

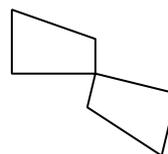
# 4-2 Transformations on the Coordinate Plane (Pages 197–203)

The movement of a geometric figure is called a **transformation**. Before a figure is transformed it is known as a **preimage**. After the transformation, the figure is referred to as an **image**. Transformations can be categorized as a reflection, translation, dilation, or rotation. In a **reflection**, the figure is flipped over a line. A **translation** is when a figure is slid horizontally, vertically, or both. In **dilations**, the figure is enlarged or reduced. A **rotation** is when a figure is turned around a point.

### Example

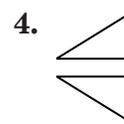
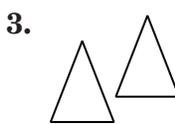
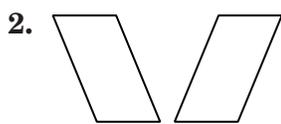
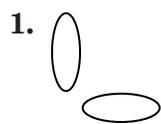
Which type of transformation does this picture show?

The figure has been rotated around the point that is the lower right corner of the original figure. This is a rotation.



### Practice

Tell whether each geometric transformation is a translation, reflection, dilation, or rotation.



Find the coordinates of the vertices of the image.

- 5. Preimage is  $\triangle ABC$  with vertices  $A(1, 4)$ ,  $B(5, 1)$ , and  $C(1, 1)$ . The figure is translated 2 units right and 4 units up.
- 6. Preimage is  $\triangle ABC$  with vertices  $A(1, 4)$ ,  $B(5, 1)$ , and  $C(1, 1)$ . The figure is reflected about the  $y$ -axis.
- 7. Preimage is  $\triangle ABC$  with vertices  $A(1, 4)$ ,  $B(5, 1)$ , and  $C(1, 1)$ . The figure is rotated  $90^\circ$  about the origin.
- 8. Preimage is  $\triangle ABC$  with vertices  $A(1, 4)$ ,  $B(5, 1)$ , and  $C(1, 1)$ . The figure is dilated by a factor of 2.
- 9. **Standardized Test Practice** Find the coordinates of the vertices of the image when the quadrilateral  $\square WXYZ$  is translated 5 units left and 4 units down. The preimage vertices are  $W(1, 0)$ ,  $X(2, 3)$ ,  $Y(4, 1)$ , and  $Z(3, -3)$ .
  - A  $W'(4, 4)$ ,  $X'(3, 1)$ ,  $Y'(1, 3)$ ,  $Z'(2, 7)$
  - B  $W'(6, -4)$ ,  $X'(8, -1)$ ,  $Y'(9, -3)$ ,  $Z'(8, -7)$
  - C  $W'(-4, 4)$ ,  $X'(-3, 1)$ ,  $Y'(-1, 3)$ ,  $Z'(-2, 7)$
  - D  $W'(-4, -4)$ ,  $X'(-3, -1)$ ,  $Y'(-1, -3)$ ,  $Z'(-2, -7)$

Answers: 1. rotation 2. reflection 3. translation 4. reflection 5. A'(3, 8), B'(7, 5), C'(3, 5) 6. A'(-1, 4), B'(-5, 1), C'(-1, 1) 7. A'(-4, 1), B'(-1, 5), C'(-1, 1) 8. A'(2, 8), B'(10, 2), C'(2, 2) 9. D