Unit 4: Geometry

Content Area:	**Mathematics**
Course(s):	**Accelerated Math 7**
Time Period:	**3rd Marking Period**
Length:	**9 weeks**
Status:	**Published**

Unit Overview

In this unit, students investigate whether sets of angle and side length measurements determine unique triangles or multiple triangles, or fail to determine triangles. Students also study and apply angle relationships, learning to understand and use the terms "complementary," "supplementary," "vertical angles," and "unique" (MP6). The work gives them practice working with rational numbers and equations for angle relationships. Students analyze and describe cross-sections of prisms, pyramids, and polyhedra. They understand and use the formula for the volume of a right rectangular prism, and solve problems involving area, surface area, and volume.

Work with transformations of plane figures in grade 8 draws on earlier work with geometry and geometric measurement. Through activities designed and sequenced to allow students to make sense of problems and persevere in solving them (MP1), students use and extend their knowledge of geometry and geometric measurement.

Students learn that angle measures are preserved under a dilation, but lengths in the image are multiplied by the scale factor. Students also conclude that the quotient of a pair of side lengths in a triangle is equal to the quotient of the corresponding side lengths in a similar triangle. This conclusion is used in the lesson that follows: students learn the terms "slope" and "slope triangle," and use the similarity of slope triangles on the same line to understand that any two distinct points on a line determine the same slope (MP7). In the following lesson, students use their knowledge of slope to find an equation for a line. They will build on this initial work with slope in a subsequent grade 8 unit on linear relationships.

Transfer

Students will be able to independently use their learning to ...

- Perform transformations on a plane and on a coordinate grid.
- Construct the image of a rigid transformation when given a pre-image and a line of reflection, angle of rotation or vector for translation.
- Analyze the transformation(s) that produced a given image from its pre-image.
- Write the rule in coordinate notation that maps a pre-image onto its image.
- Calculate angle measures formed from parallel lines and transversals
- Define and understand similarity and congruence.

For more information, read the following article by Grant Wiggins.

http://www.authenticeducation.org/ae_bigideas/article.lasso?artid=60

Meaning

Understandings
Students will understand that. . .

- Figures can be reflected, rotated, translated or moved by a sequence of transformations.
- Rigid transformations maintain angle measure, side length and parallel lines.
- As transformations are performed, the coordinates of vertices will change.
- There are congruent and supplementary relationships for angles formed by parallel lines and transversals
- The area for 2D and volume of 3D figures can be calculated using specific formulas

Essential Questions
Students consider...

- In what ways can angles be classified and compared?
- How can you determine congruence?
- How do transformations affect a figures placement on the coordinate plane?
- How can you determine similarity?
- How can you use and apply the Triangle Sum Theorem?
- How are two-dimensional figures used to solve problems involving other two dimensional figures?

Application of Knowledge and Skill

Students will know...

- How to classify special angle pairs.
- Identify and describe plane sections of given figures and analyze the cross-sections formed.
- After performing certain transformations, the order of the x & y coordinates may be reversed and the sign may be the opposite.
- For congruent figures, angle measures are congruent, side lengths are congruent, parallel lines remain parallel.
- For similar figures, angle measures are congruent, side lengths are proportional, parallel lines remain parallel.
- Figures can be moved on the coordinate plane by adding and subtracting values from the x and y coordinates of the pre-image.

Students will be skilled at...

Critiquing

- reasoning about measuring angles
- reasoning about decomposition of prisms
- reasoning about surface area of prisms

Explaining

- how to measure angles
- how to find unknown angle measurements
- how to find the volume of prisms
- how to find the surface area of prisms
- how to apply dilations to find specific images
- how to determine whether triangles are congruent, similar, or neither
- strategies for finding missing side lengths
- how to apply dilations to find specific images of points
- reasoning for a conjecture

Interpreting

- situations involving intersecting lines in order to form a conjecture
- which information is relevant to answer questions
- equations representing angle measurements
- situations involving volume and surface area

Justifying

- whether or not shapes are identical copies
- whether or not measurements determine identical copies

- whether or not measurements determine unique triangles whether or not rigid transformations could produce an image
- whether or not shapes are congruent
- whether or not polygons are congruent
- whether or not ovals are congruent
- whether or not triangles can be created from given angle measurements

Describing

- movements of figures
- observations about transforming parallel lines
- transformations using corresponding points, line segments, and angles
- observations about angle measurements
- transformations found in tessellations and in designs with rotational symmetry observations about scaled rectangles
- observations about dilated points, circles, and polygons
- sequences of transformations
- observations about side lengths in similar triangles

