8-2 Reflections and Symmetry

CONTENT STANDARDS
8.G.1.a, 8.G.1.b, 8.G.1.c, 8.G.3

What You'll Learn

To graph reflections in the coordinate plane and to identify lines of symmetry

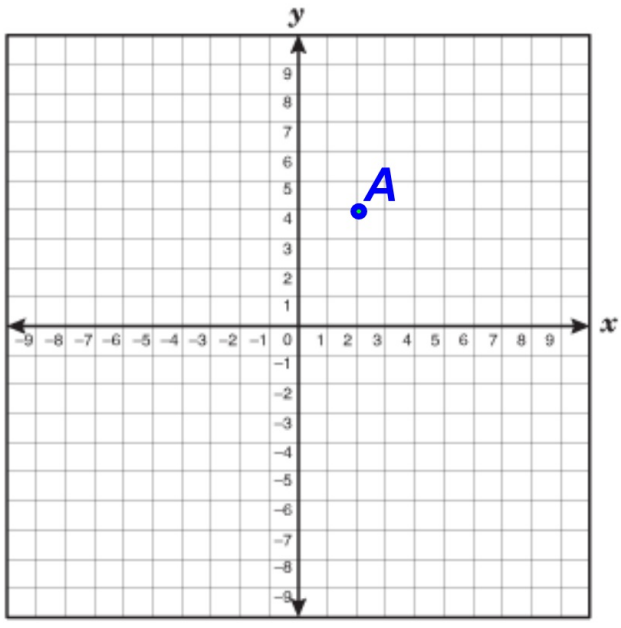
New Vocabulary reflection, line of reflection, reflectional symmetry, line of symmetry

Check Skills You'll Need

1. **Vocabulary Review**
A *translation* moves each point in a figure the same ? in the same direction.

Graph the point $A(2, 4)$ and its image after the given translation.

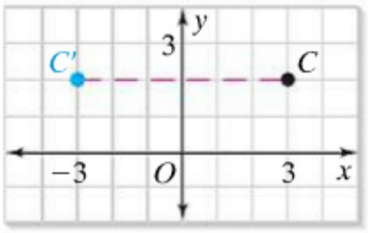
2. left 2 units
3. up 4 units
4. down 1 unit, left 4 units
5. up 2 units, right 3 units



Why Learn This?

Reflections appear everywhere in the world around us. You can see reflections in a mirror or a pool of water, or in shapes in art and nature.

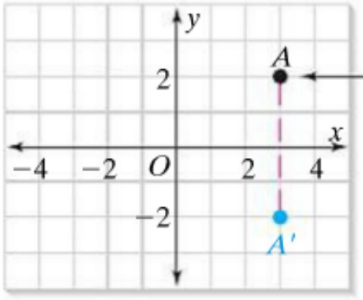
A **reflection** is a transformation that flips a figure over a line. This line is the **line of reflection.** Like translations, reflections change the position of a figure but not its size or shape.



In the diagram at the left, C and C' are the same distance from the line of reflection. The segment connecting C and C' is perpendicular to the line of reflection, the y-axis.

EXAMPLE 1 Graphing Reflections of a Point

Graph the point $A(3, 2)$. Then graph its image after it is reflected over the x-axis. Name the coordinates of A'.



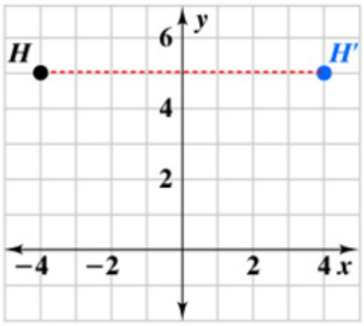
Since A is 2 units *above* the x-axis, A' is 2 units *below* the x-axis.

The coordinates of A' are $(3, -2)$.

1 EXAMPLE Graph the point H (–4, 5). Then graph its image after it is reflected over the y-axis. Name the coordinates of H'.

Since H is 4 units to the *left* of the y-axis, H' is 4 units to the *right* of the y-axis.

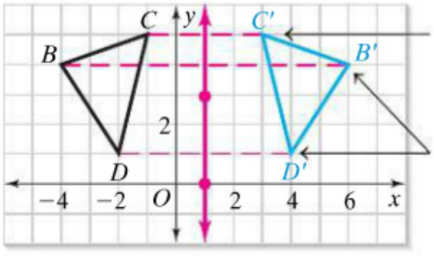
The coordinates of H' are (4,5).



