Name:________________________________ Date:______________ Per:____ A#____

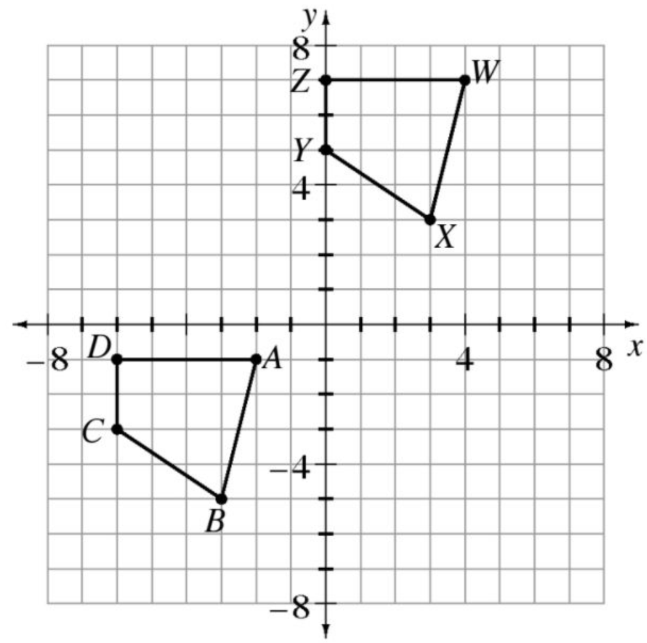
6.1.3 How can I describe it?

Describing Transformations

In Lesson 6.1.2, you used words and coordinate points to describe how a triangle moved on a graph. These expressions described the starting place, the motion, and the point where the triangle ended up. Today, you will write similar expressions to describe transformations on a grid.

6-18. Rosa changed the position of quadrilateral ABCD to that of quadrilateral WXYZ. "How did the coordinates of the points change?" she wondered.

a. Describe how Rosa transformed ABCD. Was the shape translated (slid), rotated (turned), or reflected (flipped)? Explain how you know.



Translation

b. How far did ABCD move? In which direction?

6 to the right
8 up

c. Point B became point X. What are the coordinates of points B and X? Name them using (x, y) notation.

B(-3, -5)
X(3, 3)

d. How did the x-coordinate of point B change? increase by 6

How did its y-coordinate change? increase by 8

For each coordinate, write an equation using addition to show the change.

$(x+6, y+8)$

e. Visualize translating WXYZ 10 units to the right and 12 units up. Where will point X end up? Without counting on the graph, work with your team to find the new coordinates of point Y. Write equations using addition to show the change.

Y(0, 5) $(x+10, y+12)$

$(0+10, 5+12) = (10, 17)$

6-19. Rosa translated a different shape on a grid. Use the clues below to figure out how her shape was moved.

a. The point (4, 7) was translated to (32, -2) . Without graphing, describe how the shape moved on the grid.

x increase 28
y decrease 9

$(x+28, y-9)$

b. Another point on her original shape was (-16, 9) . After the translation, where did this point end up? For each coordinate, write an equation using addition to show the change.

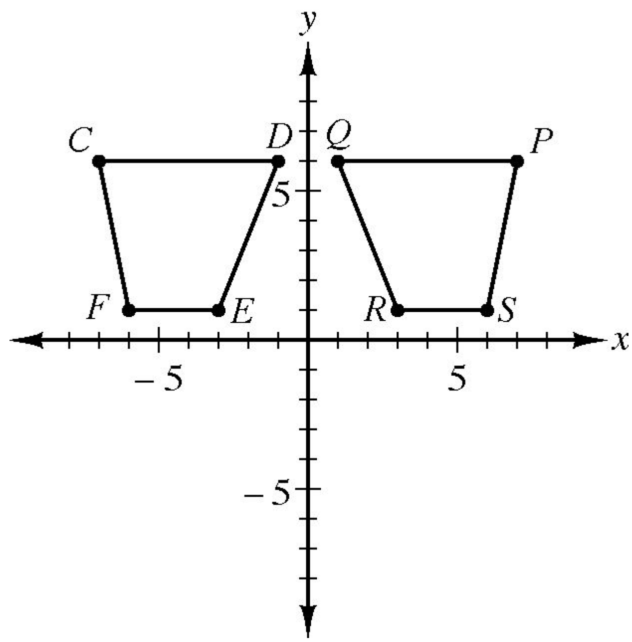
$(-16, 9)$
$(x+28, y-9)$

$(-16+28, 9-9) = \boxed{(12, 0)}$

6-20. Rowan transformed quadrilateral CDEF below to get the quadrilateral PQRS.

a. Describe how Rowan transformed the quadrilateral.
Was the shape translated, rotated, or reflected?
Explain how you know.

