

LESSON
12-3

Properties of Rotations

DAY - 2

Reteach

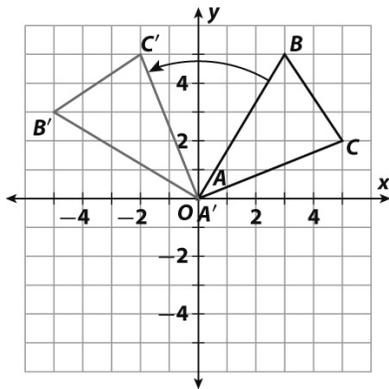
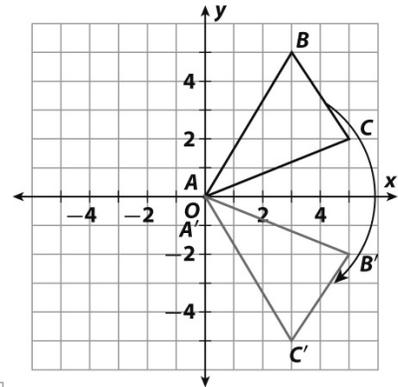
A **rotation** is a change in position of a figure.

A rotation will *turn* the figure around a point called the **center of rotation**.

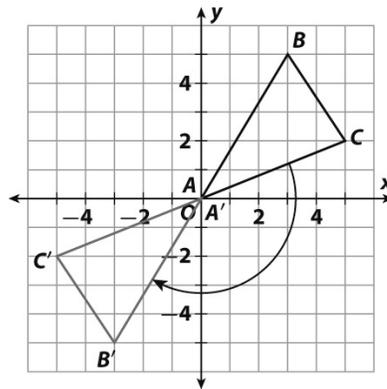
A rotation does not change the size of the figure.

At the right, triangle ABC has been rotated 90° clockwise. The resulting figure is triangle $A'B'C'$.

Below are two more rotations of triangle ABC .



90° counterclockwise rotation

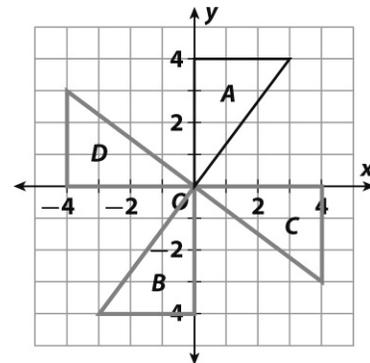


180° clockwise rotation

Use the figures at the right to answer each question.

Triangle A has been rotated about the origin.

1. Which triangle shows a 90° counterclockwise rotation? _____
2. Which triangle shows a 180° clockwise rotation? _____
3. Which triangle shows a 90° clockwise rotation? _____
4. Which triangle shows a 180° counterclockwise rotation? _____



5. If the sides of triangle A have lengths of 3 cm, 4 cm, and 5 cm, what are the lengths of the sides of triangle B ?

6. Explain why the answers to Exercises 2 and 4 are the same.

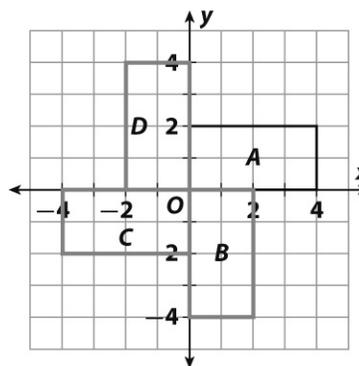
LESSON
12-3

Properties of Rotations

Practice and Problem Solving: D

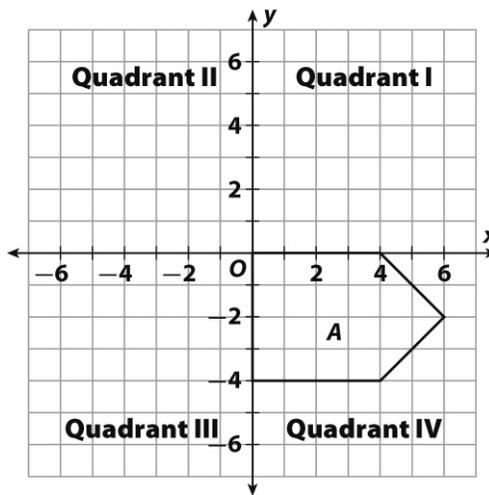
Use the figures at the right for Exercises 1–5.
 Rectangle **A** has been rotated about the origin.
 The first one has been done for you.

