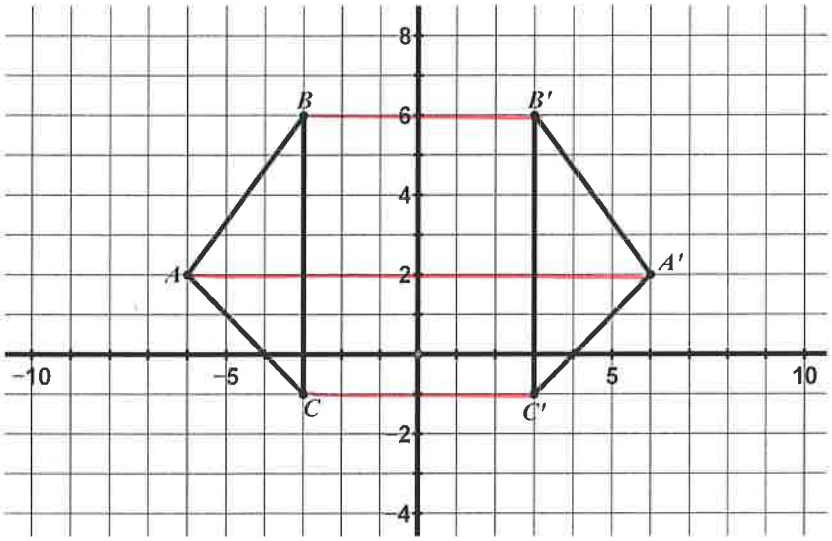
KEY

## 9.1b Class Activity: Properties of Reflections

1. In the grid below, $\Delta ABC$ has been **reflected** over the $y$-axis to obtain $\Delta A'B'C'$.




a. Describe the movement of a figure that has been **reflected**.

object was flipped over the y axis. Many others possible.

b. In the table below, write the coordinates for the vertices of the pre-image and image.

| Pre-Image | Image |
|---|---|
| $A$: $-6, 2$ | $A'$: $6, 2$ |
| $B$: $-3, 6$ | $B'$: $3, 6$ |
| $C$: $-3, -1$ | $C'$: $3, -1$ |

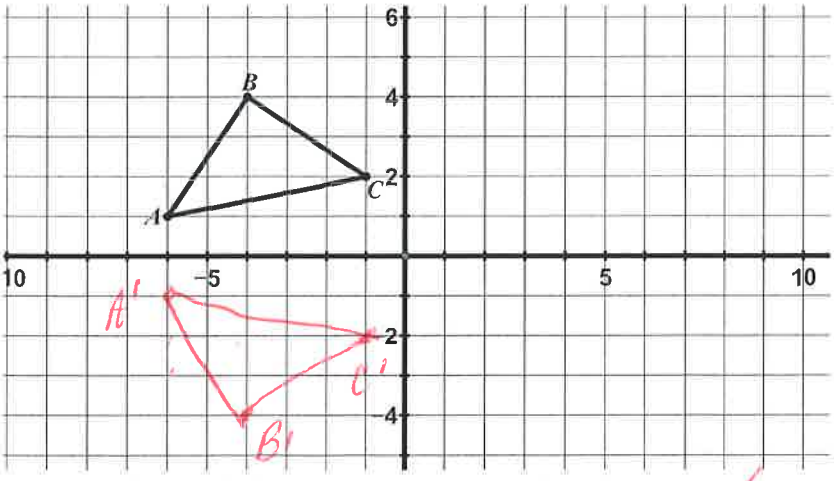
c. Write a coordinate rule to describe this reflection. $(x, y) \rightarrow (-x, y)$

d. Will this coordinate rule hold true for any figure reflected over the $y$-axis? Why or why not?

Yes - you are ~~reflecting~~ placing pts on the opposite side of the y so the x coordinate changes. y stays the same

**Directions:** Draw and label the image of each figure for the reflection given. Then, answer the questions.

2. Reflect $\Delta ABC$ across the $x$-axis and label the image.




a. In the table below, write the coordinates for the vertices of the pre-image and image.

| Pre-Image | Image |
|---|---|
| $A$: $-6, 1$ | $A'$: $-6, -1$ |
| $B$: $-4, 4$ | $B'$: $-4, -4$ |
| $C$: $-1, 2$ | $C'$: $-1, -2$ |

b. Write a coordinate rule to describe this reflection. $(x, y) \rightarrow (x, -y)$

c. Will this coordinate rule hold true for any figure reflected over the $x$-axis? Why or why not?

Yes; when you reflect over the x axis, you place points on the opposite side of the x, changing the y coordinate.

3. Use questions #1 – 2 to explore some **properties of reflections**.

   a. Go back to problem #1. Draw a segment connecting B and B', A and A', and C and C'. Make at least two conjectures about the relationship between **the line of reflection and the segments connecting corresponding vertices** in the image and pre-image of a reflection.

- segments connecting corresponding vertices are parallel (have the same slope) and are perpendicular to the line of reflection.
- The line of reflection cuts the segments into 2 equal parts.
- The L." of R." is the perpendicular bisector of all segments connecting corresponding points of image + pre-image

   b. Do your conjectures hold true in problem #2?

