

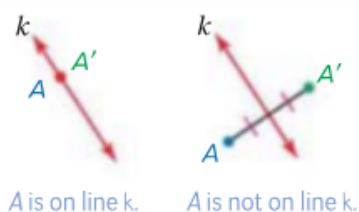
Section 3.1 Reflections

1 Draw Reflections In Lesson 1-7, you learned that a reflection or *flip* is a transformation in a line called the **line of reflection**. Each point of the preimage and its corresponding point on the image are the same distance from this line.

Key Concept Reflection in a Line

A reflection in a line is a function that maps a point to its image such that

- if the point is on the line, then the image and preimage are the same point, or
- if the point is not on the line, the line is the perpendicular bisector of the segment joining the two points.

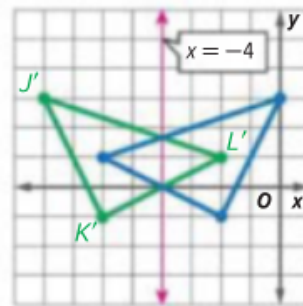


2 Describe Reflections in the Coordinate Plane Reflections can also be performed in the coordinate plane by using the techniques presented in Example 3.

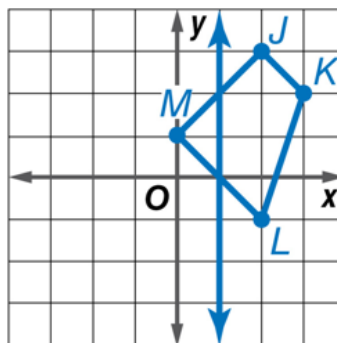
Example 3 Reflect a Figure in a Horizontal or Vertical Line

Triangle JKL has vertices $J(0, 3)$, $K(-2, -1)$, and $L(-6, 1)$. Graph $\triangle JKL$ and its image in the line $x = -4$.

Find a corresponding point for each vertex so that a vertex and its image are equidistant from the line $x = -4$.



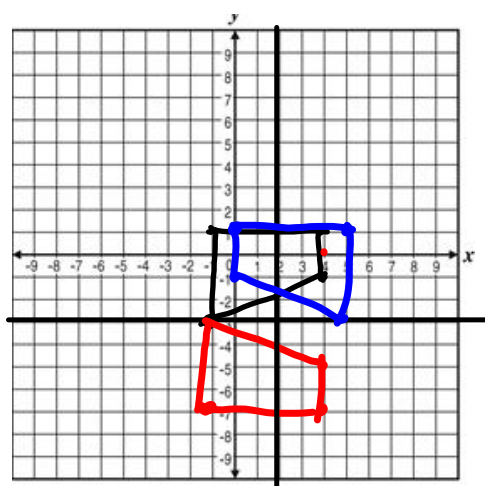
A. Quadrilateral $JKLM$ has vertices $J(2, 3)$, $K(3, 2)$, $L(2, -1)$, and $M(0, 1)$. Graph $JKLM$ and its reflection over $x = 1$.



Trapezoid $RSTV$ has vertices $R(-1, 1)$, $S(4, 1)$, $T(4, -1)$, and $V(-1, -3)$. Graph trapezoid $RSTV$ and its image in the given line.

3A. $y = -3$

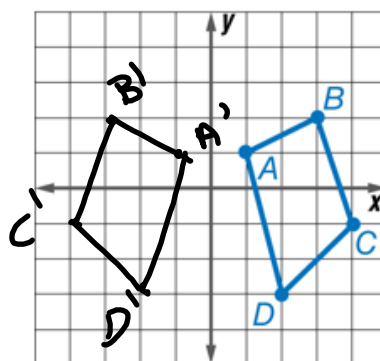
3B. $x = 2$



KeyConcept Reflection in the x - or y -axis

	Reflection in the x -axis	Reflection in the y -axis
Words	To reflect a point in the x -axis, multiply its y -coordinate by -1 .	To reflect a point in the y -axis, multiply its x -coordinate by -1 .
Symbols	$(x, y) \rightarrow (x, -y)$	$(x, y) \rightarrow (-x, y)$
Example		

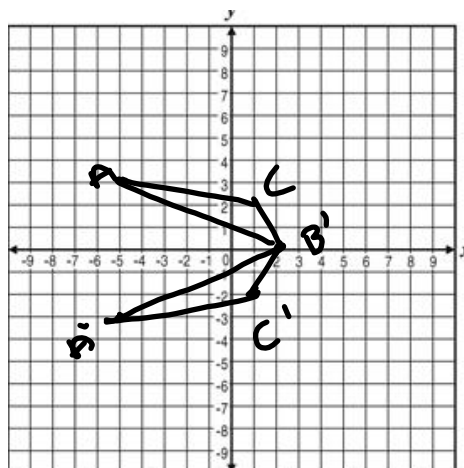
B. Graph quadrilateral $ABCD$ and its image under a reflection in the y -axis.