When you reflect a figure over a line, the image is congruent to the original figure.

EXAMPLE Graphing Reflections of a Shape

2 Graph $\triangle BCD$ and its image after it is reflected over the line through (1,3) and (1,0). Name the coordinates of the vertices of $\triangle B'C'D'$.



Since C is 2 units to the left of the red line, C′ is 2 units to the right of the line.

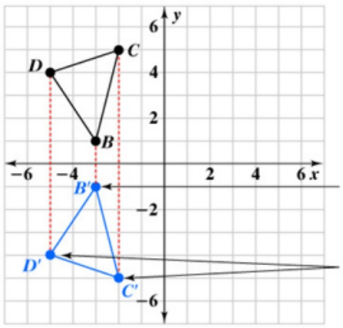
Reflect the other vertices. Draw $\triangle B'C'D'$.

The coordinates of the vertices are $B'(6, 4)$, $C'(3, 5)$, and $D'(4, 1)$.

2 EXAMPLE $\triangle BCD$ has vertices B (–3, 1), C (–2, 5), and D (–5, 4).

Graph $\triangle BCD$ and its image after a reflection over the x-axis.

Name the coordinates of the vertices of $\triangle B'C'D'$.



Since B' is 1 unit above the x-axis, B' is 1 unit below the x-axis.

Reflect the other vertices.

Draw $\triangle B'C'D'$.

The coordinates of the vertices are B' (–3, –1), C' (–2, –5), and D' (–5, –4).

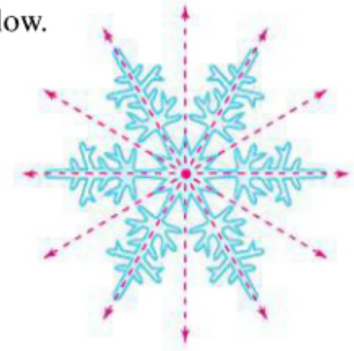
If a figure can be reflected over a line so that the reflected image matches the original figure, then the figure has **reflectional symmetry.** The line that divides the figure into mirror images is called a **line of symmetry.**

Many shapes in nature have reflectional symmetry. In the leaf at the left, the black line approximates a line of symmetry.

EXAMPLE 3 Identifying Lines of Symmetry

Draw the lines of symmetry for the snowflake below.

There are six ways to fold the figure so both halves match. The figure has six lines of symmetry.



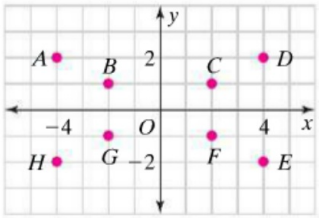
3 EXAMPLE Draw the lines of symmetry in the figure below.

There is one line of symmetry.

Check Your Understanding

1. **Vocabulary** Line a divides a figure into two halves. How can you tell whether a is a line of symmetry?

Use the graph at the right. Match each point with its image after a reflection over the given axis.



2. A, y-axis
3. B, x-axis
4. H, y-axis
5. F, y-axis
6. E, x-axis
7. C, x-axis

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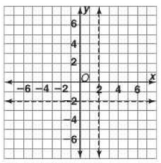
Practice 8-2

Reflections and Symmetry

How many lines of symmetry can you find for each letter?

1. W _____ 2. X _____ 3. H _____



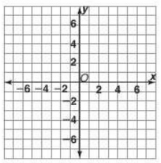
Graph the given point and its image after each reflection. Name the coordinates of the reflected point.

4. $A(5, -4)$ over the vertical dashed line

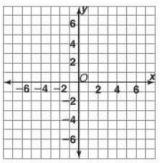
5. $B(-3, 2)$ over the horizontal dashed line

$\triangle ABC$ has vertices $A(2, 1)$, $B(3, -5)$, and $C(-2, 4)$. Graph $\triangle ABC$ and its image, $\triangle A'B'C'$, after a reflection over each line. Name the coordinates of A', B', and C'.

6. the x-axis

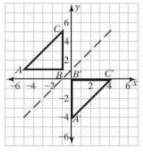


7. the y-axis



Fold your paper over each dashed line. Are the figures reflections of each other over the given line?

8.



9.