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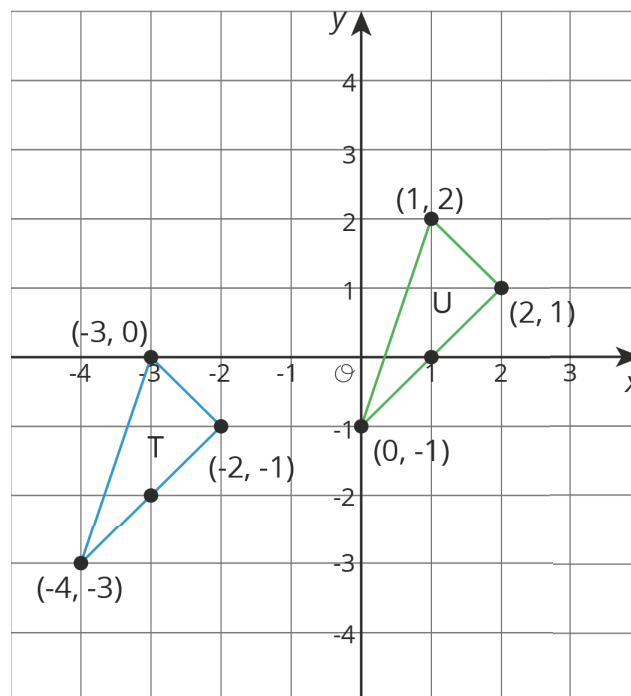
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## Unit 1, Lesson 5: Coordinate Moves

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.



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  $(2, 1)$ .

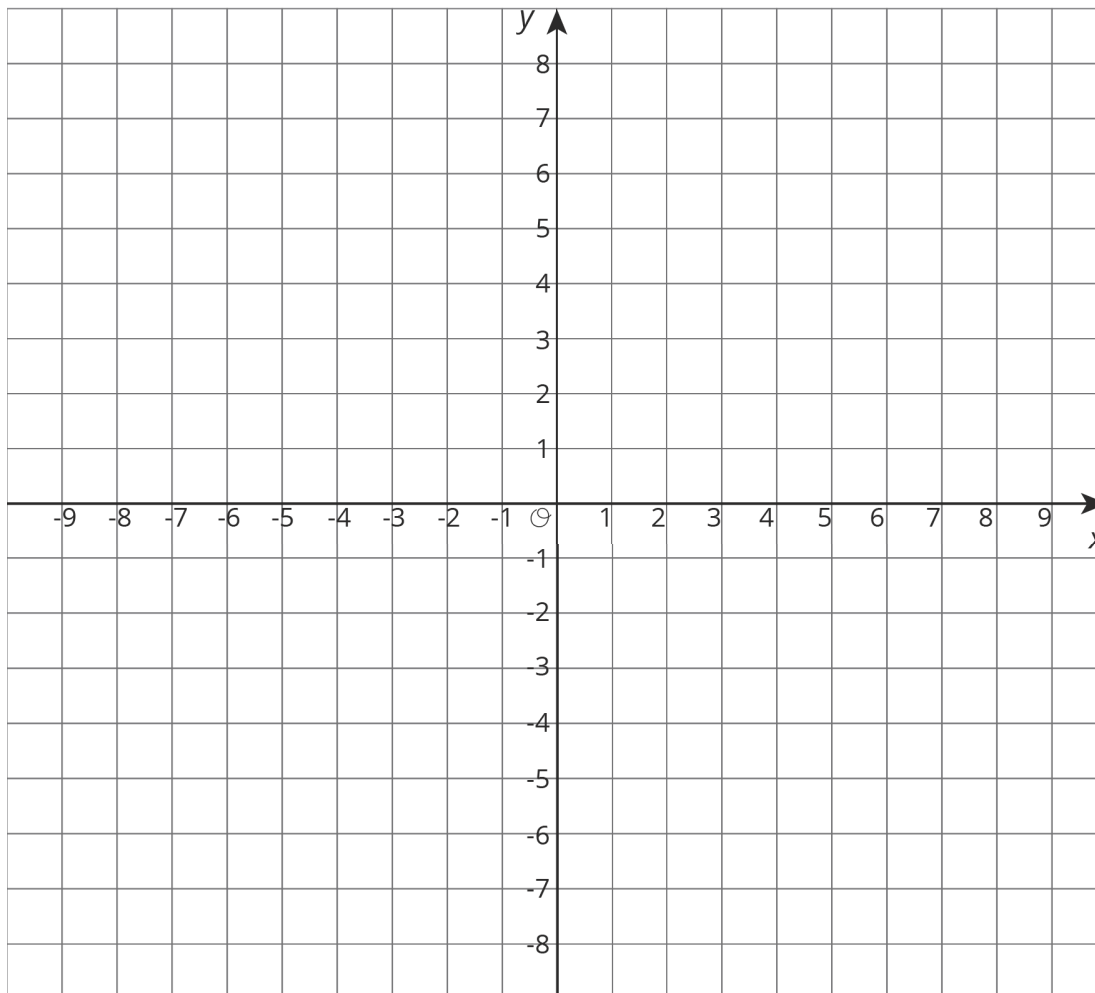
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## 5.2: Reflecting Points on the Coordinate Plane

m.openup.org/1/8-1-5-2



1. Here is a list of points

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

On the coordinate plane:

