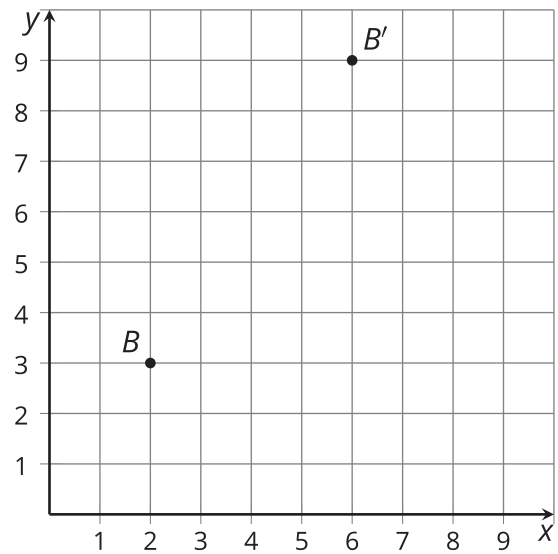
Unit 5, Lesson 3

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 $(x, y) \rightarrow (3x, 3y)$.

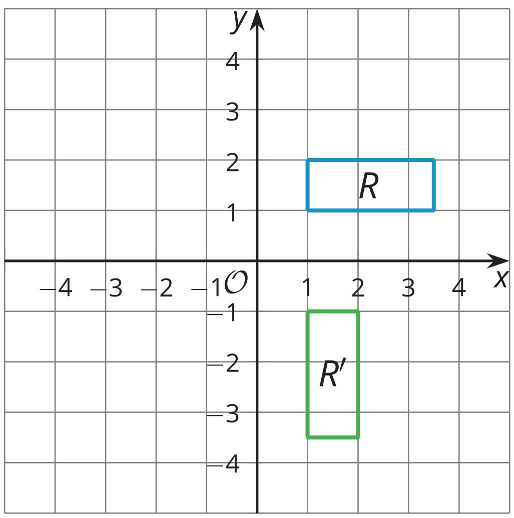


1. Add these auxiliary points and lines to create 2 right triangles: Label the origin P. Plot points $M(2, 0)$ and $N(6, 0)$. Draw segments PB', MB, and NB'.
2. How do triangles PMB and PNB' compare? How do you know?
3. What must be true about the ratio $PB : PB'$?

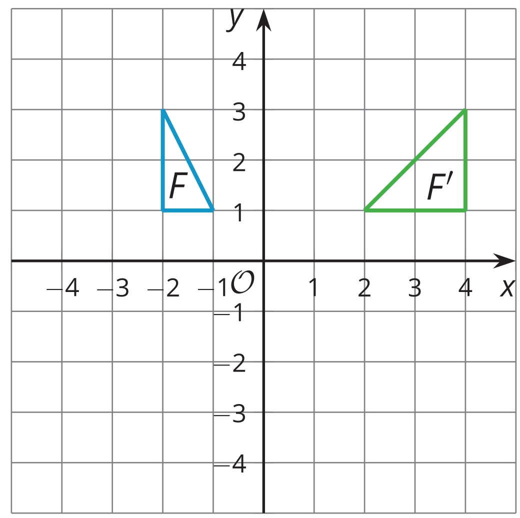
3.2 Congruent, Similar, Neither?

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.

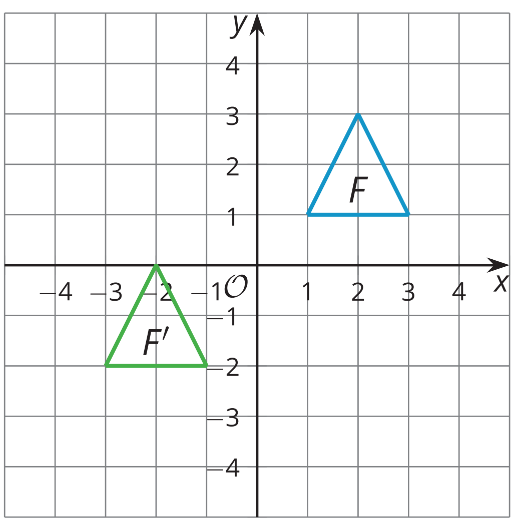
A



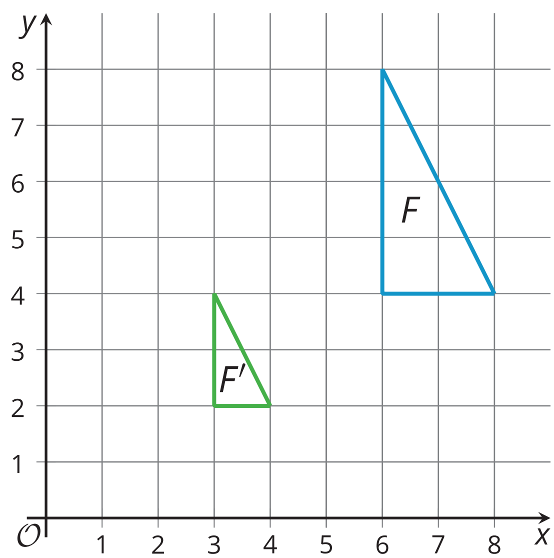
B



C



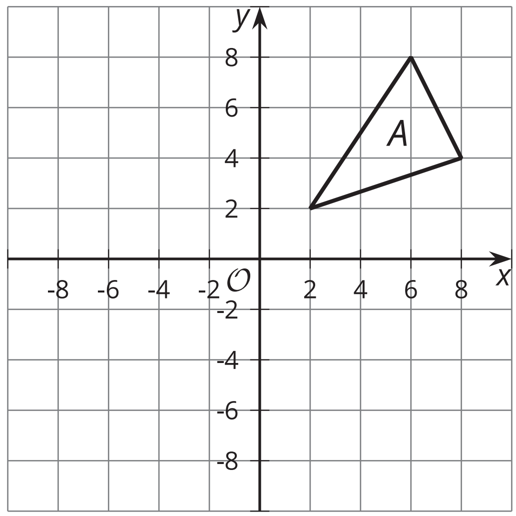
D



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. $(x, y) \rightarrow (x - 4, y - 3)$

