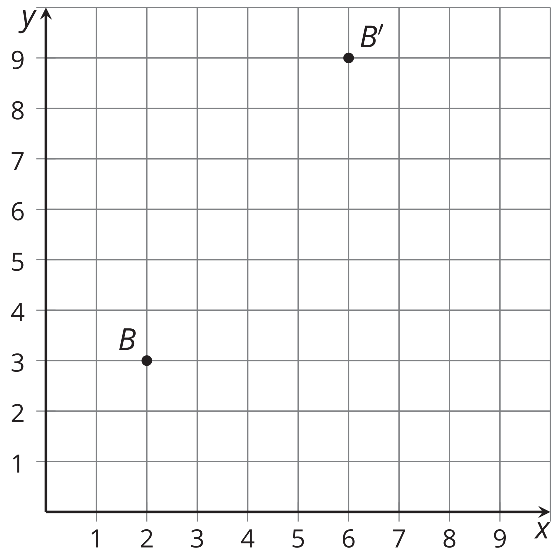
# Lesson 3: Types of Transformations

- 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 $NB'$.

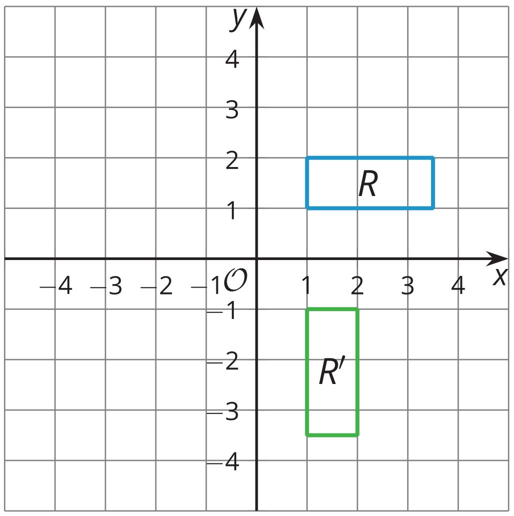
2. How do triangles $PMB$ and $PNB'$ compare? How do you know?

3. What must be true about the ratio $PB : PB'$?

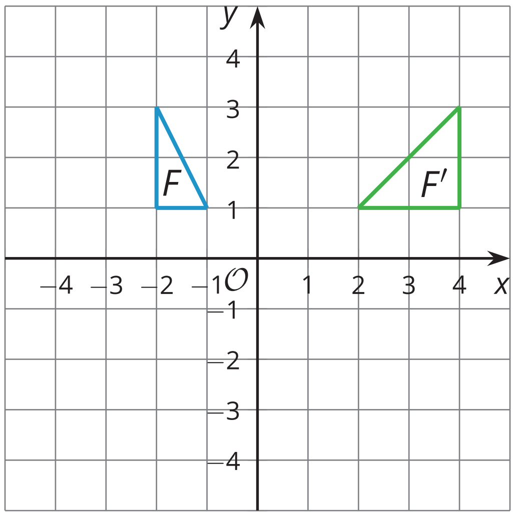
## 3.2: Congruent, Similar, Neither?

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.

