Name_____ Date _____

Coordinate Rules for Rotations about the Origin

When a point (a, b) is rotated counterclockwise about the origin, the following are true.

- For a rotation of 90°, $(a, b) \rightarrow (-b, a)$.

- For a rotation of 180°, $(a, b) \rightarrow (-a, -b)$.

- For a rotation of 270°, $(a, b) \rightarrow (b, -a)$.
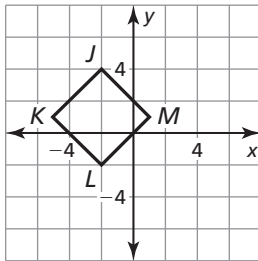 (equivalent to 90° clockwise)
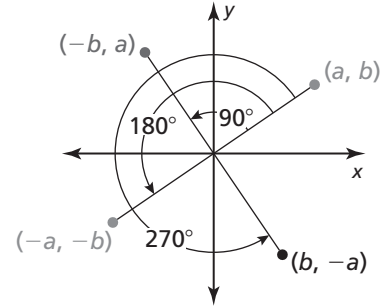
Postulate 4.3   Rotation Postulate
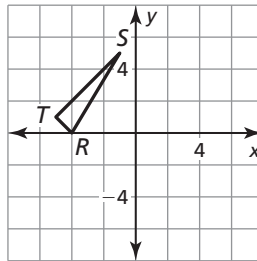
A rotation is a rigid motion.

Extra Practice

In Exercises 1–3, graph the image of the polygon after a rotation of the given number of degrees about the origin.
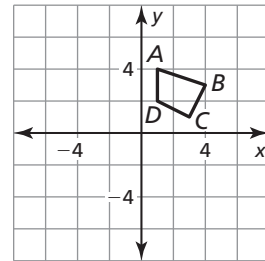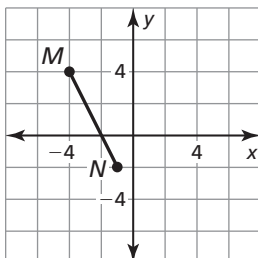
1. 180°

2. 90° counter-clockwise

3. 90° clockwise

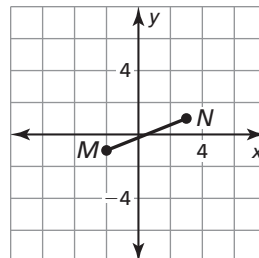**In Exercises 4–7, graph the image of $\overline{MN}$ after the composition.**

4. Reflection: x-axis

   Rotation: 180° about the origin

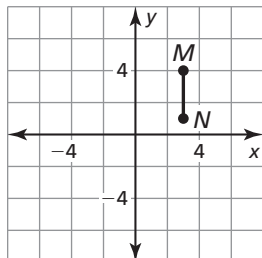**5. Rotation:** 90° about the origin counter-clockwise

   Translation: $(x, y) \rightarrow (x + 2, y - 3)$
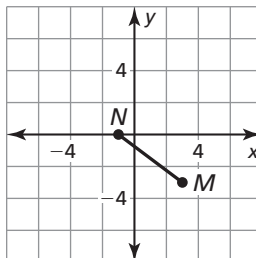
4.3 **Notetaking with Vocabulary** (continued)

6. **Rotation:** $90°$ clockwise about the origin

   Reflection: in the line $y = x$

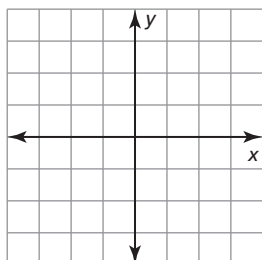7. **Rotation:** $90°$ counter-clockwise about the origin

   Translation: $(x, y) \rightarrow (x - 5, y)$

In Exercises 8 and 9, graph $\triangle JKL$ with vertices $J(2, 3)$, $K(1, -1)$, and $L(-1, 0)$ and its image after the composition.
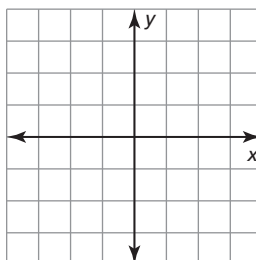
8. **Rotation:** $180°$ about the origin

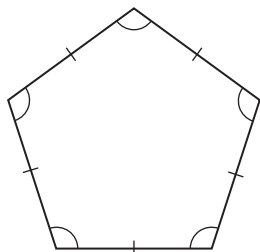   **Reflection:** $x = 2$

9. **Translation:** $(x, y) \rightarrow (x - 4, y - 4)$

   Rotation: $270°$ about the origin counter-clockwise

In Exercises 10 and 11, determine whether the figure has rotational symmetry. If so, describe any rotations that map the figure onto itself.

10.

11.