Example 4 Reflect a Figure in the x - or y -axis

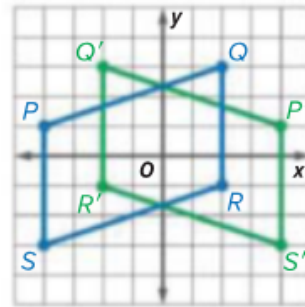
- a. Graph $\triangle ABC$ with vertices $A(-5, 3)$, $B(2, 0)$, and $C(1, 2)$ and its reflection in the x -axis.

$$A'(-5, -3) \quad B'(2, 0) \quad C'(1, -2)$$



Describe the transformation shown using coordinate notation.

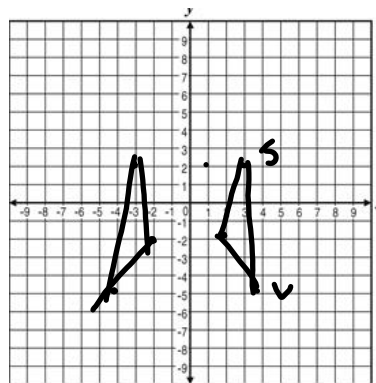
reflection in y -axis



Guided Practice

4A. Given rectangles with vertices $E(-4, -1)$, $F(2, 2)$, $G(3, 0)$, and $H(-3, -3)$ and $E'(-4, 1)$, $F'(2, -2)$, $G'(3, 0)$, and $H'(-3, 3)$, describe the transformation using coordinate notation. reflection over x -axis

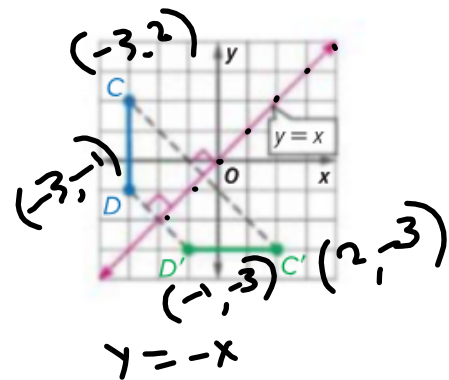
4B. Graph $\triangle JKL$ with vertices $J(3, 2)$, $K(2, -2)$, and $L(4, -5)$ and its reflection in the y -axis.



You can also reflect a figure in the line $y = x$.

The slope of $y = x$ is 1. In the graph shown, $\overline{CC'}$ is perpendicular to $y = x$, so its slope is -1 . From $C(-3, 2)$, move right 2.5 units and down 2.5 units to reach $y = x$. From this point on $y = x$, move right 2.5 units and down 2.5 units to locate $C'(2, -3)$. Using a similar method, the image of $D(-3, -1)$ is found to be $D'(-1, -3)$.

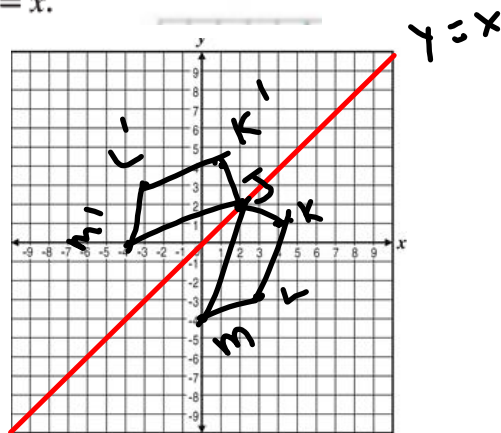
Comparing the coordinates of these and other examples leads to the following rule for reflections in the line $y = x$.



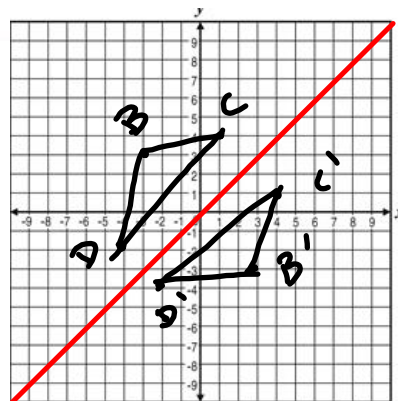
KeyConcept Reflection in Line $y = x$		
Words	To reflect a point in the line $y = x$, interchange the x - and y -coordinates.	Example
Symbols	$(x, y) \rightarrow (y, x)$	

Example 5 Reflect a Figure in the Line $y = x$

Quadrilateral $JKLM$ has vertices $J(2, 2)$, $K(4, 1)$, $L(3, -3)$, and $M(0, -4)$. Graph $JKLM$ and its image $J'K'L'M'$ in the line $y = x$.