- Which rectangle shows a 270° counterclockwise rotation? **B**
- Which rectangle shows a 180° clockwise rotation? _____
- Which rectangle shows a 90° clockwise rotation? _____
- Which rectangle shows a 90° counterclockwise rotation? _____
- If two sides of rectangle **A** have lengths of 2 cm and 4 cm, what are the lengths of the two corresponding sides of rectangle **C**?



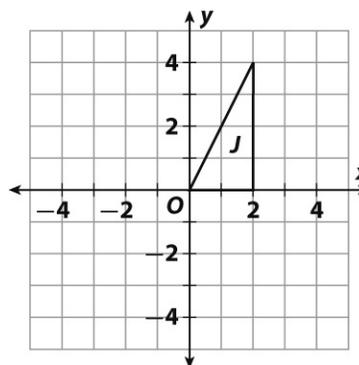
Use the figures at the right for Exercises 6–9.
 Figure **A** is to be rotated about the origin. The first one has been done for you.

- If you rotate figure **A** 270° clockwise, what quadrant will the image be in? **I**
- If you rotate figure **A** 90° counterclockwise, what quadrant will the image be in? _____
- If you rotate figure **A** 90° clockwise, what quadrant will the image be in? _____
- If you rotate figure **A** 180° clockwise, what quadrant will the image be in? _____



Use the grid at the right for Exercises 10–11.

- Draw a triangle to show a rotation of 180° clockwise about the origin of triangle **J**. Label the image triangle as **K**.
- Suppose you rotate triangle **J** 180° counterclockwise about the origin. Compare the image of that rotation with triangle **K**.



LESSON

12-4

Algebraic Representations of Transformations**Reteach**

A **transformation** is a change in size or position of a figure. The transformations below change only the position of the figure, not the size.

- A **translation** will *slide* the figure horizontally and/or vertically.
- A **reflection** will *flip* the figure across an axis.
- A **rotation** will *turn* the figure around the origin.

This table shows how the coordinates change with each transformation.

Transformation	Coordinate Mapping
Translation	$(x, y) \rightarrow (x + a, y + b)$ translates left or right a units and up or down b units
Reflection	$(x, y) \rightarrow (-x, y)$ reflects across the y -axis $(x, y) \rightarrow (x, -y)$ reflects across the x -axis
Rotation	$(x, y) \rightarrow (-x, -y)$ rotates 180° around origin $(x, y) \rightarrow (y, -x)$ rotates 90° clockwise around origin $(x, y) \rightarrow (-y, x)$ rotates 90° counterclockwise around origin

A triangle with coordinates of $(0, 0)$, $(1, 4)$, and $(3, -2)$ is transformed so the coordinates are $(0, 0)$, $(-4, 1)$, and $(2, 3)$. What transformation was performed?

Analyze each corresponding pair of coordinates:

$(0, 0)$ to $(0, 0)$ Think: Could be reflection or rotation since $0 = -0$.

$(1, 4)$ to $(-4, 1)$ Think: Since x and y are interchanged, it is a rotation and
 $(3, -2)$ to $(2, 3)$ y changes sign, so it is a 90° counterclockwise
rotation around origin.

Identify the transformation from the original figure to the image.

