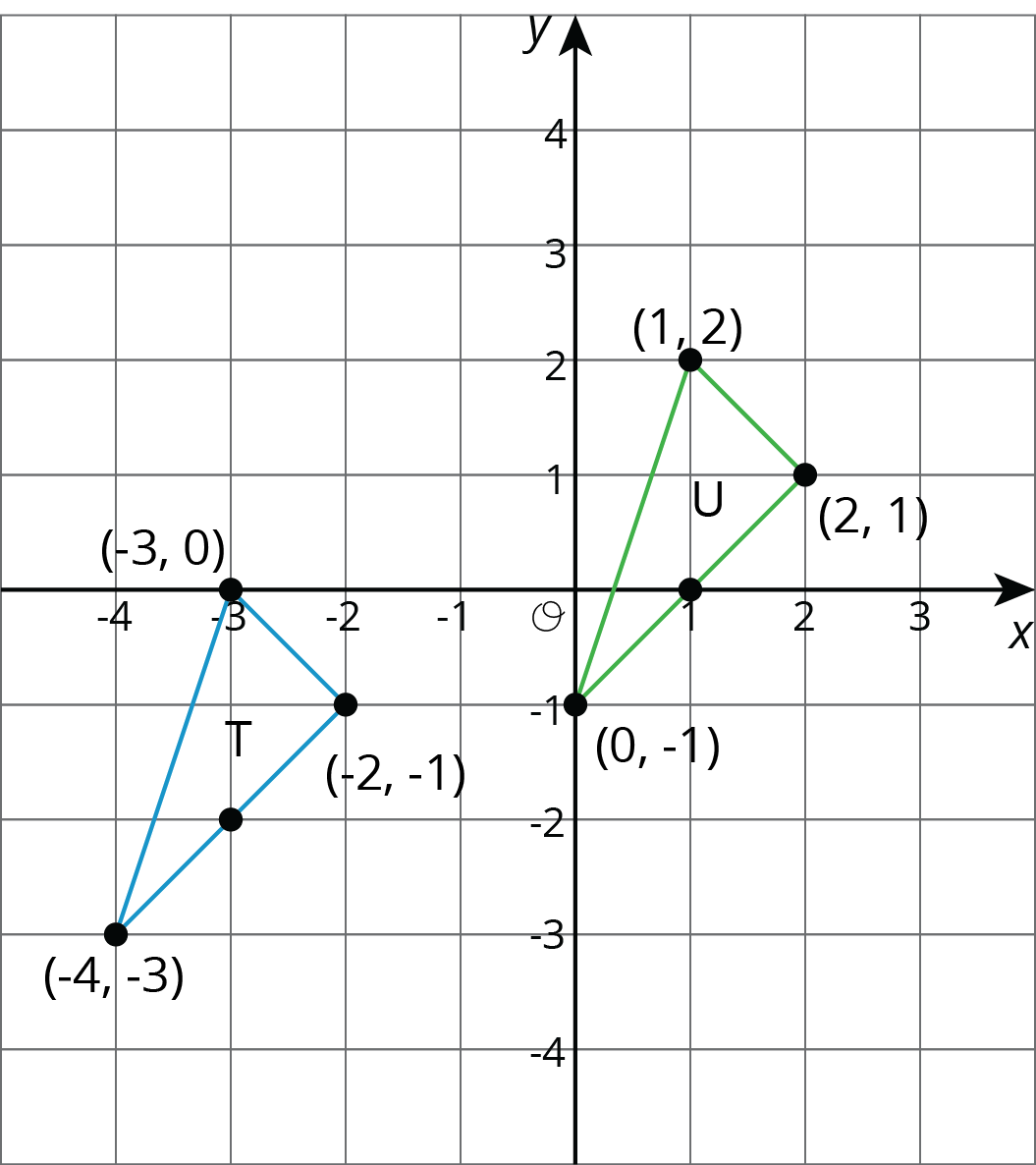
## Lesson 4: Coordinate Moves

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

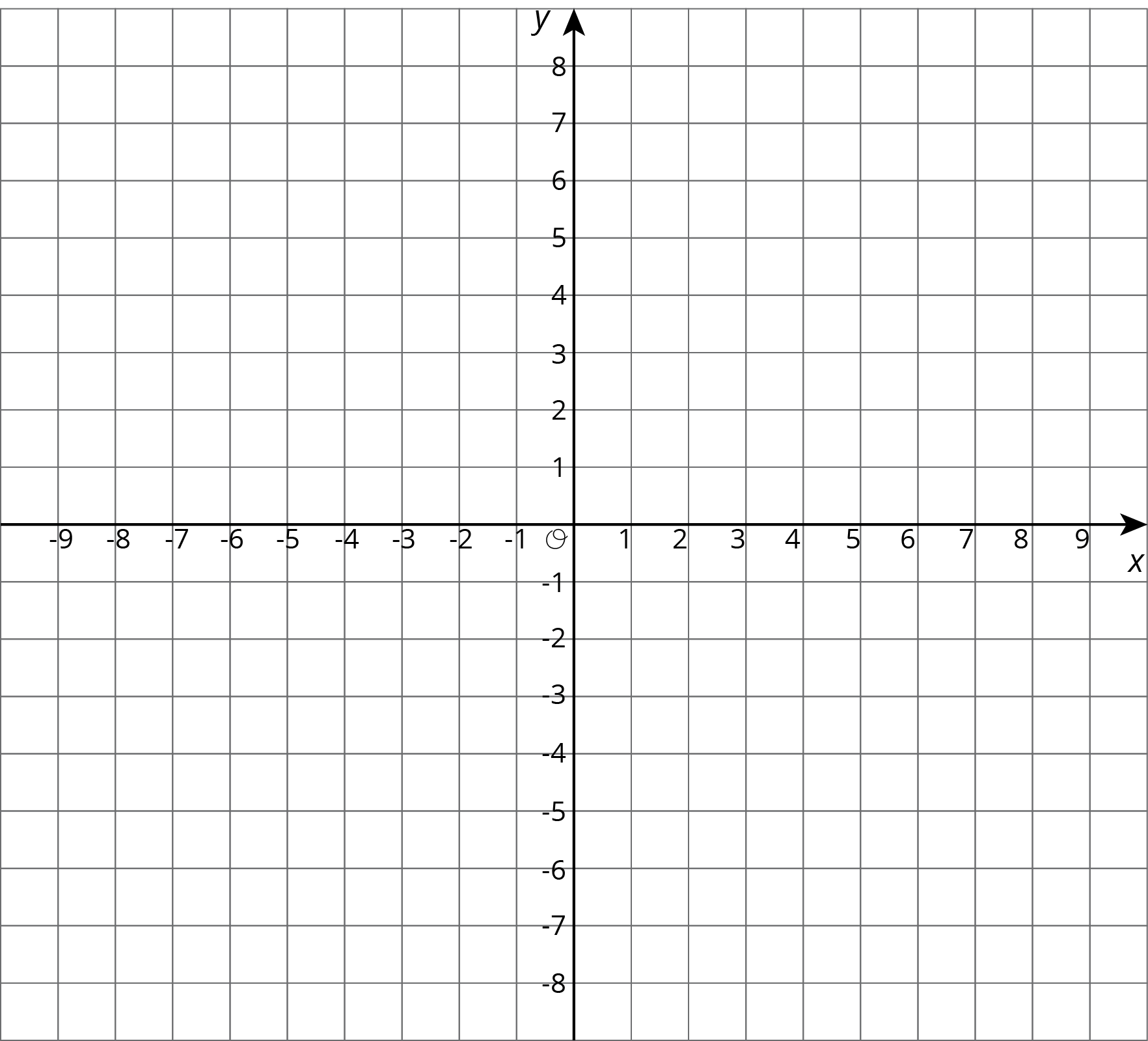
