale drawings of geometric figures.
- Reproduce a scale drawing of a geometric figure at a different scale.
- Recognize the relationship between scale factor and ratios in similar figures.
- Use scale factor and ratios to describe relationships among the side lengths of similar figures.
- Describe the two-dimensional figures that result from slicing three-dimensional figures.

EVIDENCE OF LEARNING

Benchmark Assessments

- BOY Diagnostic Snapshot Assessment
- MP1 Quarterly Assessment
- MP2 Quarterly Assessment
- MP3 Quarterly Assessment
- MP4 Quarterly Assessment
- EOY Diagnostic Snapshot Assessment

Formative Assessments

- Delta Math Assignments
- Geometric Figures Proficiency Scale
- Do Now Check ins

- Formative Assessments - exit tickets, student-friendly proficiency scales, skill checklists (Google Drive Folder)

Summative Assessments

- Summative Assessment Google Drive Folder
- OnCourse Assessments
- Teacher created assessments (both test generator and teacher generated questions)
- Delta Math - Teacher generated assessments

RESOURCES (Instructional, Supplemental, Intervention Materials)

Instructional Materials:

- Reveal Math Accelerated - Geometric Figures (Module 11) (Online link - teacher and student resources)
- Resources for Unit 8 Google Drive Folder

Supplemental/Intervention Materials:

- Desmos - Interior Angles of a Triangle, Discovering the Triangle Inequality Theorem
- Delta Math
- Khan Academy
- NCTM Illuminations
- Illustrative Math
- Illustrative Math Tasks

INTERDISCIPLINARY CONNECTIONS

- Computations
- Architecture
- Engineering
- Construction

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

See link to Accommodations & Modifications document in course folder.