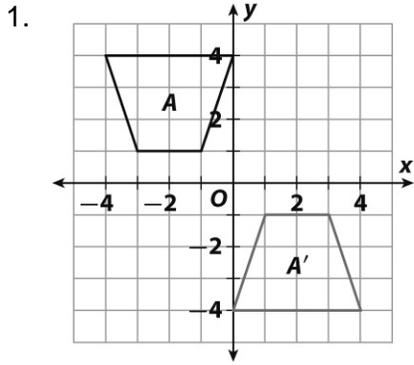
- Original: $A(-2, -4)$, $B(5, 1)$, $C(5, -4)$
Image: $A'(2, -4)$, $B'(-5, 1)$, $C'(-5, -4)$ _____
- Original: $A(-8, 2)$, $B(-4, 7)$, $C(-7, 2)$
Image: $A'(-2, -8)$, $B'(-7, -4)$, $C'(-2, -7)$ _____
- Original: $A(3, 4)$, $B(-1, 2)$, $C(-3, -5)$
Image: $A'(3, 8)$, $B'(-1, 6)$, $C'(-3, -1)$ _____
- Original: $A(1, 1)$, $B(2, -2)$, $C(4, 3)$
Image: $A'(-1, -1)$, $B'(-2, 2)$, $C'(-4, -3)$ _____
- Original: $A(-5, -6)$, $B(-2, 4)$, $C(3, 0)$
Image: $A'(-5, 6)$, $B'(-2, -4)$, $C'(3, 0)$ _____

LESSON
12-4

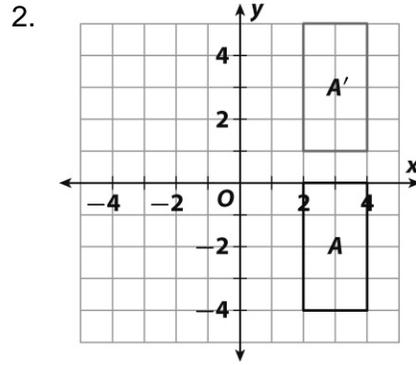
Algebraic Representations of Transformations

Practice and Problem Solving: D

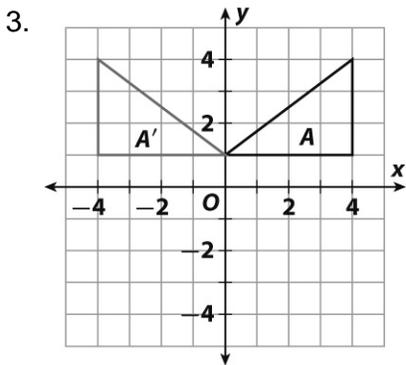
Complete the algebraic rule to describe each transformation of figure A to figure A'. Then complete the description of the transformation. The first one is done for you.



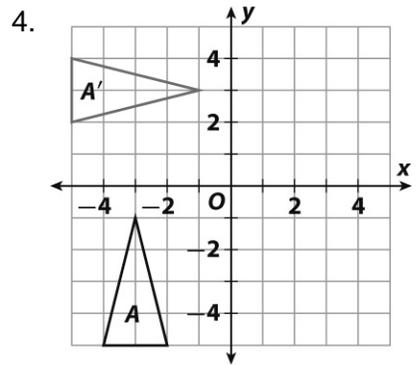
$(x, y) \rightarrow (-x, -y)$
rotation of **180** **clockwise**
°



$(x, y) \rightarrow$ _____
translation _____ of _____ units



$(x, y) \rightarrow$ _____
reflection over the _____ -axis



$(x, y) \rightarrow$ _____
rotation of _____ °

Figure A is shown on at the right. Use the rule $(x, y) \rightarrow (x, -y)$ to give the coordinates of the image of figure A. The first one is done for you.

5. $(-4, -4) \rightarrow (-4, 4)$
6. $(-1, -4) \rightarrow (__, __)$
7. $(-2, -1) \rightarrow (__, __)$
8. Graph the image of figure A for the rule $(x, y) \rightarrow (x, -y)$.