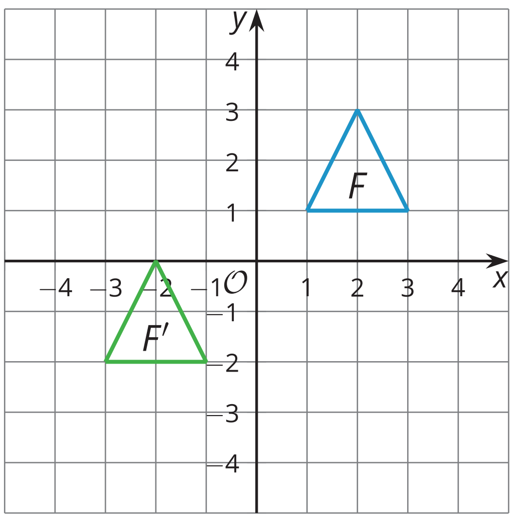
**A**



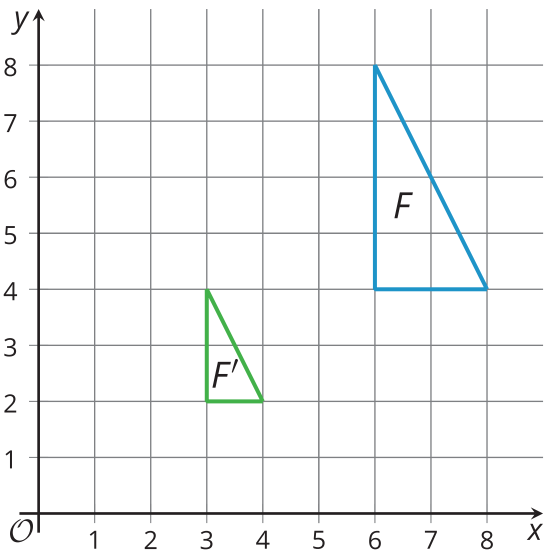

**B**




**C**




**D**




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

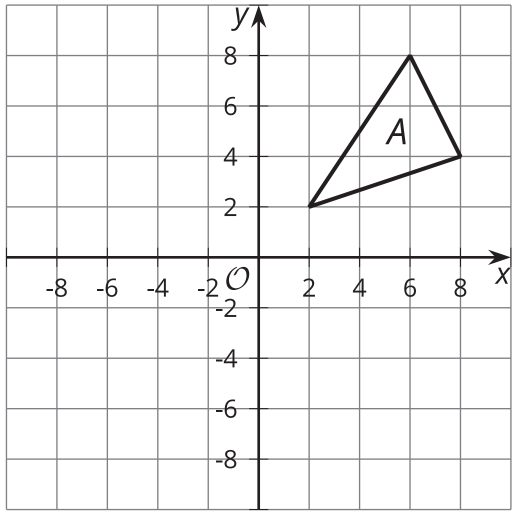
2. $(x, y) \rightarrow (y, -x)$

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

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

**Are you ready for more?**

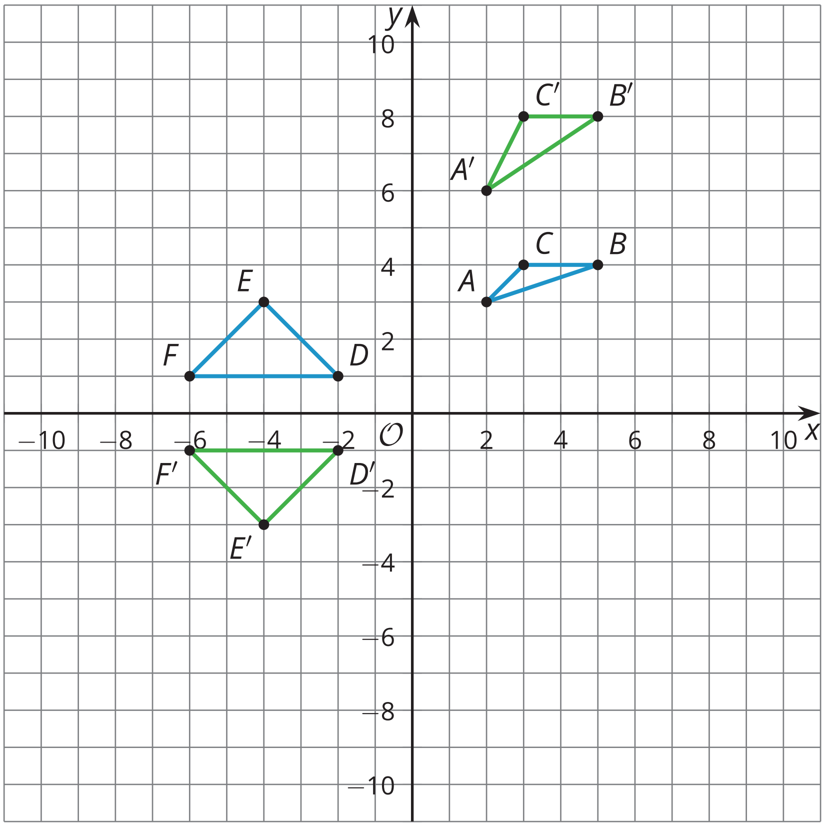
Here is triangle $A$.




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.

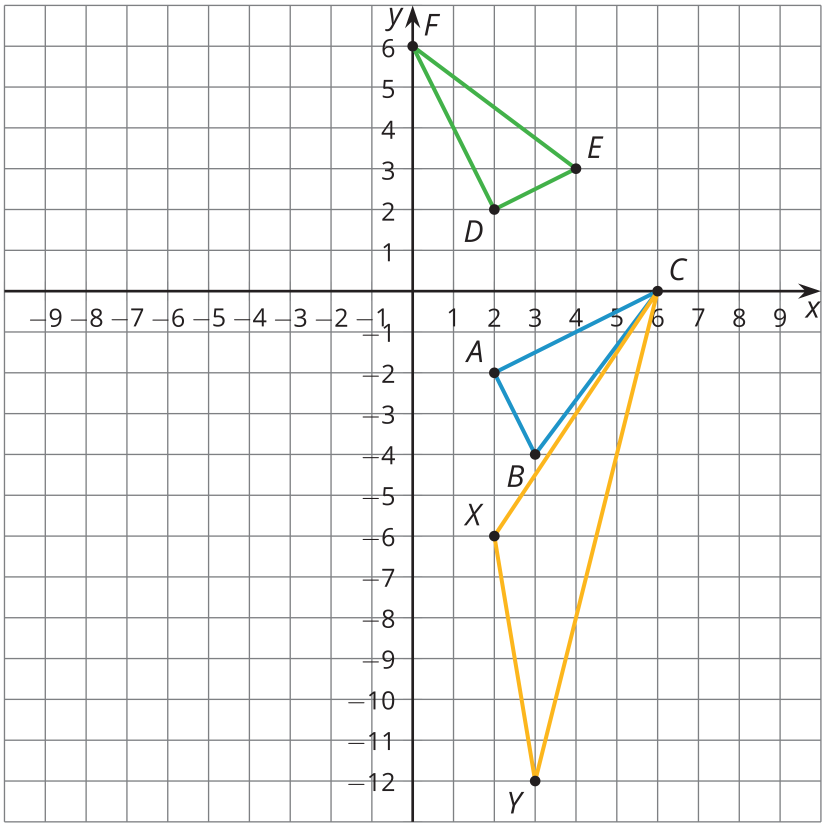
3. Write a rule that will transform triangle $DEF$ to triangle $D'E'F'$.

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.