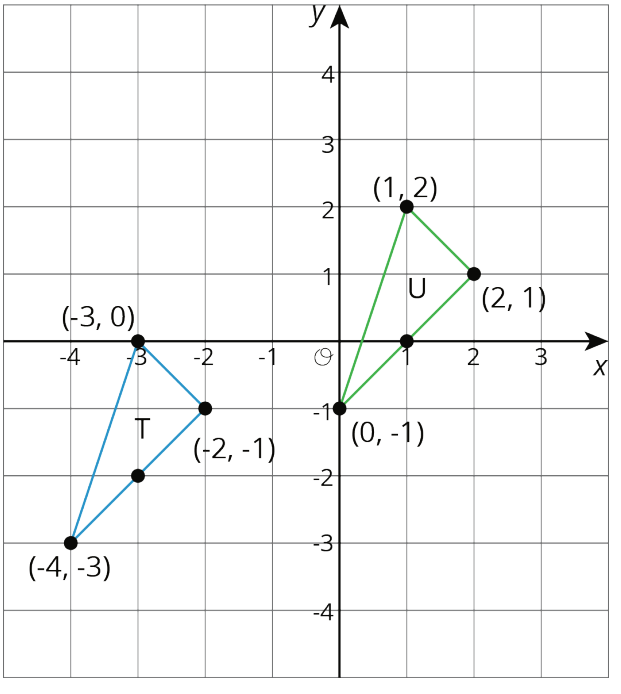
Lesson 4: Coordinate Moves

Let's transform some figures and see what happens to the coordinates of points.

4.1: Translating Coordinates

Select all of the translations that take Triangle T to Triangle U. There may be more than one correct answer.



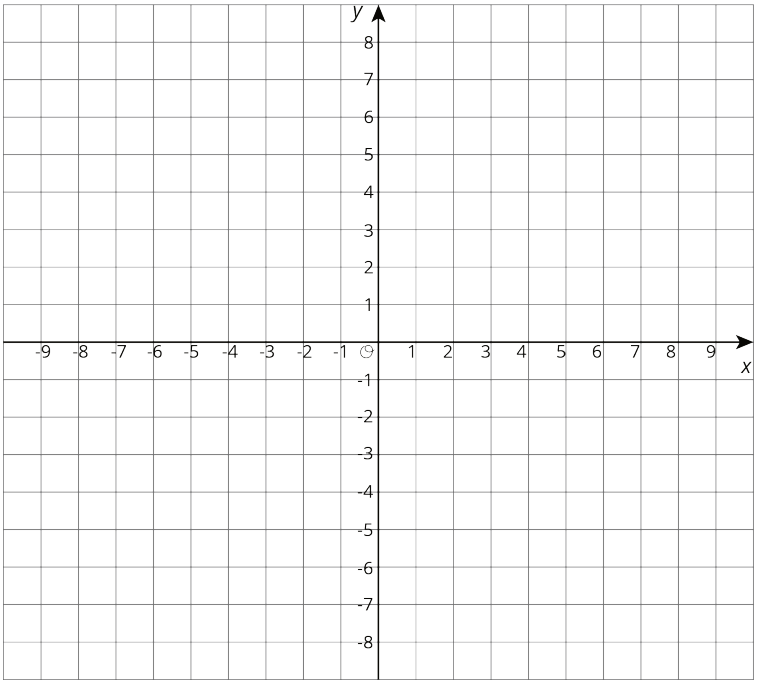
1. Translate $(-3, 0)$ to $(1, 2)$.

2. Translate $(2, 1)$ to $(-2, -1)$.

3. Translate $(-4, -3)$ to $(0, -1)$.

4. Translate $(1, 2)$ to $(2, 1)$.

4.2: Reflecting Points on the Coordinate Plane



1. Here is a list of points

   $A = (0.5, 4)$ $B = (-4, 5)$ $C = (7, -2)$ $D = (6, 0)$ $E = (0, -3)$

   On the **coordinate plane**:

   a. Plot each point and label each with its coordinates.

   b. Using the x-axis as the line of reflection, plot the image of each point.

   c. Label the image of each point with its coordinates.