Generalizing

- about categories for movement
- about rotating line segments
- about the relationship between vertical angles
- about transformations and congruence
- about corresponding segments and length
- about alternate interior angles
- about the sum of angles in a triangle

Representing

- dilations using given scale factors and coordinates
- figures using specific transformations
- graphs of lines using equations

Academic Vocabulary

adjacent angles
alternate interior angles
angle measure
angle of rotation
approximate / approximately
area
-axis
base (of a prism or pyramid)
center (of rotation)
center of a dilation
clockwise

compass
complementary
condition
congruent
coordinate
coordinates
corresponding
counterclockwise
cross section
degree
degrees
different triangle
dilate
dilation
direction
distance
equation of a line
estimate
face
identical copy
image
intersect
line of reflection
measure
measurement error
measurements
midpoint
opposite
parallel
perimeter
perpendicular
plane
point
polygon
preserve
prism
protractor
pyramid
quadrilateral
quotient
radius
reflect
reflection
right angle
rigid transformation
rotate
rotation
scale factor
scaled copy
scaling
segment
sequence of transformations

side length
similar
similarity
slide
slope
slope triangle
straight angle
supplementary
supplementary angles
surface area
symmetry
tessellation
translate
translation
transversal
turn
unique triangle
vertex (of a pyramid)
vertex (of an angle)
vertex / vertices
vertical angles
volume

Learning Goal 1

Investigate sets of angle and side length measurements to determine if they combine to form unique triangles or multiple triangles, or fail to determine triangles. Study and apply angle relationships using the terms "complementary," "supplementary," "vertical angles," and "unique."

Target #1.1 -- DOK: 2 Skill/Concept

SWBAT

- find unknown angle measures by reasoning about adjacent angles with known measures.
- recognize when an angle measures 90°, 180°, or 360°.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.

MA.K-12.5	Use appropriate tools strategically.
MA.7.G.A	Draw, construct, and describe geometrical figures and describe the relationships between them.
MA.7.G.B	Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

Target #1.2 -- DOK: 2 Skill/Concept

SWBAT

- find unknown angle measures by reasoning about complementary or supplementary angles.
- recognize when adjacent angles are complementary or supplementary.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.7	Look for and make use of structure.
MA.7.G.B	Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.
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.

Target #1.3 -- DOK: 3 Strategic Thinking

SWBAT

- determine if angles that are not adjacent are complementary or supplementary.
- explain what vertical angles are in my own words.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.7	Look for and make use of structure.
MA.7.EE.A	Use properties of operations to generate equivalent expressions.
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.

Target #1.4 -- DOK: 3 Strategic Thinking

SWBAT

- reason through multiple steps to find unknown angle measures.
- recognize when an equation represents a relationship between angle measures.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.7.G.A	Draw, construct, and describe geometrical figures and describe the relationships between them.
MA.7.G.B	Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.
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.

Target #1.5 -- DOK: 2 Skill/Concept

SWBAT

- write an equation to represent a relationship between angle measures and solve the equation to find unknown angle measures.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.7.EE.B.4	Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
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.

Target #1.6 -- DOK: 2 Skill/Concept

SWBAT

- show that the 3 side lengths that form a triangle cannot be rearranged to form a different triangle.
- show that the 4 side lengths that form a quadrilateral can be rearranged to form different quadrilaterals.
- I can reason about a figure with an unknown angle.
- I can show whether or not 3 side lengths will make a triangle.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.7	Look for and make use of structure.

MA.7.NS.A.1	Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.
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.

Target #1.7 -- DOK: 2 Skill/Concept

SWBAT

- understand that changing which sides and angles are next to each other can make different triangles.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
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.

Target #1.8 -- DOK: 3 Strategic Thinking

SWBAT

- Given two angle measures and one side length, draw different triangles with these measurements or show that these measurements determine one unique triangle or no triangle.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.7.G.A	Draw, construct, and describe geometrical figures and describe the relationships between them.
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.

Learning Goal 2

Analyze and describe cross-sections of prisms, pyramids, and polyhedra. Understand and use the formula for the volume of a right rectangular prism, and solve problems involving area, surface area, and volume.

Target #2.1 -- DOK: 2 Skill/Concept

SWBAT

- explain that when a three dimensional figure is sliced it creates a face that is two dimensional.
- picture different cross sections of prisms and pyramids.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
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.

