

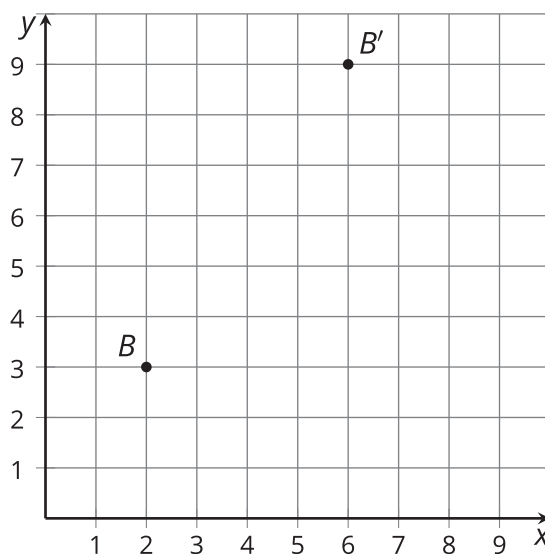


# Types of Transformations

Let's analyze transformations that produce congruent and similar figures.

## 3.1 Why Is It a Dilation?

Point  $B$  was transformed using the coordinate rule  $(x, y) \rightarrow (3x, 3y)$ .

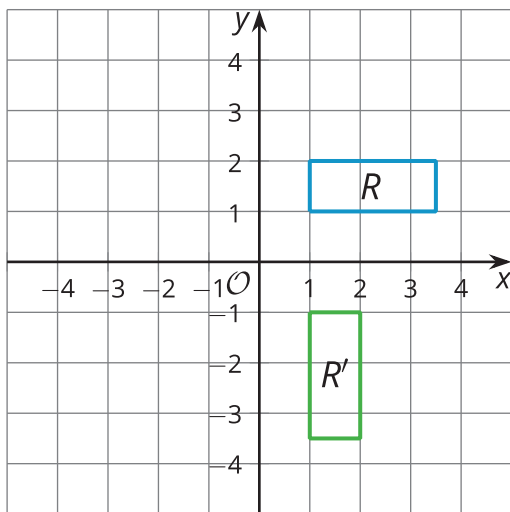


1. Add these auxiliary points and lines to create 2 right triangles: Label the origin  $P$ . Plot points  $M(2, 0)$  and  $N(6, 0)$ . Draw segments  $PB'$ ,  $MB$ , and  $NB'$ .
2. How do triangles  $PMB$  and  $PNB'$  compare? How do you know?
3. What must be true about the ratio  $PB : PB'$ ?

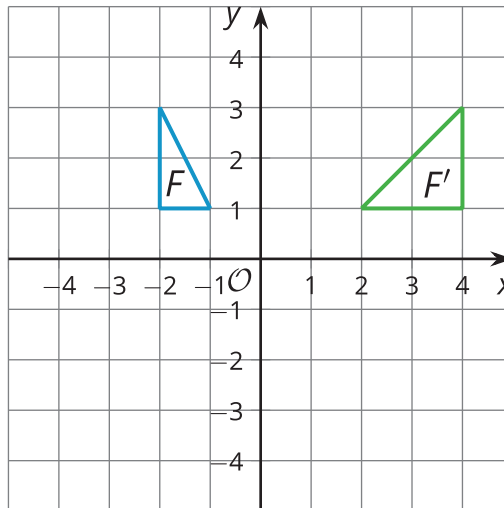
## 3.2 Congruent, Similar, Neither?

Match each image to its rule. Then, for each rule, decide whether it takes the original figure to a congruent figure, a similar figure, or neither. Explain or show your reasoning.

