



Grade 8 Pre-Algebra - Unit A - Transformations

Unit Focus

In this unit, students continue their study of geometry and geometric measurement. Student will extend their reasoning of plane figures with different rotation and mirror orientations. Students first encounter examples of transformations in the plane, without the added structure of a grid or coordinates and then extend this reasoning to transforming shapes on a square grid. Students identify and describe translations, rotations, and reflections, and sequences of these. Students learn that angles and distances are preserved by any sequence of translations, rotations, and reflections, and that such a sequence is called a "rigid transformation." Students experimentally verify the properties of translations, rotations, and reflections, and use these properties to reason about plane figures, understanding informal arguments showing that the alternate interior angles cut by a transversal have the same measure and that the sum of the angles in a triangle is 180 degrees. Students further their knowledge of transformations by comparing figures 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. Students draw images of figures under dilations on and off square grids and the coordinate plane. Students learn that angle measures are preserved under a dilation, but lengths in the image are multiplied by the scale factor.

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer	
Standards - Common Core - Mathematics: 8 - Verify experimentally the properties of rotations, reflections, and translations: (CCSS.MATH.CONTENT.8.G.A.1) - 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 congruence and similarity using physical models, transparencies, or geometry software. - 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-	<i>Students will be able to independently use their learning to...</i> T1 Initiate a plan using a variety of methods/strategies appropriately, execute it, and evaluate the reasonableness and accuracy of the solution. (MP 1) T2 Apply models to solve problems. (MP4)	
	Meaning	
	Understanding(s)	Essential Question(s)
	<i>Students will understand that...</i> U1 Mathematicians create or use models to generalize, represent, and solve problems. U2 Mathematicians work to make sense of the problem before trying to solve it.	<i>Students will keep considering...</i> Q1 What model best represents this problem? Q2 How do I determine that my answer makes sense? Q3 What makes an effective problem solver?
	Acquisition of Knowledge and Skill	
	Knowledge	Skill(s)
	<i>Students will know...</i> K1 Vocabulary: vertex, clockwise, counterclockwise, reflection, rotation, translation, image, sequence of transformations, coordinate plane, rigid transformation, corresponding, vertical angles, congruent, alternate interior	<i>Students will be skilled at...</i> S1 Identifying corresponding points before and after a transformation. S2 Applying transformations to points and figures on a grid when given their coordinates.

Stage 1: Desired Results - Key Understandings

dimensional figures, describe a sequence that exhibits the similarity between them. <i>(CCSS.MATH.CONTENT.8.G.A.4)</i> ▪ 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. <i>(CCSS.MATH.CONTENT.8.G.A.5)</i> ▪ Mathematical Practices ▪ Model with mathematics. <i>(CCSS.MATH.MP.4)</i> Madison Public Schools Profile of a Graduate • Analyzing: Examining information/data/evidence from multiple sources to identify possible underlying assumptions, patterns, and relationships in order to make inferences. <i>(POG.1.2)</i>	angles, transversal, straight angle, scale factor, dilation, center of dilation, similar, slope K2 A translation is determined by two points that specify the distance and direction of the translation. K3 A rotation is determined by a point, angle of rotation, and a direction of rotation. K4 A reflection is determined by a line. K5 Which transformations preserve congruence and which one doesn't. K6 That the phrase "rigid transformation" refers to a transformation where all pairs of "corresponding distances" and "corresponding angle" measures in the figure and its image are the same. K7 That a rotation by 180 degrees about a point of two intersecting lines moves each angle to the angle that is vertical to it. K8 Vertical angles are congruent. K9 That lengths and angle measures are preserved under any rigid transformation. K10 That congruent figures have equal corresponding side lengths, angle measures, and areas. K11 Alternate interior angles are congruent. K12 The interior angles of a triangle add up to 180 degrees. K13 A dilation is a process that produces scaled copies. K14 The phrase "similar figures" means there is a sequence of translations, rotations, reflections, and dilations that takes one figure to the other. K15 Similar figures have congruent corresponding angles and proportional corresponding sides. K16 Triangles sharing two common angles measures are similar. K17 Quotients of corresponding sides in similar polygons are equal.	S3 Describing how to move one part of a figure to another using a rigid transformation. S4 When given a pair of vertical angles and the angle measure of one of them, finding the angle measure of the other. S5 Finding missing side lengths or angle measures using properties of rigid transformations. S6 Determining congruence of shapes by measuring the distance between points and/or stating a sequence of rigid transformations that takes one shape to the other. S7 Identifying alternate interior angles and using them to find missing angle measurements. S8 Finding the missing angle of a triangle when given the measurements of the other two angles. S9 Describing a dilation using a center and a scale factor. S10 Applying dilations on a circular grid, a square grid, and a coordinate grid. S11 Applying dilations of polygons on a coordinate grid when given the coordinates of the vertices and of the center of dilation. S12 Applying a sequence of transformations to one figure to get a similar figure. S13 Using angle measures and side lengths to conclude that two polygons are not similar. S14 Finding missing sides in a pair of similar triangles using quotients of side lengths.
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