Target #2.2 -- DOK: 2 Skill/Concept

SWBAT

- explain why the volume of a prism can be found by multiplying the area of the base and the height of the prism.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.7.G.B.6	Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

Target #2.3 -- DOK: 2 Skill/Concept

SWBAT

- calculate the volume of a prism with a complicated base by decomposing the base into quadrilaterals or triangles.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.

MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
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.7.G.B.6	Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

Target #2.4 -- DOK 2 Skill/Concept

SWBAT

- find and use shortcuts when calculating the surface area of a prism.
- picture the net of a prism to help me calculate its surface area.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.7.G.B.6	Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

Target #2.5 -- DOK: 3 Strategic Thinking

SWBAT

- decide whether I need to find the surface area or volume when solving a problem about a real-world situation.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.7.G.B	Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.
MA.7.G.B.6	Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

Target #2.6 -- DOK: Strategic Thinking

SWBAT

- solve problems involving the volume and surface area of children's play structures.

| MA.K-12.1 | Make sense of problems and persevere in solving them. |

MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.7.RP.A.2a	Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.7.G.B	Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.
MA.7.G.B.6	Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

Learning Goal 3

Extend reasoning to plane figures with different rotation and mirror orientations. Identify and describe translations, rotations, and reflections, and sequences of these on and off square grids and the coordinate plane. Use mathematically precise language to ("corresponding points," "corresponding sides," and "image") to describe position.

Target #3.1 -- DOK: 2 Skill/Concept

SWBAT

- describe how a figure moves and turns to get from one position to another.
- identify corresponding points before and after a transformation.
- know the difference between translations, rotations, and reflections.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.7	Look for and make use of structure.
MA.8.G.A.1	Verify experimentally the properties of rotations, reflections, and translations:

Target #3.2 -- DOK: 3 Strategic Thinking

SWBAT

- decide which type of transformations will work to move one figure to another.
- use grids to carry out transformations of figures.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.7	Look for and make use of structure.
MA.8.G.A.1	Verify experimentally the properties of rotations, reflections, and translations:

Target #3.3 -- DOK 2 Skill/Concept

SWBAT

- use the terms translation, rotation, and reflection to precisely describe transformations.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.7	Look for and make use of structure.
MA.8.G.A.1	Verify experimentally the properties of rotations, reflections, and translations:

Target #3.4 -- DOK: 2 Skill/Concept

SWBAT

- apply transformations to points on a grid if I know their coordinates.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.4	Model with mathematics.
MA.K-12.7	Look for and make use of structure.
MA.8.G.A.3	Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

Target #3.5 -- DOK: 2 Skill/Concept

SWBAT

- apply transformations to a polygon on a grid if I know the coordinates of its vertices.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.8.G.A.1	Verify experimentally the properties of rotations, reflections, and translations:
MA.8.G.A.3	Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

Target #3.6 -- DOK: 2 Skill/Concept

SWBAT

- describe the effects of a rigid transformation on the lengths and angles in a polygon.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.8.G.A.1	Verify experimentally the properties of rotations, reflections, and translations:
MA.8.G.A.1a	Lines are transformed to lines, and line segments to line segments of the same length.
MA.8.G.A.1b	Angles are transformed to angles of the same measure.

Target #3.8 -- DOK 2: Skill/Concept

SWBAT

- can describe the effects of a rigid transformation on a pair of parallel lines.
- Given a pair of vertical angles and one of the angle measures known, find the angle measure of the other.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.7	Look for and make use of structure.
MA.8.G.A.1a	Lines are transformed to lines, and line segments to line segments of the same length.
MA.8.G.A.1b	Angles are transformed to angles of the same measure.
MA.8.G.A.1c	Parallel lines are transformed to parallel lines.

Target #3.9 -- DOK: 2 Skill/Concept

SWBAT

- find missing side lengths or angle measures using properties of rigid transformations.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.6	Attend to precision.
MA.8.G.A.1	Verify experimentally the properties of rotations, reflections, and translations:
MA.8.G.A.2	Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.

Target #3.10 -- DOK: 2 Skill/Concept

SWBAT

- decide visually whether or not two figures are congruent.
- decide using rigid transformations whether or not two figures are congruent.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.6	Attend to precision.
MA.8.G.A.1	Verify experimentally the properties of rotations, reflections, and translations:
MA.8.G.A.2	Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.

Target #3.11 -- DOK: 2 Skill/Concept

SWBAT

- use distances between points to decide if two figures are congruent.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.

MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.8.G.A.1a	Lines are transformed to lines, and line segments to line segments of the same length.
MA.8.G.A.2	Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.

