



Grade 7 Pre-Algebra - Unit F - Geometry (Angles, Prisms and Transformations)

Unit Focus

In this unit students briefly 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”. Parallel lines and the angles that result when there is a transversal are examined. Students see a simple proof for finding the angle sum of a triangle and then use this property to solve problems including those with exterior angles. The work gives them practice working with rational numbers and equations for angle relationships. Next, moving on to three dimensional objects, students analyze and describe cross-sections of prisms, pyramids, and polyhedra. They understand and use the formula for the volume of any prism, and solve problems involving area, surface area, and volume of prisms.

The students will use their geometry skills in the Poster Packaging PBA where they analyze a given box and improve upon it based on their own criteria.

The unit also includes a study of rigid transformations including dilations, rotations, reflections and translations. Students pay particular attention to similarities and differences between the image and its new image. This topic is an 8th grade standard and teachers, as a team, may decide to teach it out of sequence at another point later in the year.

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer	
Common Core Mathematics: 7 - Draw (freehand, with ruler and protractor, and with technology) 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. (CCSS.MATH.CONTENT.7.G.A.2) - Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids. (CCSS.MATH.CONTENT.7.G.A.3) - 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. (CCSS.MATH.CONTENT.7.G.B.5) - 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. (CCSS.MATH.CONTENT.7.G.B.6) - Make sense of problems and persevere in solving them. (CCSS.MATH.MP.1) - Construct viable arguments and critique the reasoning of others. (CCSS.MATH.MP.3)	<i>Students will be able to independently use their learning to...</i> T1 Construct viable arguments using clear and appropriate mathematical language and critique the reasoning of others. T2 Demonstrate fluency with mathematical computations and definitions. T3 Initiate a plan using a variety of methods/strategies appropriately, execute it, and evaluate the reasonableness and accuracy of the solution.	
	Meaning	
	Understanding(s)	Essential Question(s)
	<i>Students will understand that...</i> U1 Mathematicians construct viable arguments to explain problems, solutions, and mathematical representations. U2 Mathematicians work to make sense of the problem before trying to solve it.	<i>Students will keep considering...</i> Q1 What relationship(s) in the diagram do I see? Q2 What do effective problem solvers do when they get stuck?
	Acquisition of Knowledge and Skill	
	Knowledge	Skill(s)
	<i>Students will know...</i> K1 Vocabulary: straight angle, adjacent angles, right angle, supplementary, complementary, measurement error, vertical angles, vertex (of an angle), intersect, cross section, base (of a prism or pyramid), prism, pyramid,	<i>Students will be skilled at...</i> S1 identifying and distinguishing complementary, supplementary, adjacent and vertical angles.

Stage 1: Desired Results - Key Understandings

- Attend to precision. (CCSS.MATH.MP.6)

Mathematics: 8

- Lines are taken to lines, and line segments to line segments of the same length. (CCSS.MATH.CONTENT.8.G.A.1A)
- Angles are taken to angles of the same measure. (CCSS.MATH.CONTENT.8.G.A.1B)
- Parallel lines are taken to parallel lines. (CCSS.MATH.CONTENT.8.G.A.1C)
- 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. (CCSS.MATH.CONTENT.8.G.A.2)
- Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. (CCSS.MATH.CONTENT.8.G.A.3)
- 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. (CCSS.MATH.CONTENT.8.G.A.4)
- 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. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so. (CCSS.MATH.CONTENT.8.G.A.5)

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- Analyzing: Examining information/data/ evidence from multiple sources to identify possible underlying assumptions, patterns, and relationships in order to make inferences. (POG.1.2)

volume, face, surface area, parallel, transformation, translation, rotation, dilation, reflection

K2 that given a set of criteria for a shape a triangle may or not be able to be created.

K3 that given a set of criteria for a shape a unique triangle may or not be able to be created.

K4 how to name an angle.

K5 how to classify an angle by its size (acute, straight, right, obtuse)

K6 that the volume of any prism is the area of the base times the height of the prism.

K7 the relationship between the angles formed when two parallel lines are cut by a transversal.

K8 that the sum of the angles of a triangle is 180 degrees.

K9 that an exterior angle of a triangle is equal to the sum of the two remote interior angles.

K10 that when a rigid transformation is performed the resulting shape will have corresponding angles that are equal to the original shape.

K11 that when a rigid transformation is performed the resulting shape will have corresponding sides that are proportional to the original shape.

K12 that the transformation of a figure results in a similar figure (or even more specifically - congruent).

S2 finding missing angle measurements of complementary, supplementary and vertical angles (both those that involve algebra and those that do not).

S3 identifying the cross section(s) that will result from slicing solids.

S4 using surface area and volume in application problems.

S5 finding the missing angle of a triangle when given two other angles.

S6 finding the volume of a prism with a triangular base, a rectangular base or some combination of these two bases.

S7 using the exterior angle of a triangle theorem to solve for unknown angles in a diagram

S8 finding missing angles in a diagram involving parallel lines

S9 performing a transformation (translation, rotations, reflection, dilation) or a series of transformations on a shape.

S10 determining if two shapes are congruent

S11 determining if two shapes are similar.