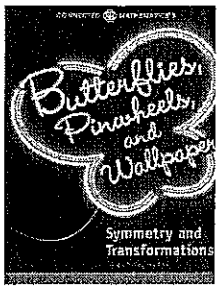
Name: Key Date: _____ Period: _____

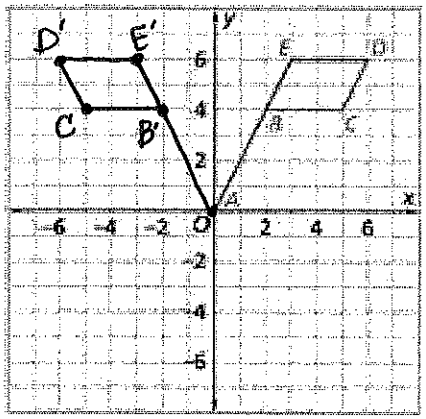


Transforming Coordinates 3.1

Video game programmers use rules for geometric transformations to guide the movement of characters on the screen. The axes and grid are hidden from your view, but they are essential to setting the color of the pixels that you see. In this investigation, you will develop your understanding of coordinate rules for transformations and skill in using that knowledge to solve geometric problems.

When you draw a geometric figure on a grid, each point has a unique pair of coordinates (x,y). Remember that the x value gives you the horizontal movement (right or left) and the y value gives you the vertical movement (up or down). You always begin at the origin (0,0).

The diagram below shows a flag located in the first quadrant. Notice the labels on key points.



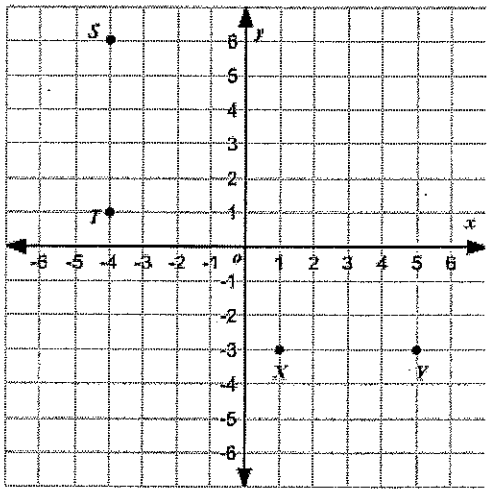
How can you find the coordinates of the image of those key points under reflections, rotations, and translations? In this problem, you will find rules to relate coordinates to their corresponding points after reflections. Complete the table below for the coordinates of A-E and their images under a reflection in the y-axis.

Point	A	B	C	D	E
Original Coordinates	(0,0)	(2,4)	(5,4)	(6,6)	(3,6)
Coordinates after a reflection	(0,0)	(-2,4)	(-5,4)	(-6,6)	(-3,6)

1. Write a rule relating coordinates of key points and their images after a reflection in the y-axis:

$(x,y) \rightarrow (\underline{-x}, \underline{y})$ keep y, change x (+/−)

2. Reflect each point below over the y-axis. Record the coordinates for each point before and after the reflection.



Point	S	T	X	Y
Original Coordinates	(-4,6)	(-4,1)	(+1,-3)	(5,-3)
Coordinates after a reflection	(4,6)	(4,1)	(-1,-3)	(-5,-3)

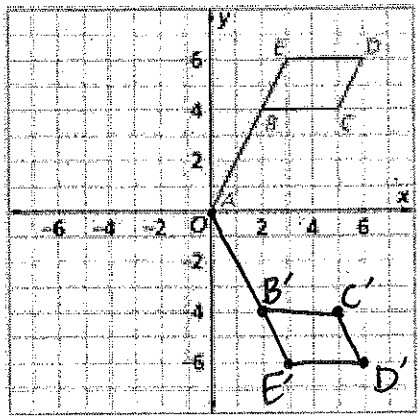
3. Does your rule hold true for these points?

Yes; y stayed the same and x became opposite (+/−)

4. What can you summarize about the effect on coordinates when reflecting over the y-axis?

The y-coordinate does not change, and x becomes the opposite of what it was.

5. Copy and complete the table for a reflection of the figure over the x-axis.

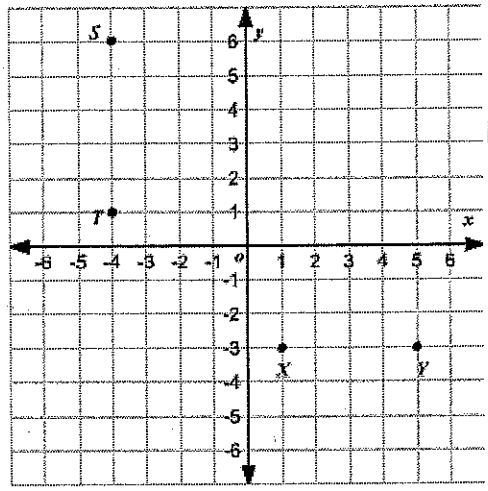


Point	A	B	C	D	E
Original Coordinates	(0,0)	(2,4)	(5,4)	(6,6)	(3,6)
Coordinates after a reflection	(0,0)	(2,-4)	(5,-4)	(6,-6)	(3,-6)

6. Write a rule relating key point and their images after a reflection in the x-axis.

(x,y)→(X , -Y) Keep x, change y (+/-)

7. Reflect each point below over the x-axis. Record the coordinates for each point before and after the reflection.



Point	S	T	X	Y
Original Coordinates	(-4,6)	(-4,1)	(1,-3)	(5,-3)
Coordinates after a reflection	(-4,-6)	(-4,-1)	(1,3)	(5,3)

8. Does your rule hold true for these points?

Yes; x stayed same & y became opposite (+/-)

9. What can you summarize about the effect on coordinates when reflecting over the x-axis?

The x-coordinate doesn't change, and the y-coordinate becomes the opposite of what it was.

10. A traingle has vertices at A(-4,3), B(1,5), C(2,-2). Using the rules you have discovered in this investigation, what would the new coordinates be if it was reflected over the y-axis?

A'(4 , 3) B'(-1 , 5) C'(-2 , -2)

Keep y, change x

What if it was reflected over the x-axis? → keep x, change y

A''(-4 , -3) B''(1 , -5) C''(2 , 2)