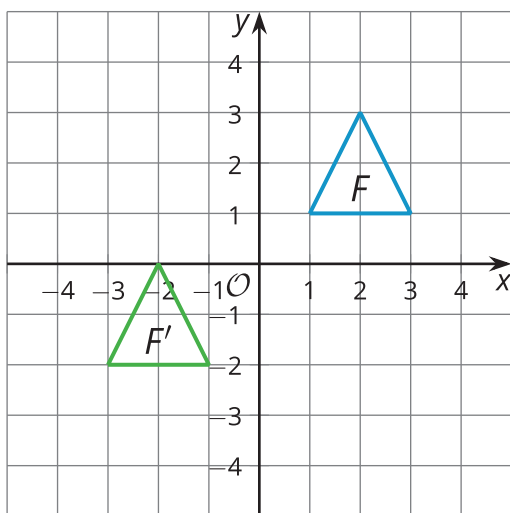
A



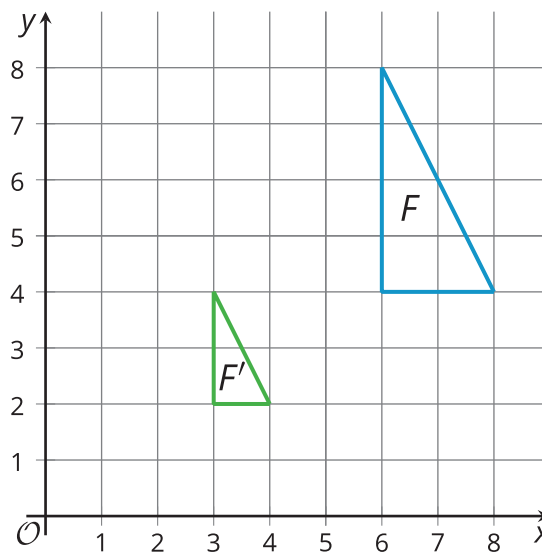
B



C



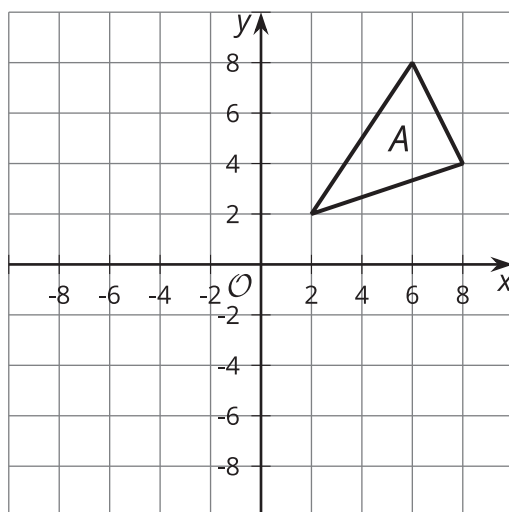
D



1.  $(x, y) \rightarrow \left(\frac{x}{2}, \frac{y}{2}\right)$
2.  $(x, y) \rightarrow (y, -x)$
3.  $(x, y) \rightarrow (-2x, y)$
4.  $(x, y) \rightarrow (x - 4, y - 3)$

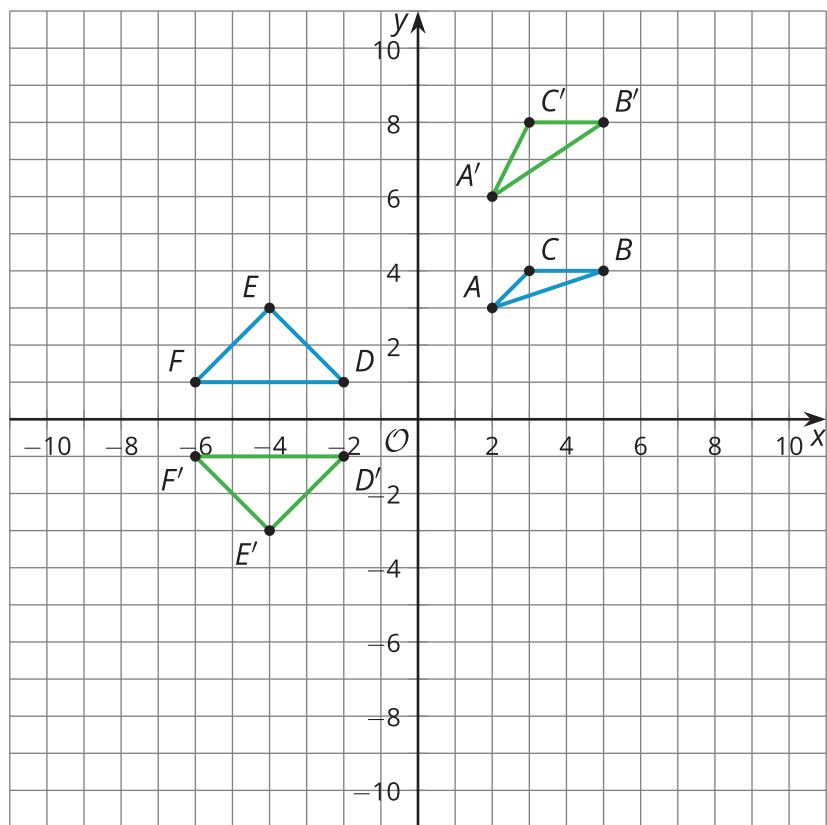
 **Are you ready for more?**

Here is triangle  $A$ .