Reflection



b. Rowan noticed that the y-coordinates of the points did not change. What happened to the x-coordinates? Compare the x-coordinate of point D with the x-coordinate of point Q. Do the same with points E and R and with points F and S and with points C and P. What do you notice?

c. Can you describe the change to all of the x-coordinates with addition like you did in problems 6-18 and 6-19? If not, what other operation could you use? Explain.

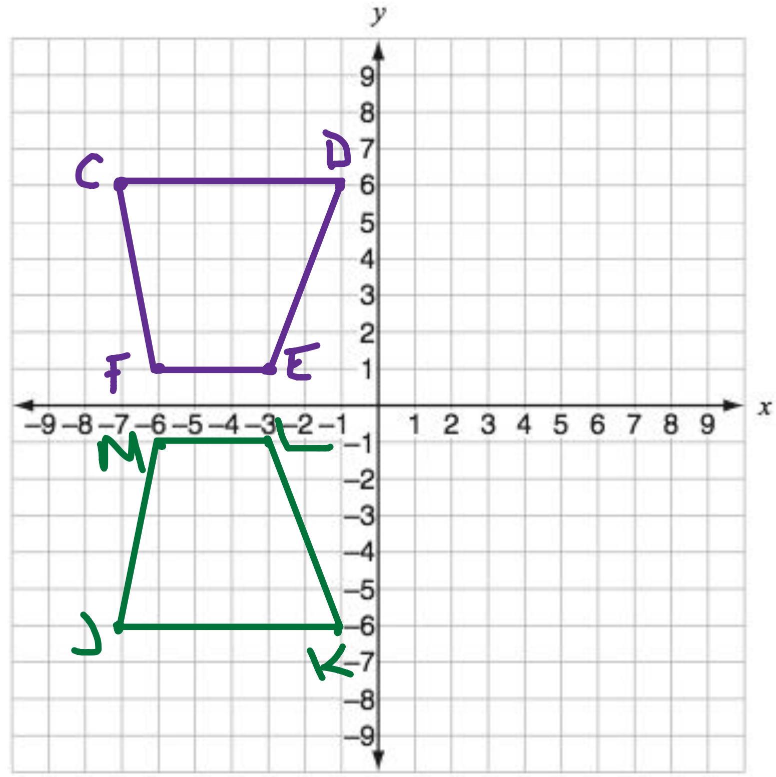
$(-x, y)$

d. What parts of quadrilateral CDEF are the same as quadrilateral PQRS?

6-21. Imagine that Rowan reflected quadrilateral CDEF from problem 6-20 across the x-axis instead. What do you think would happen to the coordinates in that case?

a. First visualize how the quadrilateral will reflect across the X-axis.

b. Reflect quadrilateral CDEF across the x-axis to get quadrilateral JKLM. C(-7,6) D(-1,6) E(-3,1) F(-6,1)



D. Find coordinates of JKLM.

C(-7,6) J(-7, -6)

D(-1,6) K(-1, -6)

E(-3,1) L(-3, -1)

F(-6,1) M(-6, -1)

e. Compare the coordinates of point C with point J, point D with point K, point E with point L, and point F with point M. What do you notice? How can you use multiplication to describe this change?

(x, -y)

6-22. In problem 6-20, Rowan noticed that ***multiplying the x-coordinates by –1 reflects the shape across the y-axis***.

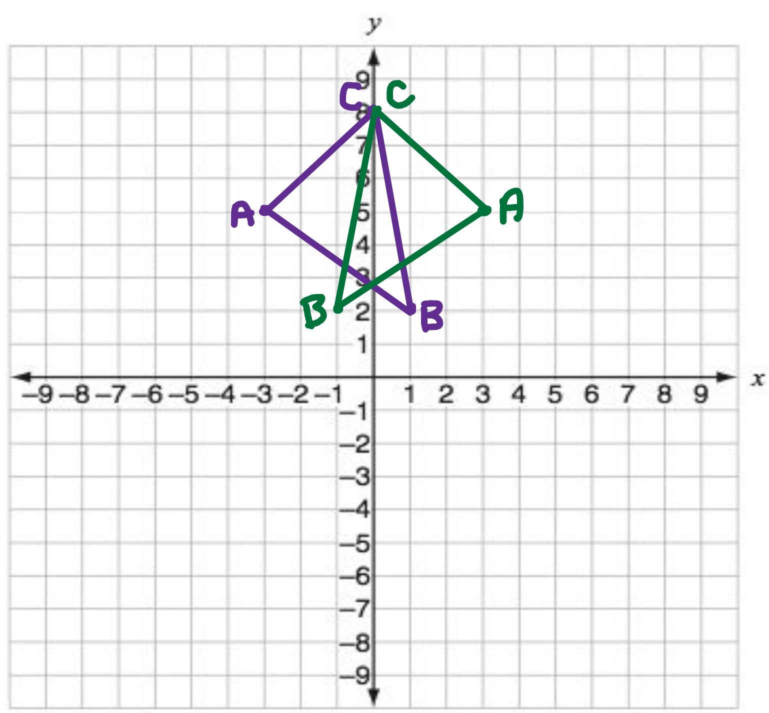
a. Test this strategy on a triangle formed by the points A (-3, 5) , B(1, 2) , and C(0, 8) . Before you graph, multiply each x-coordinate by –1. What are the new points?