Target #3.12 -- DOK: 2 Skill/Concept

SWBAT

- If two parallel lines cut by a transversal, identify alternate interior angles and use that to find missing angle measurements.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.8.G.A.1	Verify experimentally the properties of rotations, reflections, and translations:
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.

Target #3.13 -- DOK: 2 Skill/Concept

SWBAT

- if two of the angle measures in a triangle are known, I can find the third angle measure.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.8.G.A.2	Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.
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.

Target #3.14 -- DOK: 2 Skill/Concept

SWBAT

- explain using pictures why the sum of the angles in any triangle is 180 degrees.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
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.

Target #3.15- DOK: 3 Strategic Thinking

SWBAT

- repeatedly use rigid transformations to make interesting repeating patterns of figures.
- use properties of angle sums to reason about how figures will fit together.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.8.G.A	Understand congruence and similarity using physical models, transparencies, or geometry software.

Learning Goal 4

Use and extend knowledge of geometry and geometric measurement by looking at cut-out figures, first comparing them visually to determine if they are scaled copies of each other, then representing the figures in a diagram, and finally representing them on a circular grid with radial lines. Use mathematically precise language ("scale factor," "dilation" and "center of dilation") to describe figures.

Target #4.1 -- DOK: 2 Skill/Concept

SWBAT

- decide if one rectangle is a dilation of another rectangle.

- know how to use a center and a scale factor to describe a dilation.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.8.G.A	Understand congruence and similarity using physical models, transparencies, or geometry software.

Target # 4.2 -- DOK: 3 Strategic Thinking

SWBAT

- apply dilations to figures on a circular grid when the center of dilation is the center of the grid.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.8.G.A	Understand congruence and similarity using physical models, transparencies, or geometry software.

Target # 4.3 -- DOK: 3 Strategic Thinking

SWBAT

- apply a dilation to a polygon using a ruler.
- apply dilations to figures on a rectangular grid.
- if the angle measures and side lengths of a polygon are known, find the angles measures and side lengths of the polygon when a dilation with a certain scale factor is applied.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.8.G.A	Understand congruence and similarity using physical models, transparencies, or geometry software.

MA.8.G.A.3	Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

Target # 4.4 -- DOK: 3 Strategic Thinking

SWBAT

- apply dilations to polygons on a rectangular grid if I know the coordinates of the vertices and of the center of dilation.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.8.G.A	Understand congruence and similarity using physical models, transparencies, or geometry software.
MA.8.G.A.3	Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

Target #4.5 -- DOK: 3 Strategic Thinking

SWBAT

- apply a sequence of transformations to one figure to get a similar figure.
- use a sequence of transformations to explain why two figures are similar.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.8.G.A.2	Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.
MA.8.G.A.4	Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

Target #4.6 DOK: 2 Skill/Concept

SWBAT

- use angle measures and side lengths to conclude that two polygons are not similar.
- know the relationship between angle measures and side lengths in similar polygons.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.4	Model with mathematics.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.8.G.A.2	Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.
MA.8.G.A.4	Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

Target #4.7 DOK: 2 Skill/Concept

SWBAT

- know how to decide if two triangles are similar just by looking at their angle measures.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.8.G.A	Understand congruence and similarity using physical models, transparencies, or geometry software.
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.

Target #4.8 DOK 2: Skill/Concept

SWBAT

- decide if two triangles are similar by looking at quotients of lengths of corresponding sides.
- find missing side lengths in a pair of similar triangles using quotients of side lengths.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.

MA.K-12.4	Model with mathematics.
MA.K-12.6	Attend to precision.
MA.8.G.A	Understand congruence and similarity using physical models, transparencies, or geometry software.
MA.8.G.A.4	Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

Target #4.9 -- DOK: 2 Skill/Concept

SWBAT

- draw a line on a grid with a given slope.
- find the slope of a line on a grid.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.8.EE.B.6	Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.

Target #4.10 -- DOK: 2 Skill/Concept

SWBAT

- decide whether a point is on a line by finding quotients of horizontal and vertical distances.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.8.EE.B.6	Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.
MA.8.G.A	Understand congruence and similarity using physical models, transparencies, or geometry software.