### 4.1: Translating Coordinates

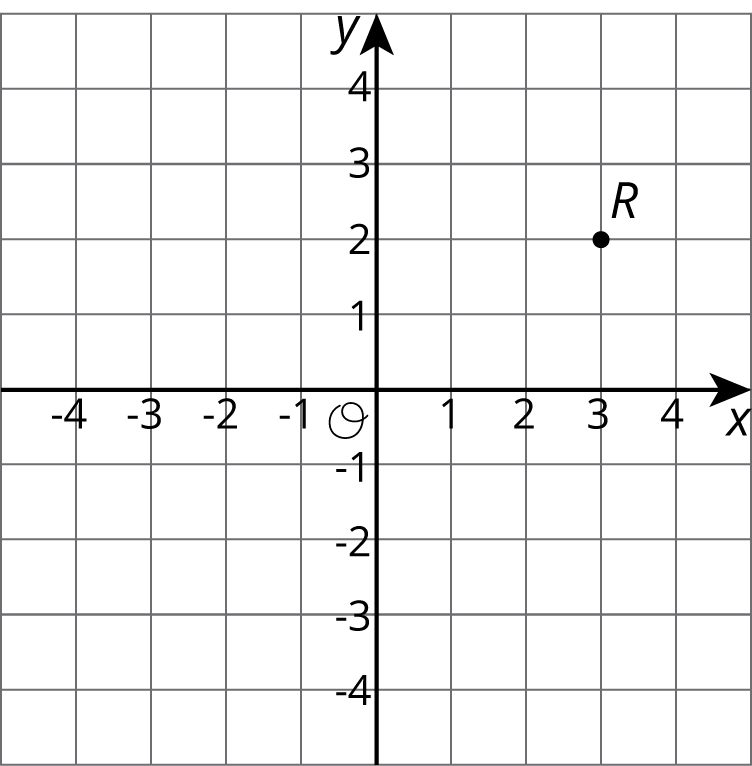
Select all of the translations that take Triangle T to Triangle U. There