Essential Question How does a reflection affect the properties of a two-dimensional figure?

VISUAL LEARNING ASSESS

Scan for Multimedia

EXAMPLE 1 Understand Reflections

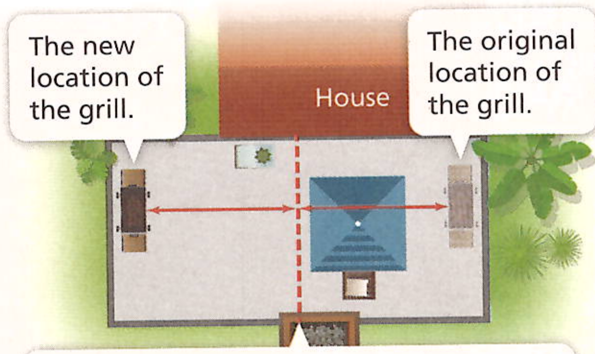
The client also wants the architect to flip the placement of the grill, putting it on the other side of the patio. Where does the client want the grill to be placed?

Model with Math Can a picture or an object be used to represent the problem situation?

The architect flips the placement of the grill over the vertical line segment dividing the patio.

A **reflection**, or flip, is a transformation that flips a figure over a *line of reflection*. Reflected figures are the same distance from the line of reflection but on opposite sides.

The grill has been reflected. The grill is the same distance from the center but on the opposite side of the patio. The grill still has the same shape and size. The orientation, or direction, has changed.



A **line of reflection** is a line over which a figure is reflected. The original location and the new location of the grill are the same distance from the line of reflection.

Try It!

While updating the design, the architect accidentally clicked on the chair and reflected it across the center line. Draw the new location of the chair on the plan.

Convince Me! How do the preimage and image compare after a reflection?

EXAMPLE 2 Reflect a Figure on a Coordinate Plane

ACTIVITY ASSESS

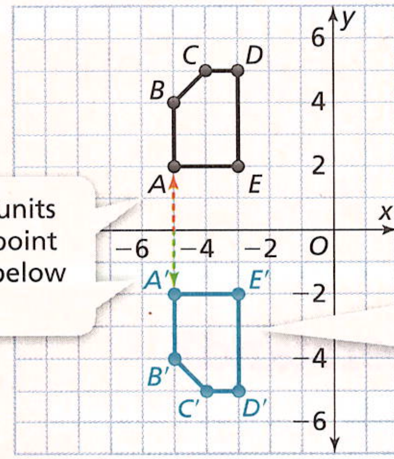
Polygon $ABCDE$ has vertices $A(-5, 2)$, $B(-5, 4)$, $C(-4, 5)$, $D(-3, 5)$ and $E(-3, 2)$. Graph and label the vertices of $ABCDE$ and its image, $A'BC'D'E$, after a reflection across the x-axis.

STEP 1 Graph polygon $ABCDE$.

STEP 2 Show how each vertex of $ABCDE$ maps to its image after a reflection across the x-axis.

STEP 3 Draw and label the vertices of polygon $A'B'C'D'E$.

Since point A is 2 units above the x-axis, point A' will be 2 units below the x-axis.



The corresponding side lengths and angle measures remain the same but their positions and orientations are different.

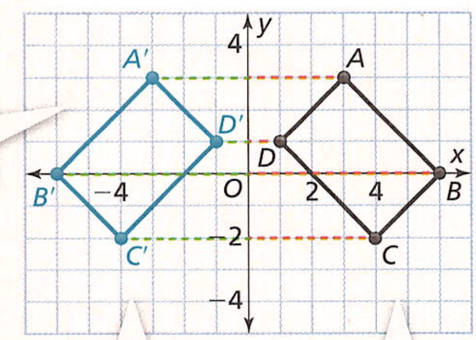
Try It!

Quadrilateral $KLMN$ has vertices at $K(2, 6)$, $L(3, 8)$, $M(5, 4)$, and $N(3, 2)$. It is reflected across the y-axis, resulting in quadrilateral $K'L'M'N'$. What are the coordinates of point N'?

EXAMPLE 3 Describe a Reflection

What is a rule that describes the reflection that maps parallelogram $ABCD$ onto parallelogram $A'B'C'D'$?

A reflection maps every point of $ABCD$ to the corresponding point of $A'B'C'D'$.



Parallelogram $A'B'C'D'$ is the image of parallelogram $ABCD$ after a reflection across the y-axis.

Generalize When reflecting across the y-axis, the y-coordinate of the vertex of the image remains the same and the x-coordinate is the opposite. $(x, y) \rightarrow (-x, y)$

Each point of preimage $ABCD$ is the same distance from the line of reflection as the corresponding point of image $A'B'C'D'$.

Try It!

Polygon $ABCDE$ is reflected across the line $x = -2$. Graph and label the image $A'B'C'D'E'$. Is $m\angle A = m\angle A'$? Explain.