- Plot each point and label each with its coordinates.
- Using the  $x$ -axis as the line of reflection, plot the image of each point.
- Label the image of each point with its coordinates.
- Include a label using a letter. For example, the image of point  $A$  should be labeled  $A'$ .

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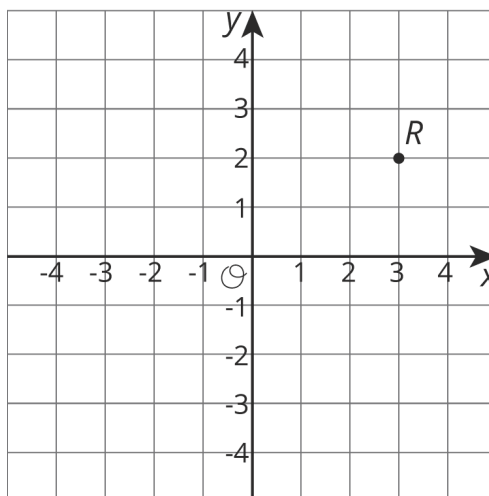
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2. If the point  $(13, 10)$  were reflected using the  $x$ -axis as the line of reflection, what would be the coordinates of the image? What about  $(13, -20)$ ?  $(13, 570)$ ? Explain how you know.

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?

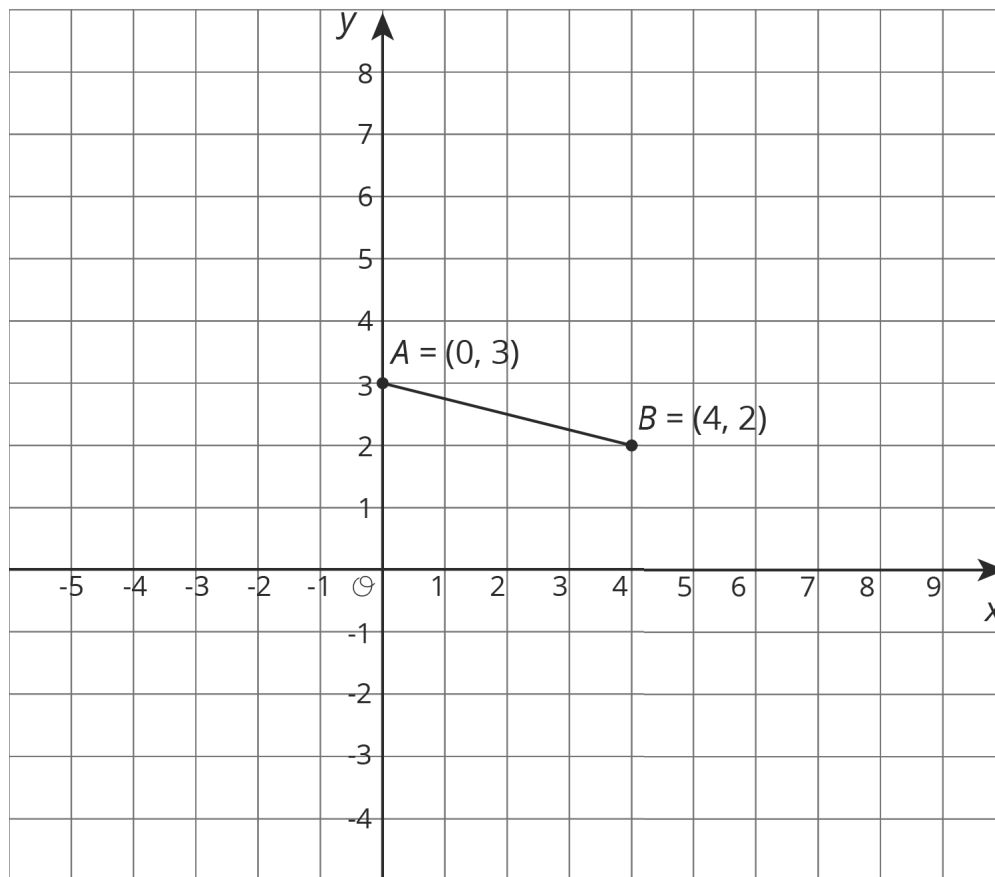
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### 5.3: Transformations of a Segment

m.openup.org/1/8-1-5-3



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?