may be more than one correct answer.



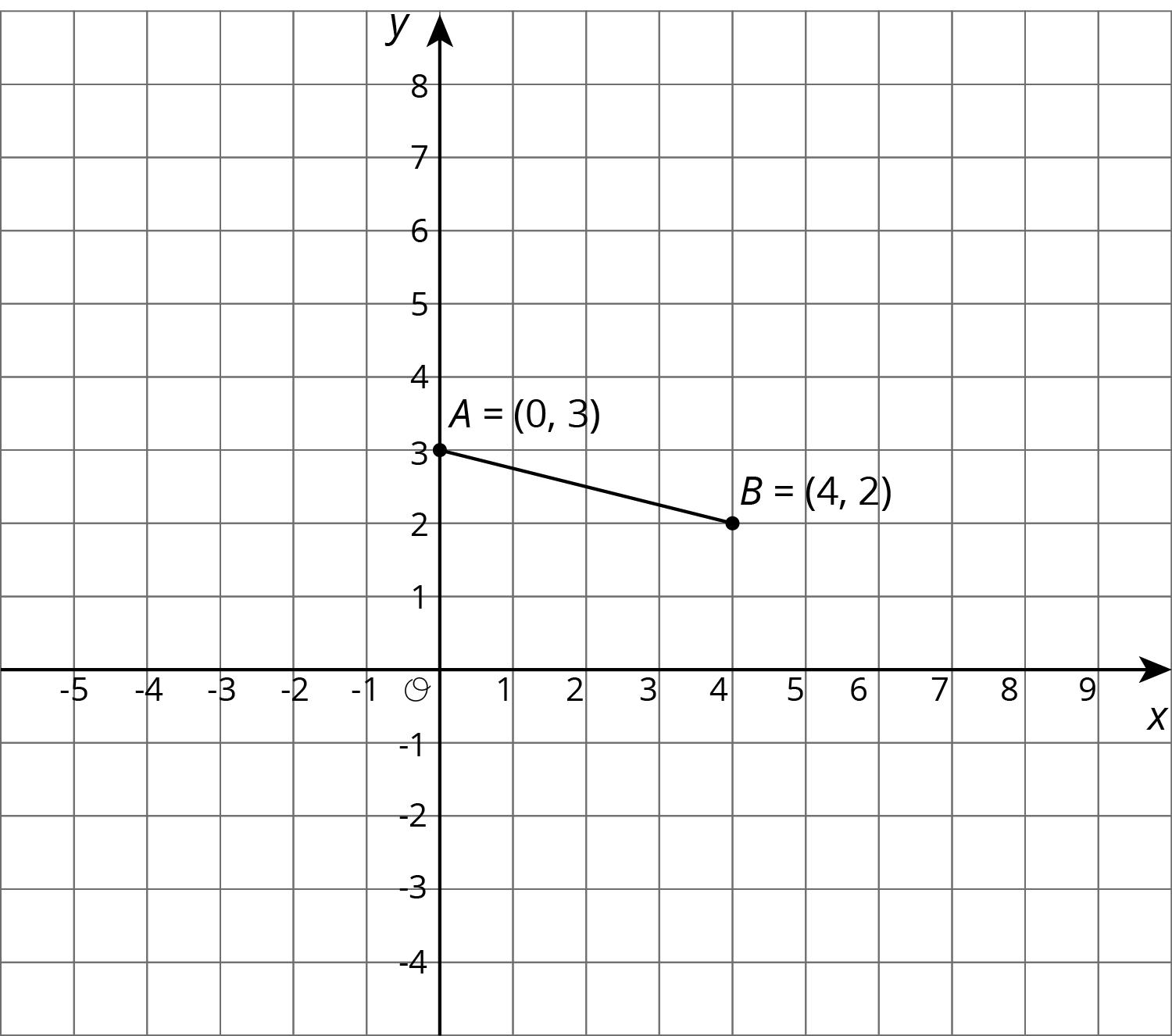
1. Translate to .
2. Translate to .
3. Translate to .
4. Translate to .