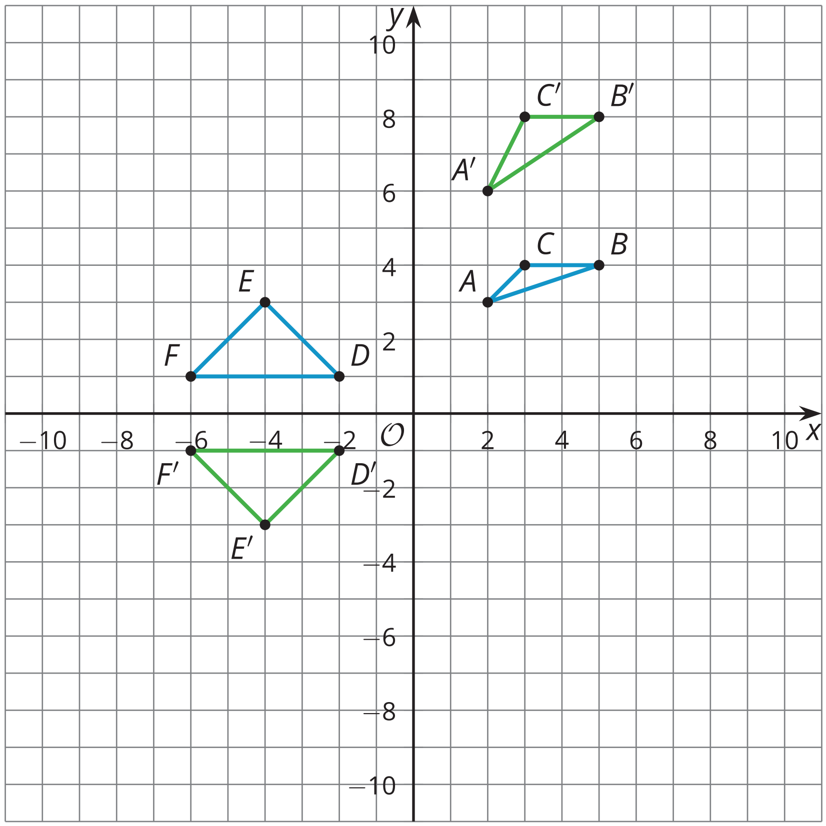
Are you ready for more?

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.

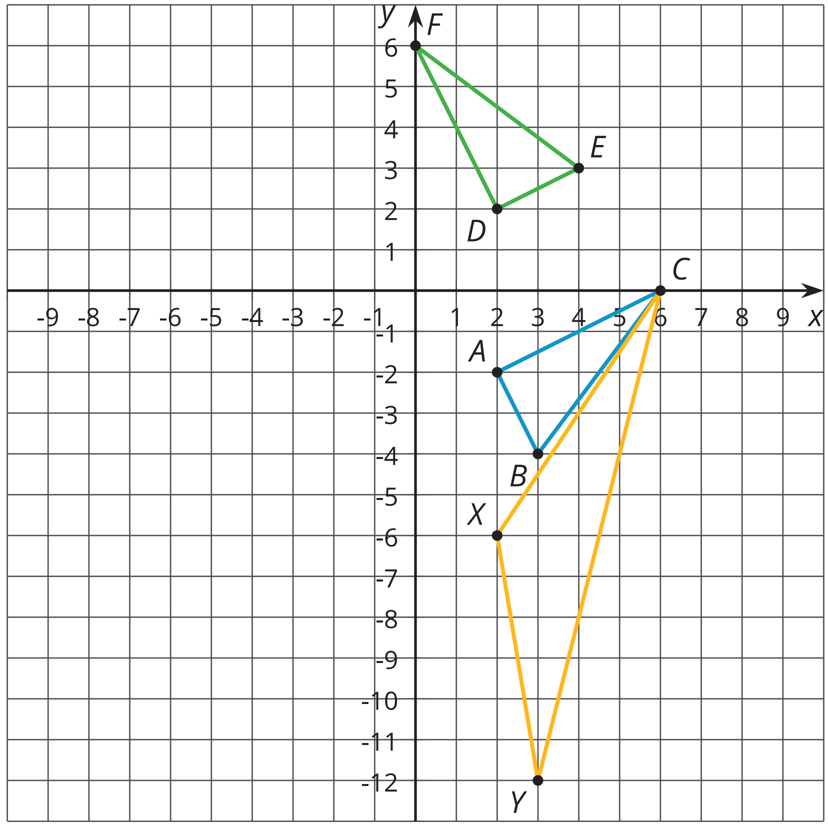
3. Write a rule that will transform triangle DEF to triangle $D'E'F'$.

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.