1. Reflect triangle  $A$  across the line  $x = 2$ .
2. Write a single rule that reflects triangle  $A$  across the line  $x = 2$ .

### 3.3 You Write the Rules

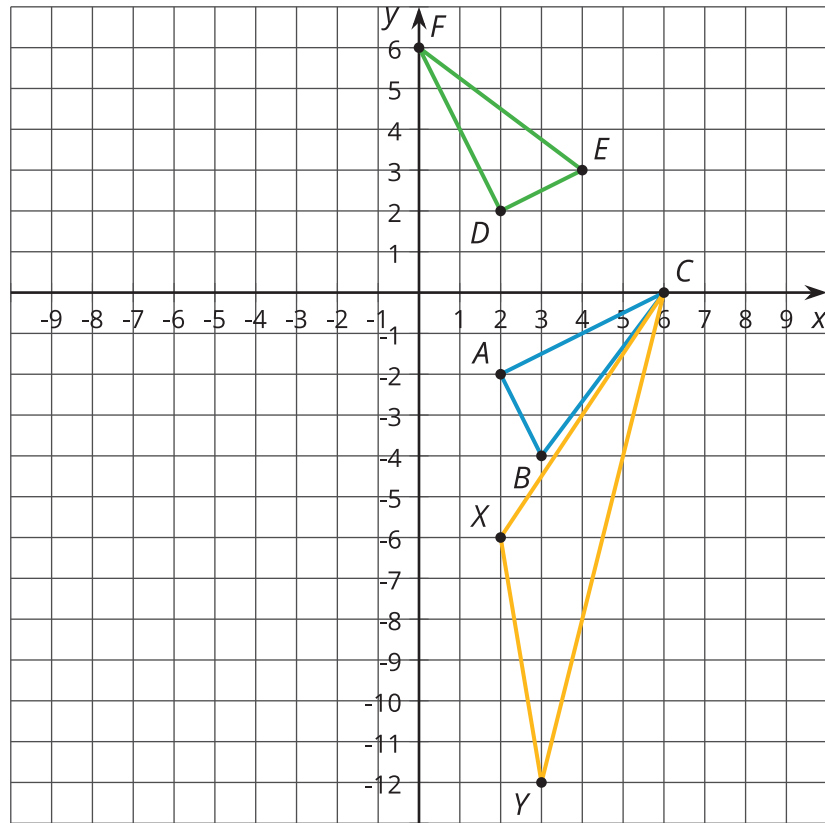


1. Write a rule that will transform triangle  $ABC$  to triangle  $A'B'C'$ .
2. Are  $ABC$  and  $A'B'C'$  congruent? Similar? Neither? Explain how you know.
3. Write a rule that will transform triangle  $DEF$  to triangle  $D'E'F'$ .
4. Are  $DEF$  and  $D'E'F'$  congruent? Similar? Neither? Explain how you know.

### Lesson 3 Summary

Triangle  $ABC$  has been transformed in two different ways:

- $(x, y) \rightarrow (-y, x)$ , resulting in triangle  $DEF$
- $(x, y) \rightarrow (x, 3y)$ , resulting in triangle  $XYC$



Let's analyze the effects of the first transformation. If we calculate the lengths of all the sides, we find that segments  $AB$  and  $DE$  each measure  $\sqrt{5}$  units,  $BC$  and  $EF$  each measure 5 units, and  $AC$  and  $DF$  each measure  $\sqrt{20}$  units. The triangles are congruent by the Side-Side-Side Triangle Congruence Theorem. That is, this transformation leaves the lengths and angles in the triangle the same—it is a rigid transformation.

Not all transformations keep lengths or angles the same. Compare triangles  $ABC$  and  $XYC$ . Angle  $X$  is larger than angle  $A$ . All of the side lengths of  $XYC$  are larger than their corresponding sides. The transformation  $(x, y) \rightarrow (x, 3y)$  stretches the points on the triangle 3 times farther away from the  $x$ -axis. This is not a rigid transformation. It is also not a dilation since the corresponding angles are not congruent.