Target #4.11 -- DOK: 2 Skill/Concept

SWBAT

- find an equation for a line and use that to decide which points are on that line.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.4	Model with mathematics.
MA.K-12.6	Attend to precision.
MA.8.EE.B	Understand the connections between proportional relationships, lines, and linear equations.
MA.8.G.A	Understand congruence and similarity using physical models, transparencies, or geometry software.
MA.8.G.A.3	Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

Target #4.12 -- DOK: 4 Extended Thinking

SWBAT

- model a real-world context with similar triangles to find the height of an unknown object.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.7	Look for and make use of structure.
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.

Summative Assessment

- End of Unit Test
- LinkIt!
- Pre-Unit Diagnostic Test
- Project
- Quiz

Formative Assessment and Performance Opportunities

- cK-12 Adaptive Practice

- Exit/Admit ticket

- Journal

- Kahoot

- Small group instruction

- Student-Teacher conference

- Think-Pair-Share

- Whiteboard Activities

21st Century Life and Careers

CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP6.1	Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP7.1	Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP8.1	Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.
CRP.K-12.CRP9	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP9.1	Career-ready individuals consistently act in ways that align personal and community-held ideals and principles while employing strategies to positively influence others in the

workplace. They have a clear understanding of integrity and act on this understanding in every decision. They use a variety of means to positively impact the directions and actions of a team or organization, and they apply insights into human behavior to change others' action, attitudes and/or beliefs. They recognize the near-term and long-term effects that management's actions and attitudes can have on productivity, morals and organizational culture.

CRP.K-12.CRP10	Plan education and career paths aligned to personal goals.
CRP.K-12.CRP10.1	Career-ready individuals take personal ownership of their own education and career goals, and they regularly act on a plan to attain these goals. They understand their own career interests, preferences, goals, and requirements. They have perspective regarding the pathways available to them and the time, effort, experience and other requirements to pursue each, including a path of entrepreneurship. They recognize the value of each step in the education and experiential process, and they recognize that nearly all career paths require ongoing education and experience. They seek counselors, mentors, and other experts to assist in the planning and execution of career and personal goals.
CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP11.1	Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.
CAEP.9.2.8.B.3	Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.
CAEP.9.2.8.B.6	Demonstrate understanding of the necessary preparation and legal requirements to enter the workforce.
TECH.8.1.8.A.1	Demonstrate knowledge of a real world problem using digital tools.
TECH.8.1.8.A.3	Use and/or develop a simulation that provides an environment to solve a real world problem or theory.
TECH.8.1.8.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
TECH.8.1.8.B.CS1	Apply existing knowledge to generate new ideas, products, or processes.
TECH.8.1.8.B.CS2	Create original works as a means of personal or group expression.
TECH.8.1.8.C.CS2	Communicate information and ideas to multiple audiences using a variety of media and formats.
TECH.8.1.8.D.CS2	Demonstrate personal responsibility for lifelong learning.
TECH.8.1.8.E	Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.
TECH.8.1.8.E.CS1	Plan strategies to guide inquiry.
TECH.8.1.8.F.CS1	Identify and define authentic problems and significant questions for investigation.

Accommodations & Modifications

- Adaptive Practice (cK-12 modality)
- Calculators
- Centers
- Document Cameras

- Geo-Solids
- Graphing Calculators
- Lesson Extentions
- Manipulatives
- Modifications as per IEP/504
- Pattern Blocks
- PLIX (cK-12 modality)
- Review and Practice
- Small Group Instruction

Unit Resources

See also: Illustrative Math Tasks Folder in Curriculum Portal

ALEKS

[cK-12 Accelerated 7th Grade Book](#)

Mr. Morgan's Math Help

  [Unit 7.7 Angles, Triangles and Prisms](#)

  [Unit 8.1 Rigid Transformations and Congruence](#)

  [Unit 8.2 Dilations, Similarity, and Introducing Slope](#)

NJCTL (New Jersey Center for Teaching and Learning)

  [Drawing Geometric Figures](#)

  [2D Geometry (7th Grade)](#)

  [2D Geometry (8th Grade)](#)

cK-12 PLIX:

  Triangle classification: [Types of Triangles](#)

Triangle area: [Ice Cream Cones](#)

Triangle Congruence: [Congruence Conundrum](#)

Vertical Angles: [Yo-yo Eiffel Tower Trick](#)

Desmos activities:

[Sketchy Dilations](#)

[Puzzling it Out](#)

[Laser Challenge](#)

[Slope Challenge](#)

[Which is Steepest?](#)

Interdisciplinary Connections

Have students design a net for a box (or another shape) in which to ship a specific item. Have students consider factors such as volume needed and minimizing surface area (material) to protect the environment and minimize waste.

SCI.MS-ESS3-3	Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.