### 4.2: Reflecting Points on the Coordinate Plane



1. Here is a list of points On the **coordinate plane**:
   1. Plot each point and label each with its coordinates.
   2. Using the -axis as the line of reflection, plot the image of each point.
   3. Label the image of each point with its coordinates.
   4. Include a label using a letter. For example, the image of point should be labeled .
2. If the point were reflected using the -axis as the line of reflection, what would be the coordinates of the image? What about ? ? Explain how you know.
3. The point has coordinates .
   1. Without graphing, predict the coordinates of the image of point if point were reflected using the -axis as the line of reflection.
   2. Check your answer by finding the image of on the graph.
   * 
   1. Label the image of point as .
   2. What are the coordinates of ?
4. Suppose you reflect a point using the -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 .

1. Rotate segment 90 degrees counterclockwise around center . Label the image of as . What are the coordinates of ?
2. Rotate segment 90 degrees counterclockwise around center . Label the image of as . What are the coordinates of ?
3. Rotate segment 90 degrees clockwise around . Label the image of as and the image of as . What are the coordinates of and ?
4. Compare the two 90-degree counterclockwise rotations of segment . What is the same about the images of these rotations? What is different?

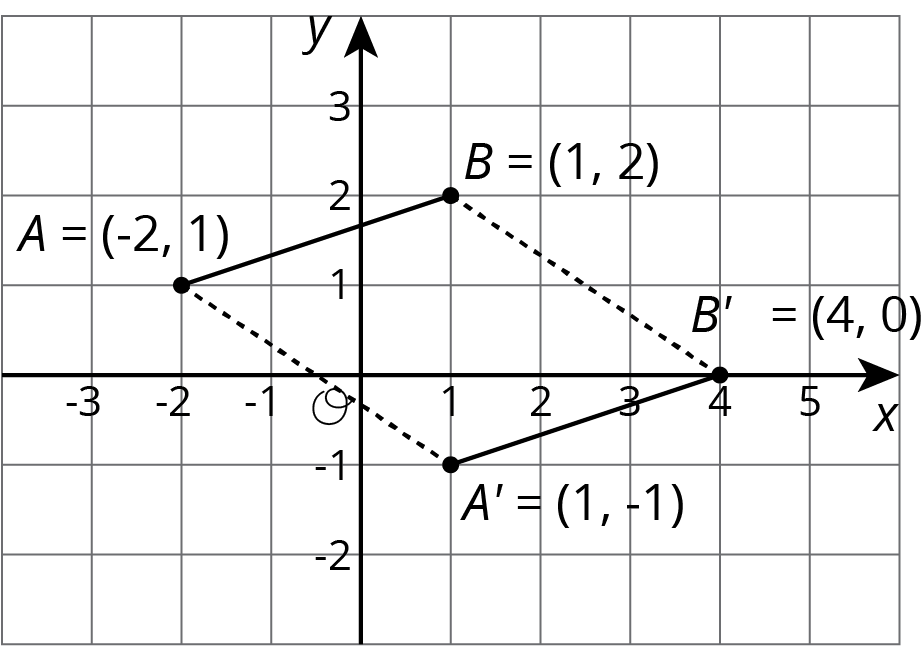
#### Are you ready for more?