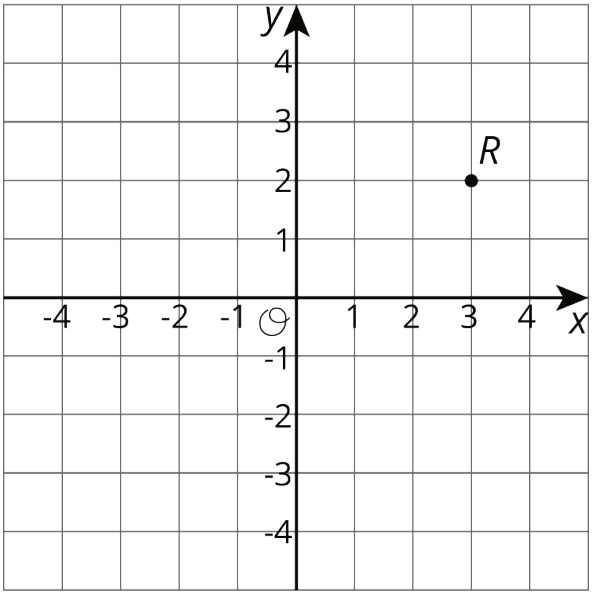
   d. Include a label using a letter. For example, the image of point A should be labeled A'.

2. If the point $(13, 10)$ were reflected using the x-axis as the line of reflection, what would be the coordinates of the image? What about $(13, -20)$? $(13, 570)$? Explain how you know.

3. The point R has coordinates $(3, 2)$.

   a. Without graphing, predict the coordinates of the image of point R if point R were reflected using the y-axis as the line of reflection.

   b. Check your answer by finding the image of R on the graph.

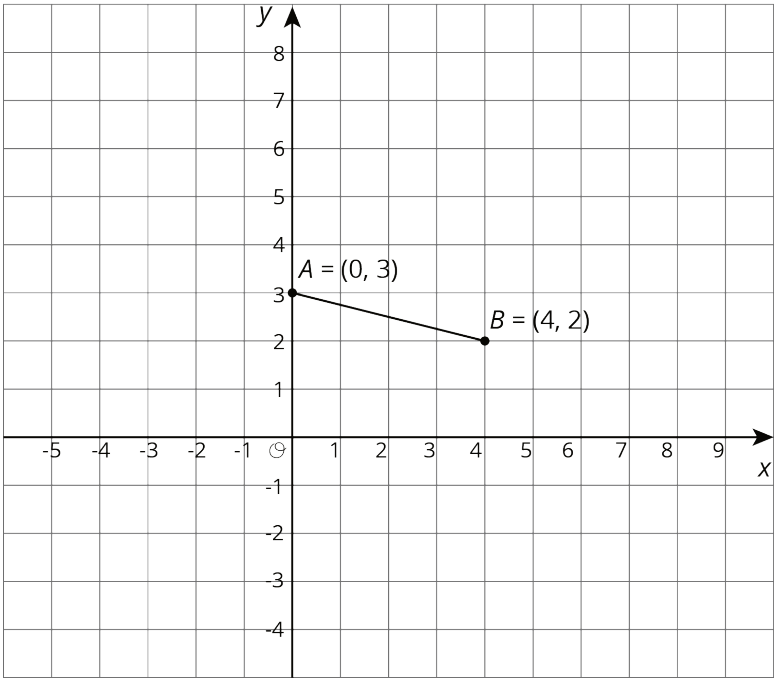


   c. Label the image of point R as R'.

   d. What are the coordinates of R'?

4. Suppose you reflect a point using the y-axis as line of reflection. How would you describe its image?

4.3: Transformations of a Segment



Apply each of the following transformations to segment AB.

1. Rotate segment AB 90 degrees counterclockwise around center B. Label the image of A as C. What are the coordinates of C?

2. Rotate segment AB 90 degrees counterclockwise around center A. Label the image of B as D. What are the coordinates of D?

3. Rotate segment AB 90 degrees clockwise around $(0, 0)$. Label the image of A as E and the image of B as F. What are the coordinates of E and F?