A (-3, 5) A'(3, 5)

B(1, 2) B'(-1, 2)

C(0, 8) C'(0, 8)

b. Graph your original and new triangle on a new set of axes. Did your triangle get reflected across the y-axis?



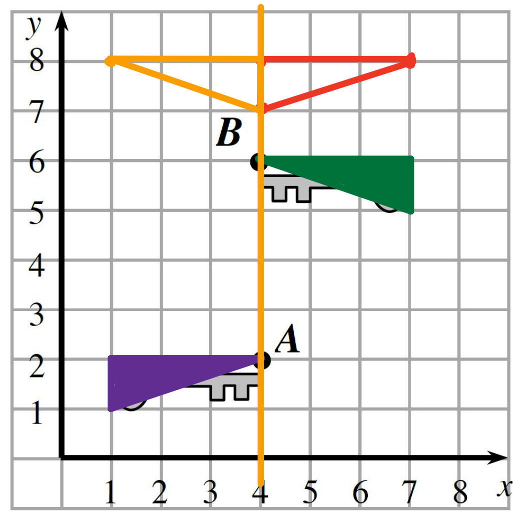
6-24. Stella used three steps to move the key on the graph at right from A to B. On the images on the right, draw a triangle around each key. Then follow the steps Stella wrote below. What was her last move?

1. Slide the key to the right 3 units and up 6 units.

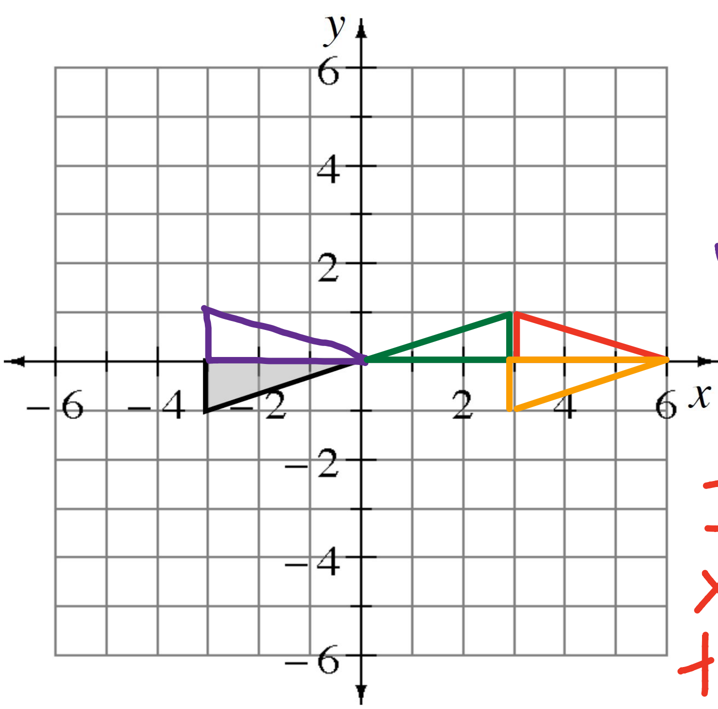
2. Reflect the key across the line x = 4.

3. ???

$(x+3, y-2)$



HW **6-25. Additional Challenge:** Do you think there is a way to use translations to create a reflection or a rotation? Or can reflections be used to move a shape in the same way as a rotation? To investigate these questions, complete parts (a) through (c).



a. Reflect (flip) the triangle across the x-axis. Then reflect the new triangle over the y-axis.

b. Rotate the original triangle 180° around the point (0, 0) . What do you notice?

The triangles end up in the same place.

c. Is there a way to use more than one reflection step so that at the end, the triangle looks like it was translated (slid)? If so, describe the combination of moves you would use.

If you reflect over the x-axis, then the y-axis, then x=3, and then the x-axis, it looks like you translated $(x+6, y+0)$.