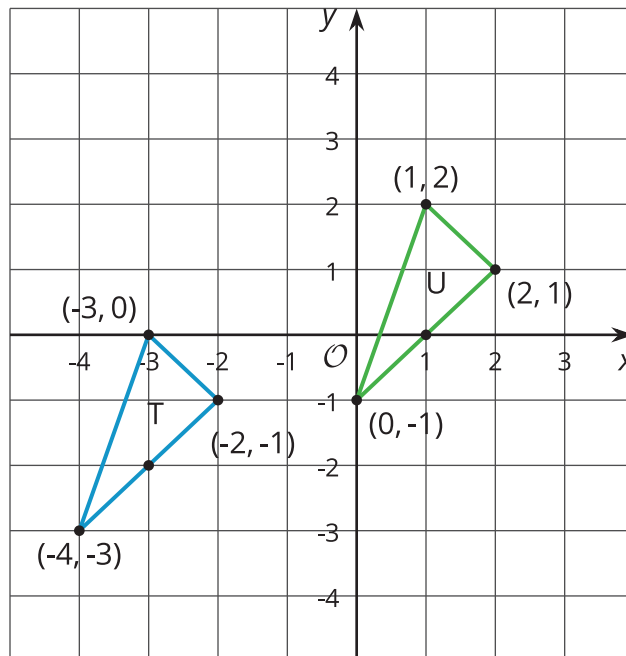# Coordinate Moves

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

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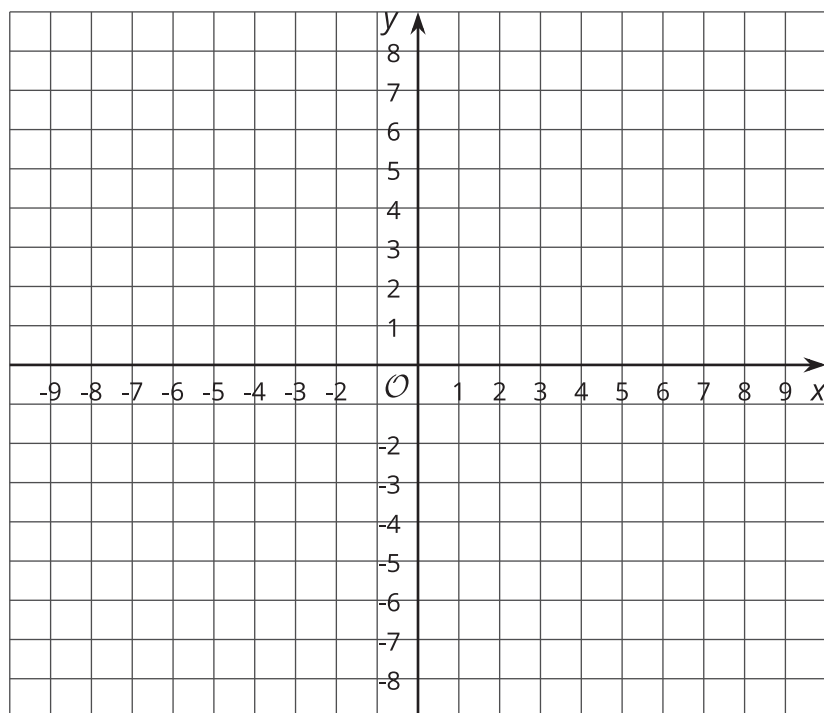
Select all of the translations that take Triangle T to Triangle U. There may be more than one correct answer.

