LESSON 3

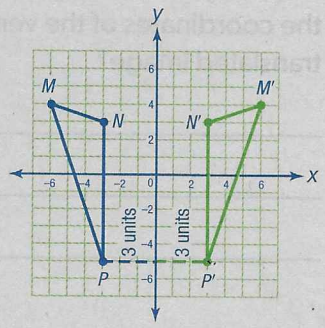
Reflections

UNDERSTAND A **reflection** is a transformation that flips a figure across a line called a **line of reflection**. Each reflected point is the same distance from the line of reflection as its corresponding point on the preimage, but it is on the opposite side of the line. The resulting image and the preimage are mirror images of one another. The line of reflection can be the x-axis, the y-axis, or any other line in the coordinate plane.

You can think of a reflection of a figure as a function in which the input is not a single value, x, but rather a point on the coordinate plane, (x, y). When you apply the function to a point on a figure, the output will be the coordinates of the reflected image of that point.

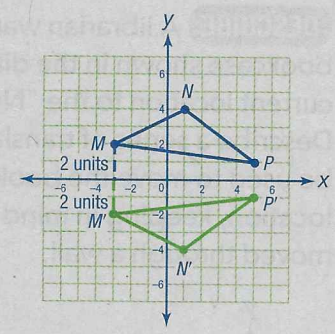
When a point is reflected across the y-axis, the sign of its x-coordinate changes. The function for a reflection across the y-axis is:

$$R_{y\text{-axis}}(x, y) = (-x, y)$$



When a point is reflected across the x-axis, the sign of its y-coordinate changes. The function for a reflection across the x-axis is:

$$R_{x\text{-axis}}(x, y) = (x, -y)$$



Another common line of reflection is the diagonal line $y = x$. To reflect over this line, swap the x- and y-coordinates. The function for a reflection across line $y = x$ is:

$$R_{y=x}(x, y) = (y, x)$$

The path that a point takes across the line of reflection is always **perpendicular** to the line of reflection. Perpendicular lines form right angles when they cross one another. As shown in the diagram on the right, the path from point P to point P' forms right angles with the line of reflection, $y = x$.