

Unit 12: Transformations and Similarity

Cluster: Understand congruence and similarity using physical models, transparencies, or geometry software.

Nevada Academic Content Standard

What does this standard mean that a student will know and be able to do? (adapted from North Carolina 8th Grade Standards, *Unpacked Content*)

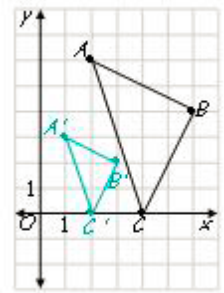
8.G.A.3

Describe the effect of **dilations**, translations, rotations, and reflections on two-dimensional figures using coordinates.

8.G.3 Dilations

A dilation is a non-rigid transformation that moves each point along a ray which starts from a fixed center, and multiplies distances from this center by a common scale factor. Dilations enlarge (scale factors greater than one) or reduce (scale factors less than one) the size of a figure by the scale factor. In 8th grade, dilations will be from the origin. The dilated figure is *similar* to its pre-image.

The coordinates of A are $(2, 6)$; A' $(1, 3)$. The coordinates of B are $(6, 4)$ and B' are $(3, 2)$. The coordinates of C are $(4, 0)$ and C' are $(2, 0)$. Each of the image coordinates is $\frac{1}{2}$ the value of the pre-image coordinates indicating a scale factor of $\frac{1}{2}$.



The scale factor would also be evident in the length of the line segments using the ratio: $\frac{\text{image length}}{\text{pre-image length}}$

Students recognize the relationship between the coordinates of the pre-image, the image and the scale factor for dilation from the origin. Using the coordinates, students are able to identify the scale factor (image/pre-image).

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.

8.G.4 Similar figures and similarity are first introduced in the 8th grade.

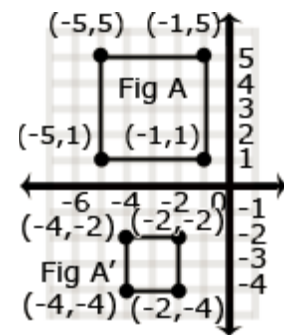
Students understand similar figures have congruent angles and sides that are proportional. Similar figures are produced from dilations. Students describe the sequence that would produce similar figures, including the scale factors. Students understand that a scale factor greater than one will produce an enlargement in the figure, while a scale factor less than one will produce a reduction in size.

Example 1:

Is Figure A similar to Figure A'?

Explain how you know.

Solution: Dilated with a scale factor of $\frac{1}{2}$, then reflected across the x -axis, making Figures A and A' similar.



	<p>Students need to be able to identify that triangles are similar or congruent based on given information.</p> <p><i>Example 2:</i> Describe the sequence of transformations that results in the transformation of Figure A to Figure A'.</p> <p><i>Solution:</i> Rotated 180°, translated 4 right and 2 up, dilated $\frac{1}{2}$. In this case, the scale factor of the dilation can be found by using the horizontal distances on the triangle (image = 2 units; pre-image = 4 units).</p>	
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Approximate Time Frame: 1-2 weeks

Terms:

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| ✓ composition of transformations | ✓ corresponding parts
✓ dilation | ✓ similar
✓ scale factor |
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Resources

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| <p>MGH – McGraw Hill, <i>Glencoe Math (2015)</i>
 ML – McDougal Littell, <i>Pre-Algebra Book; Larson, 2005</i>
 EX – <i>Explorations in Core Math (Holt McDougal)</i>
 LZ – Learn Zillion Website</p> | <p>NY – <i>Engage New York</i>
 IL – <i>Illinois Model Math Curriculum</i>
 MAP – <i>Math Assessment Project (MARS)</i></p> |
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	Suggested Topics for Lessons	Suggested Resources
8.G.A.3	<p>Dilations</p> <p>SBAC Evidence:</p> <ul style="list-style-type: none"> ➤ The student constructs a new figure after the original figure is dilated, rotated, reflected, or translated. ➤ The student describes the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. 	<ul style="list-style-type: none"> ➤ MGH 6-4 Inquiry Lab: <i>Dilations</i> (page 483) ➤ MGH 6-4 <i>Dilations</i> (page 487) ➤ ML 13.7 <i>Dilations</i> (page 747) ➤ EX 4-4 <i>Dilations</i> (page 157) ➤ NY Module 3, Topic A, Lessons 1-7: <i>Dilation</i> ➤ PBS Learning Media: Math Shorts Video—Dilations ➤ PBS Learning Media: KCPT Video Rotation and Dilation ➤ LZ Lesson Set: Analyze dilation of parallelograms (Knab) ➤ LZ Lesson Set: Graph a dilated image using using coordinates (Knab)
8.G.A.4	<p>Similarity</p> <p>SBAC Evidence:</p> <ul style="list-style-type: none"> ➤ The student describes sequences of rotations, reflections, translations, and dilations that can verify whether two 	<ul style="list-style-type: none"> ➤ MGH 7-3 Inquiry Lab: <i>Similar Triangles</i> (page 535) ➤ MGH 7-3 <i>Similarity and Transformations</i> (page 537) ➤ MGH 7-4 <i>Properties of Similar Polygons</i> (page 545) ➤ MGH 7-5 <i>Similar Triangles and Indirect Measurement</i> (page 553) ➤ MGH 7-6 <i>Slope and Similar Triangles</i> (page 561) ➤ (Review/prep) ML 6.1 <i>Ratios and Rates</i> (page 269) ➤ (Review/prep) ML 6.2 <i>Writing and Solving Proportions</i> (page 275)

	<p>dimensional figures are similar or congruent to each other.</p>	<ul style="list-style-type: none"> ➤ (Review/prep) ML 6.3 <i>Solving Proportions Using Cross Products</i> (page 280) ➤ (Review/prep) EX 4-1 <i>Ratios, Rates, and Unit Rates</i> (page 143) ➤ (Review/prop) EX 4-2 <i>Solving Proportions</i> (page 147) ➤ ML 6.4 (Activity) <i>Investigating Similar Figures</i> (page 287) ➤ ML 6.4 (Lesson) <i>Similar Figures and Congruent Figures</i> (page 288) ➤ EX 4-3 <i>Similar Triangles</i> (page 151) ➤ EX 5-8 <i>Combining Transformations with Dilations</i> (page 211) ➤ MAP Assessment Lesson: <u>Identifying Similar Triangles</u> ➤ NY Module 3, Topic B, Lessons 8-12: <u>Similarity</u> ➤ Khan Academy Skills Practice: <u>Exploring angle-preserving transformations & similarity</u> ➤ PBS Learning Media: <u>School Yourself Geometry: Defining Similarity</u> ➤ PBS Learning Media: <u>School Yourself Geometry: Similar Ratios</u> ➤ LZ Lesson: <u>Prove two figures are similar after a dilation</u> ➤ Sophia Slide Show: <u>Using Similar Triangles to Make Indirect Measurements</u> ➤ YouTube: <u>Indirect Measurement Using Similar Triangles</u>
	<p>Area and Perimeter of Similar Figures (appears on CCSD semester exam)</p>	<ul style="list-style-type: none"> ➤ MGH 7-7 <i>Area and Perimeter of Similar Figures</i> (page 569) ➤ Math Warehouse: <u>Area and Perimeter of Similar Triangles</u>