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

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

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

D. Translate $(1, 2)$ to $(2, 1)$.
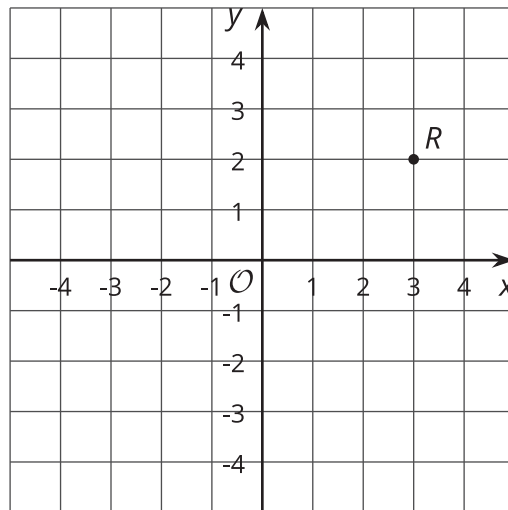
1. Here is a list of points:

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

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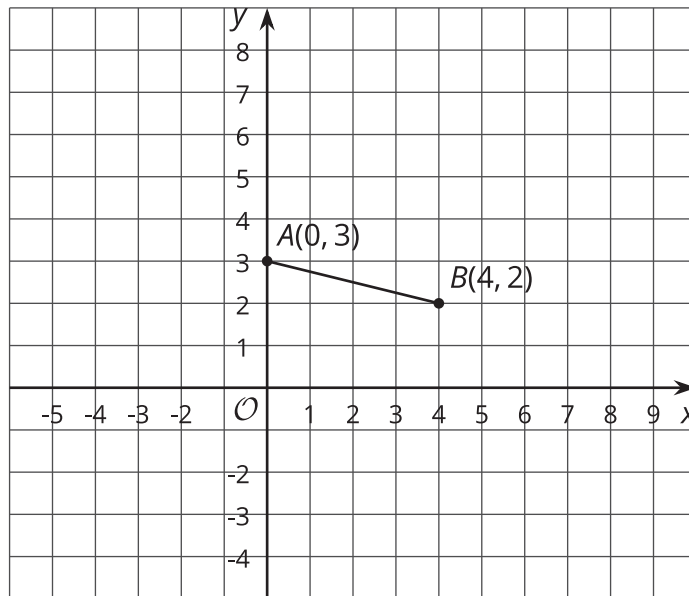
    b. Check your answer by finding the image of R on the graph.

    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 the line of reflection. How would you describe its image?

Apply each of the following transformations to segment AB.

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

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

3. Rotate segment AB $90°$ 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 $90°$ counterclockwise rotations of segment AB. What is the same about the images of these rotations? What is different?
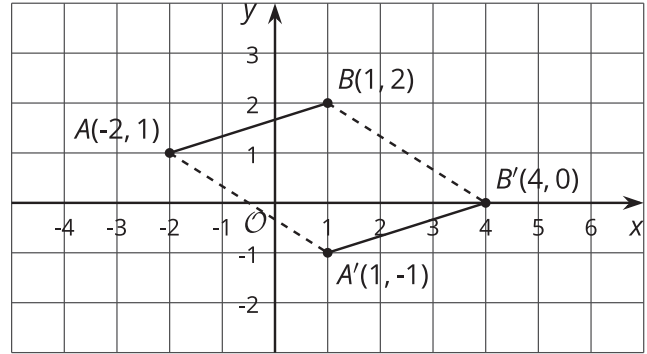
💡 **Are you ready for more?**

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

🧑‍🏫 Lesson 5 Summary

We can use coordinates to describe points and find patterns in the coordinates of transformed points.
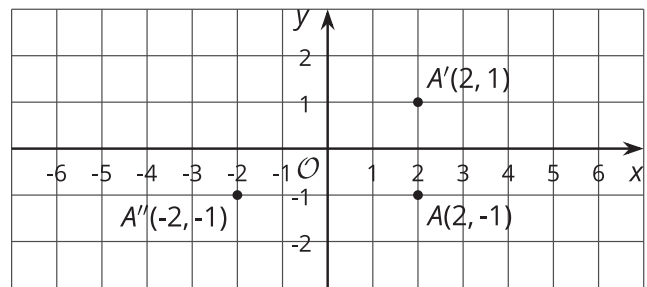
We can describe a translation by expressing it as a sequence of horizontal and vertical translations.

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