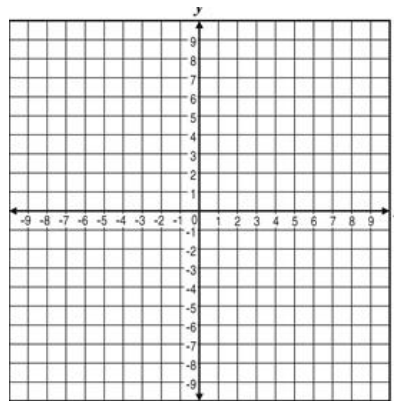


$\triangle BCD$ has vertices $B(-3, 3)$, $C(1, 4)$, and $D(-2, -4)$. Graph $\triangle BCD$ and its image in the line $y = x$.



c

Quadrilateral $ABCD$ with vertices $A(1, 1)$, $B(3, 2)$, $C(4, -1)$, and $D(2, -3)$. Graph $ABCD$ and its image under reflection of the line $y = x$.



ConceptSummary Reflection in the Coordinate Plane		
Reflection in the x -axis	Reflection in the y -axis	Reflection in the line $y = x$
<p>$(x, y) \rightarrow (x, -y)$</p>	<p>$(x, y) \rightarrow (-x, y)$</p>	<p>$(x, y) \rightarrow (y, x)$</p>

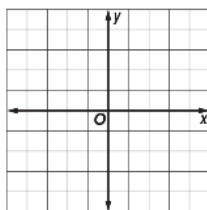
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3-1 Skills Practice

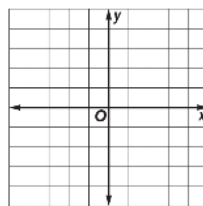
Reflections

COORDINATE GEOMETRY Graph each figure and its image under the given reflection.

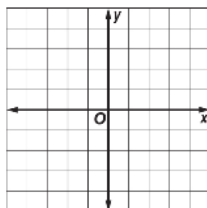
5. $\triangle ABC$ with vertices $A(-3, 2)$, $B(0, 1)$, and $C(-2, -3)$ in the line $y = x$



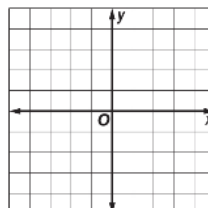
6. trapezoid $DEFG$ with vertices $D(0, -3)$, $E(1, 3)$, $F(3, 3)$, and $G(4, -3)$ in the y -axis



7. parallelogram $RSTU$ with vertices $R(-2, 3)$, $S(2, 4)$, $T(2, -3)$ and $U(-2, -4)$ in the line $y = x$

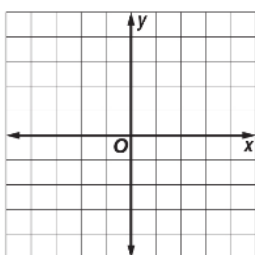


8. square $KLMN$ with vertices $K(-1, 0)$, $L(-2, 3)$, $M(1, 4)$, and $N(2, 1)$ in the x -axis

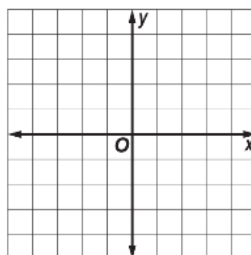


COORDINATE GEOMETRY Graph each figure and its image under the given reflection.

3. quadrilateral $ABCD$ with vertices $A(-3, 3)$, $B(1, 4)$, $C(4, 0)$, and $D(-3, -3)$ in the line $y = x$

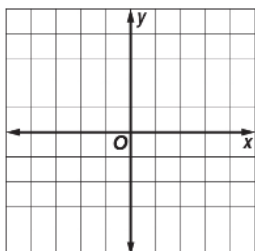


4. $\triangle FGH$ with vertices $F(-3, -1)$, $G(0, 4)$ and $H(3, -1)$ in the line $y = x$



NAME _____ DATE _____ PERIOD _____

5. rectangle $QRST$ with vertices $Q(-3, 2)$, $R(-1, 4)$, $S(2, 1)$, and $T(0, -1)$ in the x -axis



6. trapezoid $HIJK$ with vertices $H(-2, 5)$, $I(2, 5)$, $J(-4, -1)$, and $K(-4, 3)$ in the y -axis