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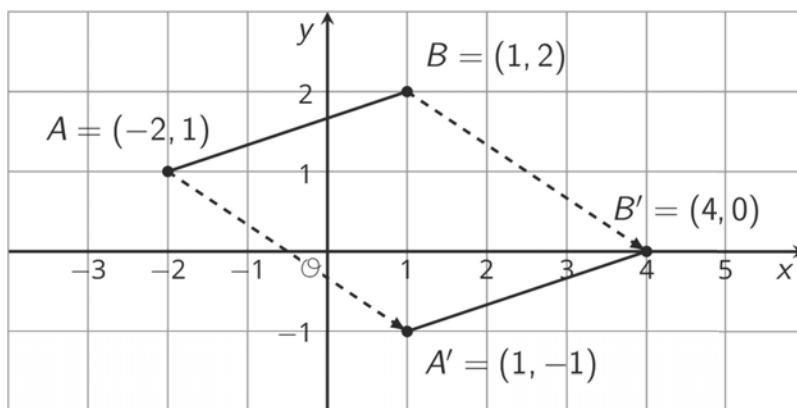
**Are you ready for more?**

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.

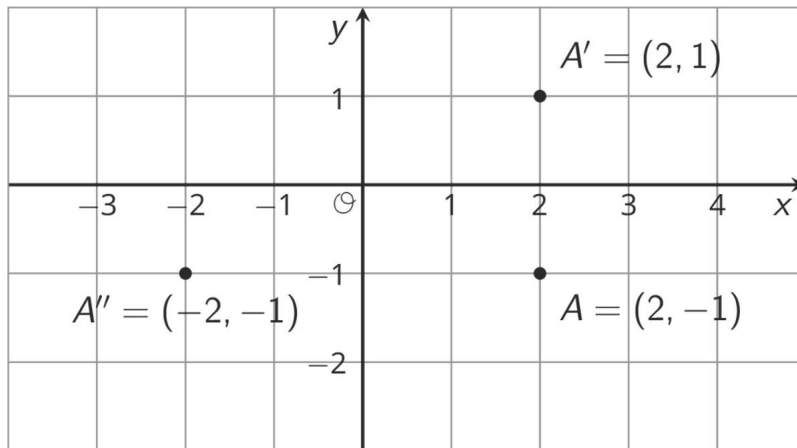


Reflecting a point across an axis changes the sign of one coordinate. For example, reflecting the point  $A$  whose coordinates are  $(2, -1)$  across the  $x$ -axis changes the sign of the  $y$ -coordinate, making its image the point  $A'$  whose coordinates are  $(2, 1)$ . Reflecting the point  $A$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

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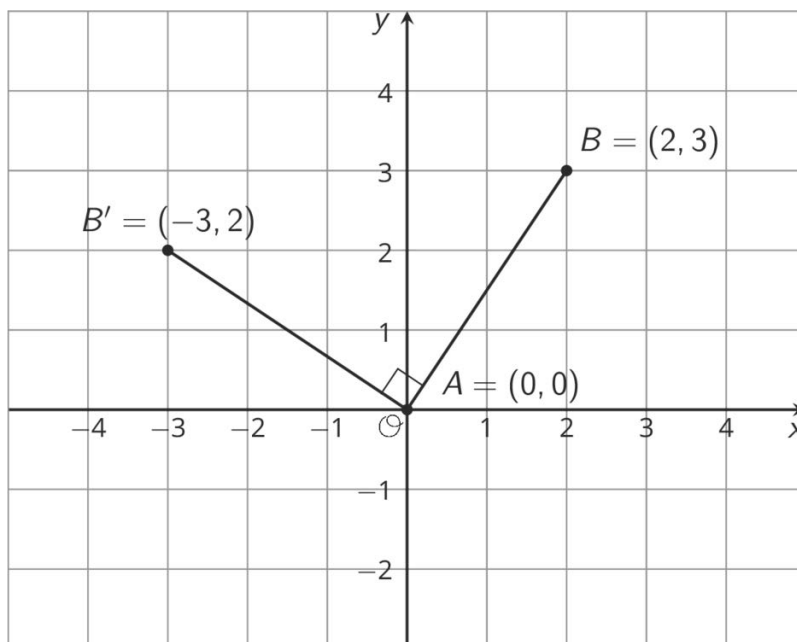
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Reflections across other lines are more complex to describe.