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

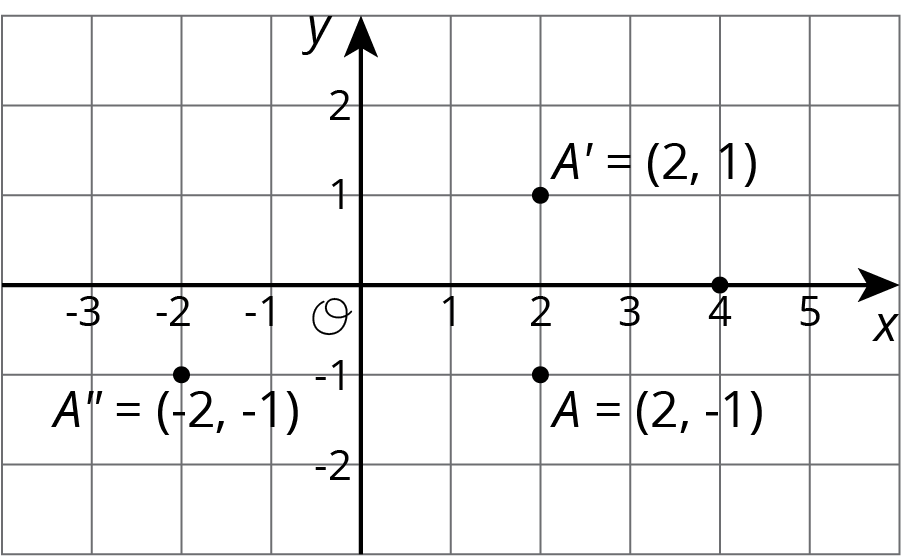
### Lesson 4 Summary

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 is translated right 3 and down 2.

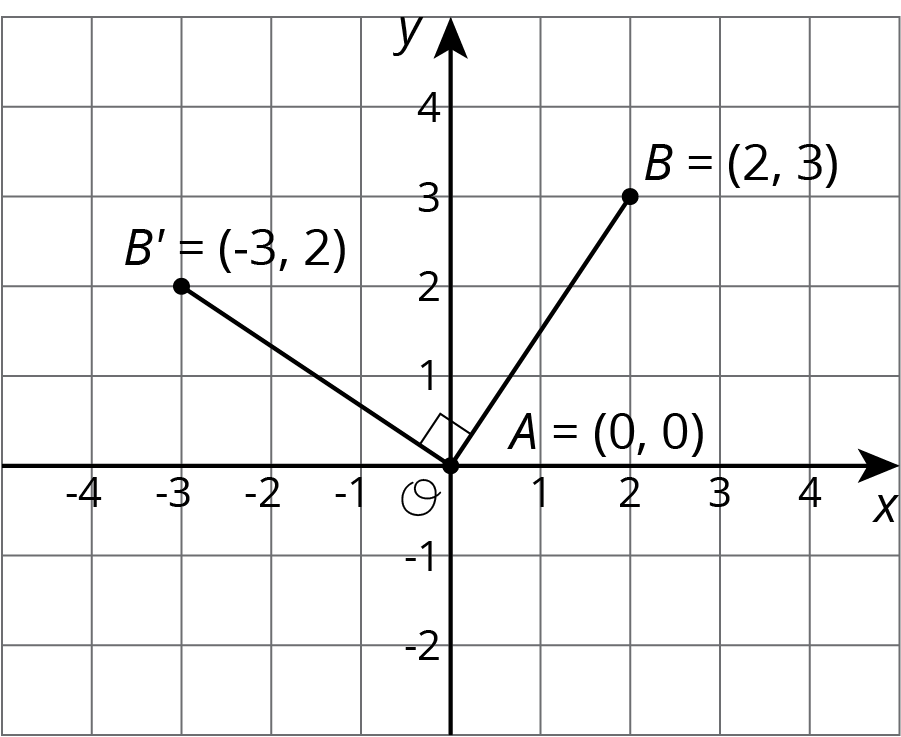


Reflecting a point across an axis changes the sign of one coordinate. For example, reflecting the point whose coordinates are across the -axis changes the sign of the -coordinate, making its image the point whose coordinates are . Reflecting the point across the -axis changes the sign of the -coordinate, making the image the point whose coordinates are .



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 rotation with center in a counterclockwise direction.



Point has coordinates . Segment was rotated counterclockwise around . Point with coordinates rotates to point whose coordinates are .



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