Name:_____          Date:_____

# Congruence: Transformations in a Plane

A **transformation** is a change in the position, size, or shape of a figure or graph. There are several types of transformations in geometry. Reflections, translations, and rotations do not change the size or shape of a figure. Their motion is considered rigid.
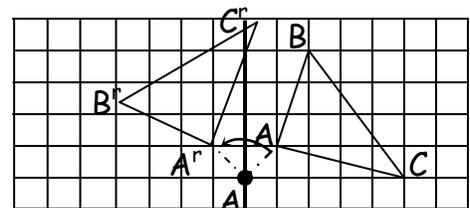
A **translation** is a transformation in which all points of a figure move the same distance in the same direction.
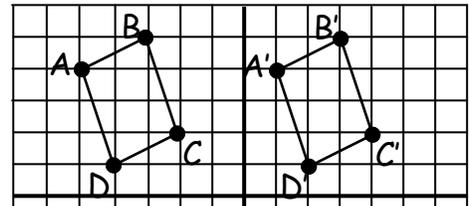
A **reflection** is a transformation across a line called the line of reflection.
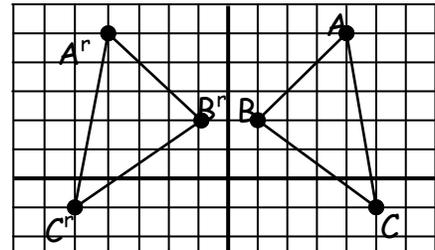
A **rotation** is a transformation about a center of rotation that is equal distance from each figure.

A **tessellation** is a repeated pattern that completely covers a plane with no gaps or overlaps. These are formed by a combination of rotations, reflections, and translations. The angles that line up at each vertex add up to 360.
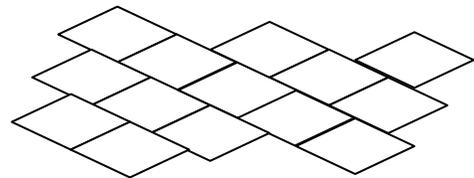
Any image created by rigid transformation can be rotated, translated, or reflected so that it completely overlaps the original image, or *preimage*.

Non-rigid transformations include stretching and dilating, as shown here:

1.

2.
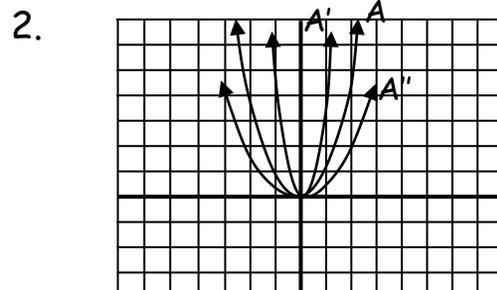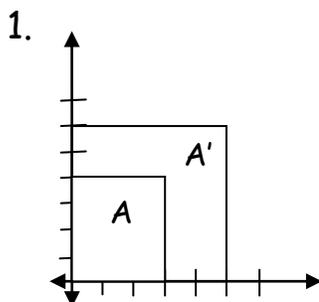
In Example 1 above, A is dilated to A' along the x and y axis. Though the side lengths are affected by the transformation, the angles remain the same. These images are similar, but not congruent.

In Example 2 above, the parabola is vertically stretched in A →A' and compressed in A → A". These objects are similar (share the same parent function), but are not congruent.
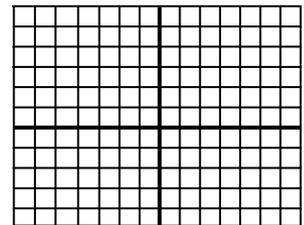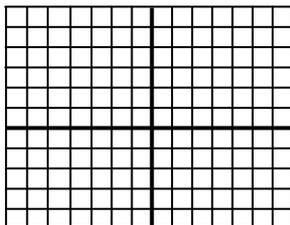
Practice. Describe the transformation.

1.

2.
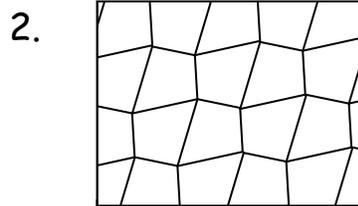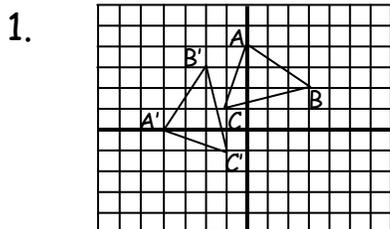
3. $\triangle ABC \rightarrow (-y, x)$

4. $\triangle ABC \rightarrow (x-6, y+2)$

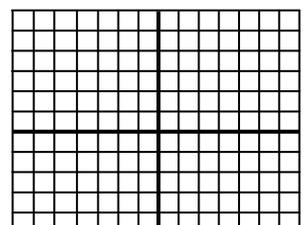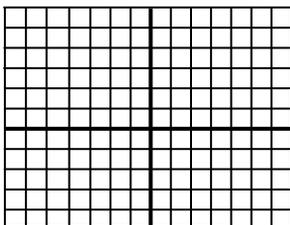Graph the transformation for $\triangle ABC$: A(0,1); B(6,2); C(-3,4)

5. $\triangle ABC \rightarrow (x +2, y-1)$

6. $\triangle ABC \rightarrow (-y, x)$

7. $\triangle ABC$ reflected about y=0

8. $\triangle ABC$ rotated 180 about the origin

Describe the transformation required so that A' lies directly over A.

9.

A          A'

10.

A'          A

**Answer Key**

**Congruence: Transformations in a Plane**

1. Rotation 90 left
2. Tessellation composed of reflection, rotation, and translation
3. Rotation 90 left
4. Translation up 2, left 6
Check Student Graphs.
5. A'(2,0); B'(8,1); C'(-1,3)
6. A'(-1,0); B'(-2,6); C'(-4,-3)
7. A'(0,-1); B'(6,-2); C'(-3,-4)
8. A'(-1,0); B'(-2,-6); C'(-4,3)
9. Rotation
10. Dilation and reflection