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



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

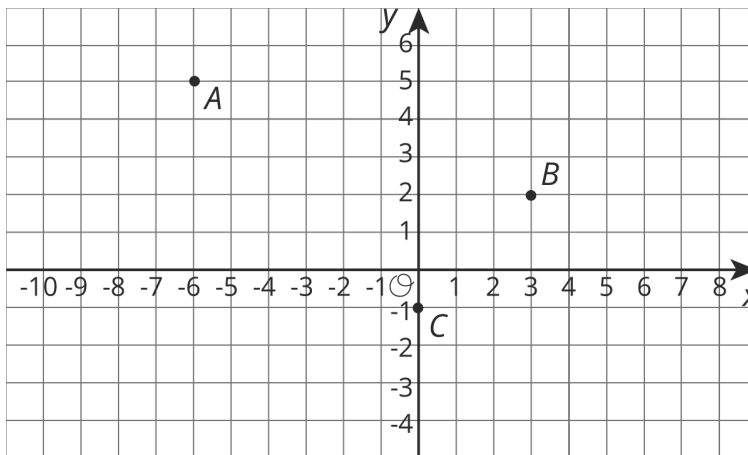
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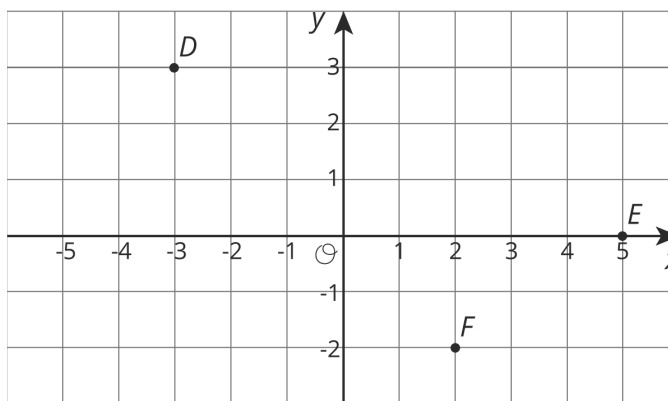
# Unit 1, Lesson 5: Coordinate Moves

1. a. Here are some points.



What are the coordinates of  $A$ ,  $B$ , and  $C$  after a translation to the right by 4 units and up 1 unit? Plot these points on the grid, and label them  $A'$ ,  $B'$  and  $C'$ .

b. Here are some points.



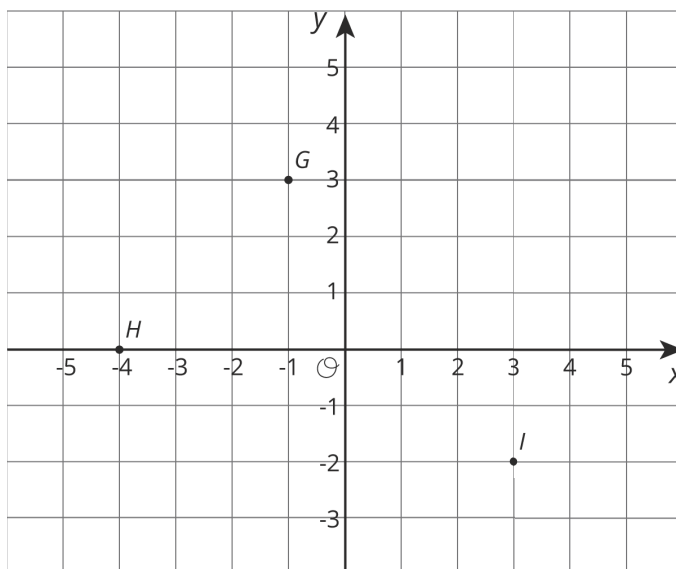
What are the coordinates of  $D$ ,  $E$ , and  $F$  after a reflection over the  $y$  axis? Plot these points on the grid, and label them  $D'$ ,  $E'$  and  $F'$ .

c. Here are some points.

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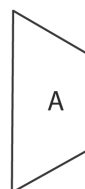
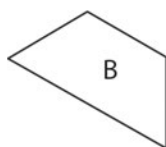
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What are the coordinates of  $G$ ,  $H$ , and  $I$  after a rotation about  $(0, 0)$  by 90 degrees clockwise? Plot these points on the grid, and label them  $G'$ ,  $H'$  and  $I'$ .

2. Describe a sequence of transformations that takes trapezoid A to trapezoid B.



(from Unit 1, Lesson 4)

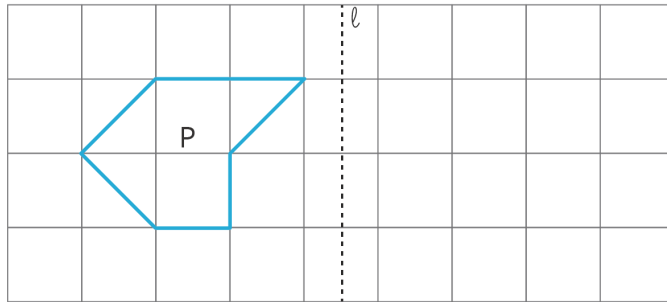
3. Reflect polygon  $P$  using line  $\ell$ .



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(from Unit 1, Lesson 3)