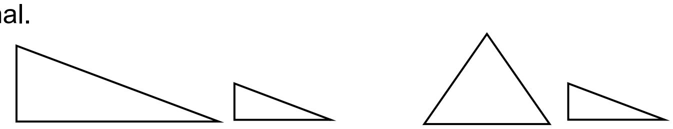
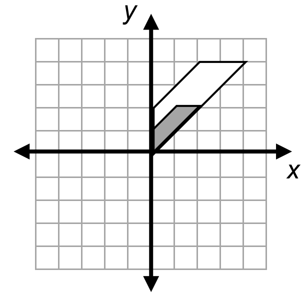
STUDENT RESOURCES

Word or Phrase	Definition
congruent figures	Two figures in the plane are <u>congruent figures</u> if the second can be obtained from the first by a sequence of one or more translations, rotations, and reflections. Two squares are congruent if they have the same side-length.  congruent not congruent
dilation	A <u>dilation</u> is a transformation that moves each point along the ray through the point emanating from a fixed center, multiplying distances from the center by a common scale factor. The fixed center is referred to as a "center point." The transformation of the plane mapping $(x, y) \rightarrow (2x, 2y)$ is a dilation with center at the origin and scale factor 2.
image	The <u>image</u> of a function or transformation is the collection of its output values. The input values are then referred to as the pre-image. See <u>transformation</u>.
rigid motion	A <u>rigid motion</u> is a transformation that preserves distances. Any rigid motion of the plane is a sequence of one or more translations, rotations, and reflections. Rigid motions also preserve lengths, angle measures, and parallel lines.
scale factor	A <u>scale factor</u> is a positive number which multiplies some quantity.
similar figures	Two figures in the plane are <u>similar figures</u> if one can be moved to exactly cover the other by a sequence of one or more translations, rotations, reflections, and dilations. In similar figures, corresponding angles are congruent, and lengths of corresponding sides are proportional.  similar not similar If $\triangle ABC$ is similar to $\triangle DEF$, we write $\triangle ABC \sim \triangle DEF$.
transformation	A <u>transformation</u> is a function that maps points in the plane (called the pre-image) to points in the plane (called the <u>image</u>). Translations, rotations, reflections, and dilations are transformations of the plane.

Dilations of the Plane

A dilation is a transformation of the plane that is used to resize an object.
Multiplying by a scale factor:

- greater than 1 results in an enlargement of the pre-image.
- between 0 and 1 results in a reduction of the pre-image.
- equal to 1 results in a figure congruent to the pre-image.



The transformation of the plane to the right

- has a center at the origin and a scale factor of 2, and
- can be represented by the rule $(x, y) \rightarrow (2x, 2y)$.

Dilations share many but not all of the properties of translations, rotations, and reflections. Dilations

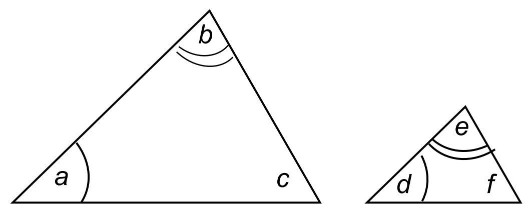
- map lines to lines (in fact to lines with the same slope),
- map parallel lines to parallel lines (that is, they preserve parallelism), and
- map angles to angles of the same measure.

However, dilations DO NOT, in general, preserve distances. The only dilation with the center at the origin that preserves distances is the identity transformation $(x, y) \rightarrow (x, y)$, which has scale factor $s = 1$.

The Angle-Angle Criterion for Similarity of Triangles

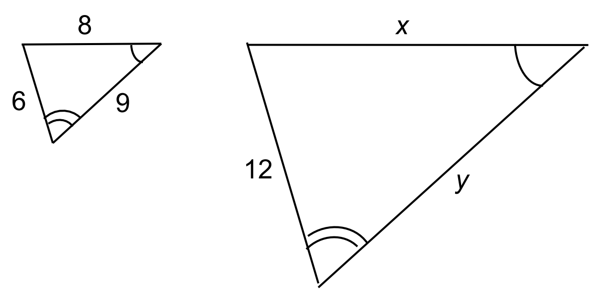
A-A criterion: If two angles of one triangle are congruent to two angles of another triangle, then the triangles are similar.

In the figures to the right, if the sums of the angles in both triangles are to be 180°, then angles *c* and *f* must have the same measure. Therefore, the two triangles must be similar.



Finding Side Lengths of Similar Triangles

If the two triangles below are similar, there are two basic ways to set up proportions to find missing side lengths.



Method 1: Establish values of ratios of corresponding segments **between** the two figures.

$\frac{6}{12} = \frac{8}{x} \rightarrow x = 16$ and $\frac{6}{12} = \frac{9}{y} \rightarrow y = 18$

Method 2: Establish values of ratios of corresponding segments **within** the two figures.

$\frac{8}{6} = \frac{x}{12} \rightarrow x = 16$ and $\frac{9}{6} = \frac{y}{12} \rightarrow y = 18$