4. Compare the two 90-degree counterclockwise rotations of segment AB. What is the same about the images of these rotations? What is different?

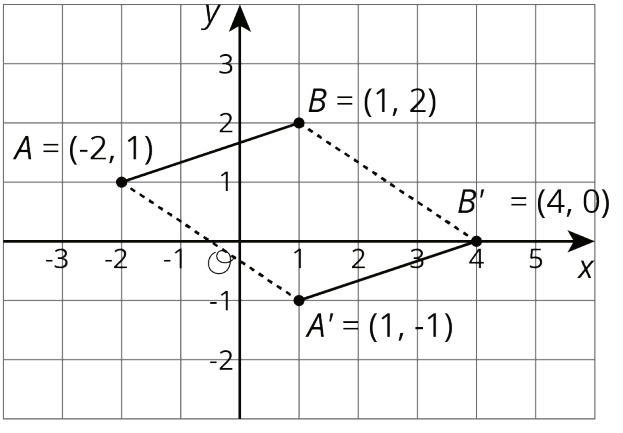
Are you ready for more?

Suppose EF and GH are line segments of the same length. Describe a sequence of transformations that moves EF to GH.

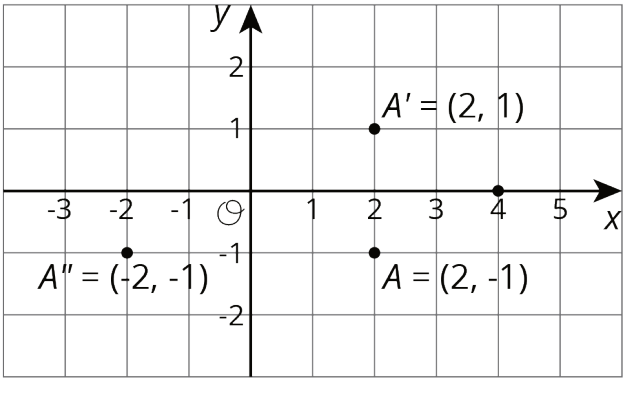
Lesson 4 Summary

We can use coordinates to describe points and find patterns in the coordinates of transformed points.

We can describe a translation by expressing it as a sequence of horizontal and vertical translations. For example, segment AB is translated right 3 and down 2.

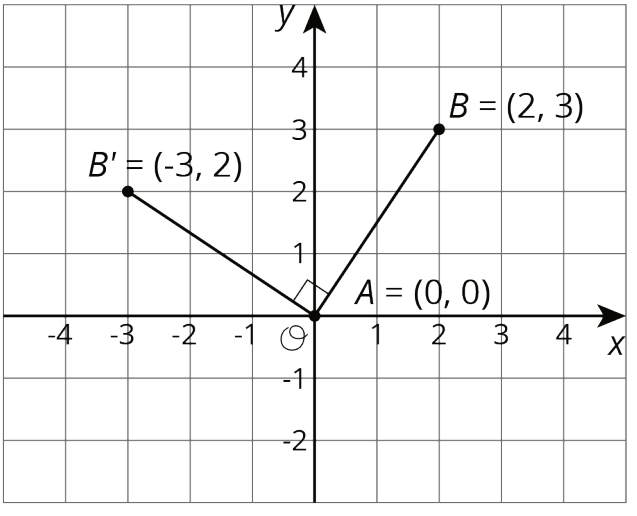


Reflecting a point across an axis changes the sign of one coordinate. For example, reflecting the point A whose coordinates are $(2, -1)$ across the x-axis changes the sign of the y-coordinate, making its image the point A' whose coordinates are $(2, 1)$. Reflecting the point A across the y-axis changes the sign of the x-coordinate, making the image the point A'' whose coordinates are $(-2, -1)$.



Reflections across other lines are more complex to describe.

We don't have the tools yet to describe rotations in terms of coordinates in general. Here is an example of a 90° rotation with center $(0, 0)$ in a counterclockwise direction.



Point A has coordinates $(0, 0)$. Segment AB was rotated 90° counterclockwise around A. Point B with coordinates $(2, 3)$ rotates to point B' whose coordinates are $(-3, 2)$.