Yes ~~AB still~~.

   c. Go back to problem #1. For a *translation* we learned that corresponding segments are parallel (have the same slope). Is this property also true for reflections? No. AB slope is $\frac{4}{3}$

A'B' slope is $-\frac{4}{3}$

   d. Now, go to problem #2. Find the slopes of the following segments:

$\overline{AB} = \frac{3}{2}$ $\overline{AC} = \frac{1}{5}$ $\overline{BC} = -\frac{2}{3}$

$\overline{A'B'} = -\frac{3}{2}$ $\overline{A'C'} = -\frac{1}{5}$ $\overline{B'C'} = +\frac{2}{3}$

   e. Compare the slopes of the corresponding segments of the image and pre-image. What do you notice about the slopes? How does this connect to the coordinate rule $(x, y) \rightarrow (x, -y)$? n#

Discuss →

The sign of our rise (change in y) will change so ∴ changing the sign of the slope

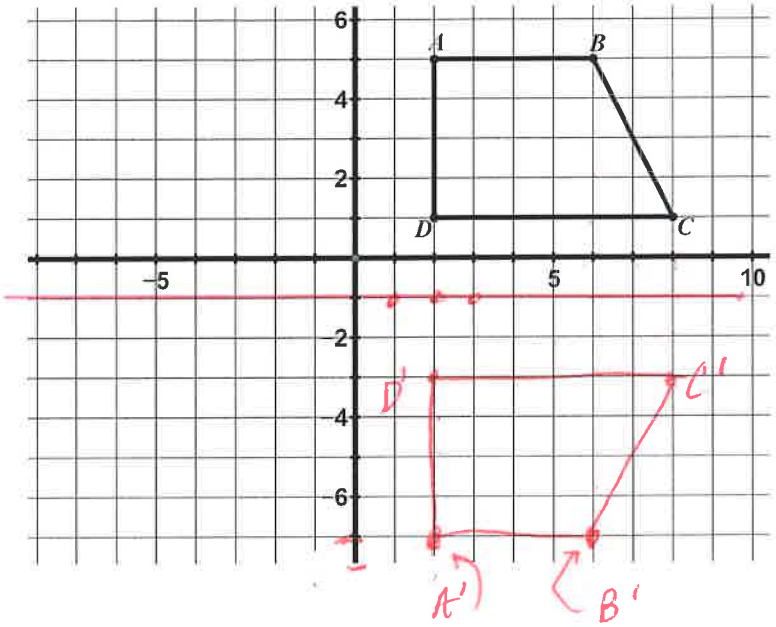
For proof, the sign of the run ($\Delta x$) will change ∴ changing the sign of the slope

   f. Examine problems #1 and #2. What do you notice about the **lengths of corresponding segments** in the image and pre-image?

They are congruent (same).
angle measures are also congruent.

(x, -1) 1, -1 2, -1 3, -1

4. Reflect $ABCD$ across the line $y = -1$ and label the image.




a. In the table below, write the coordinates for the vertices of the pre-image and image.

| Pre-Image | Image |
|---|---|
| $A$: 2, 5 | $A'$: 2, -7 |
| $B$: 6, 5 | $B'$: 6, -7 |
| $C$: 8, 1 | $C'$: 8, -3 |
| $D$: 2, 1 | $D'$: 2, -3 |

* Challenge

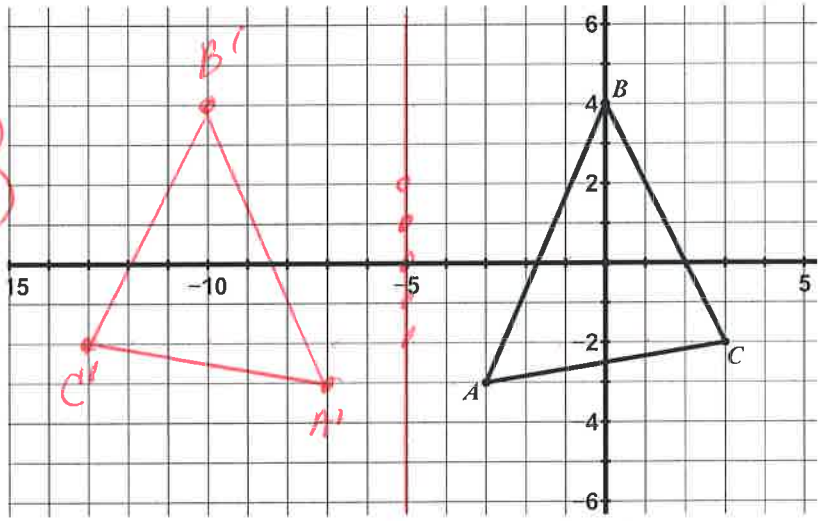
b. Write a coordinate rule to describe this reflection.

((x, y)(x, -y-2))

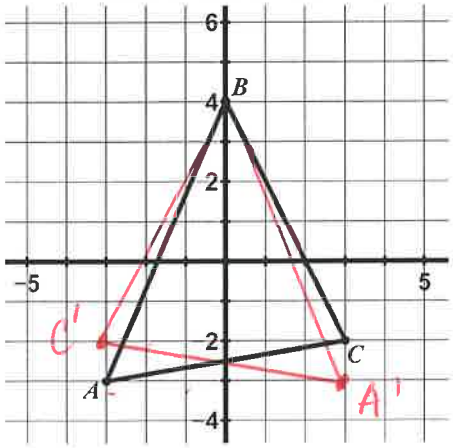
• Should see a reflection over a horizontal line will change/can the y coordinate, not the x. Think as a reflection over the x first then a translation down 2.

5. Reflect $\Delta ABC$ across the line $x = -5$ and label the image.

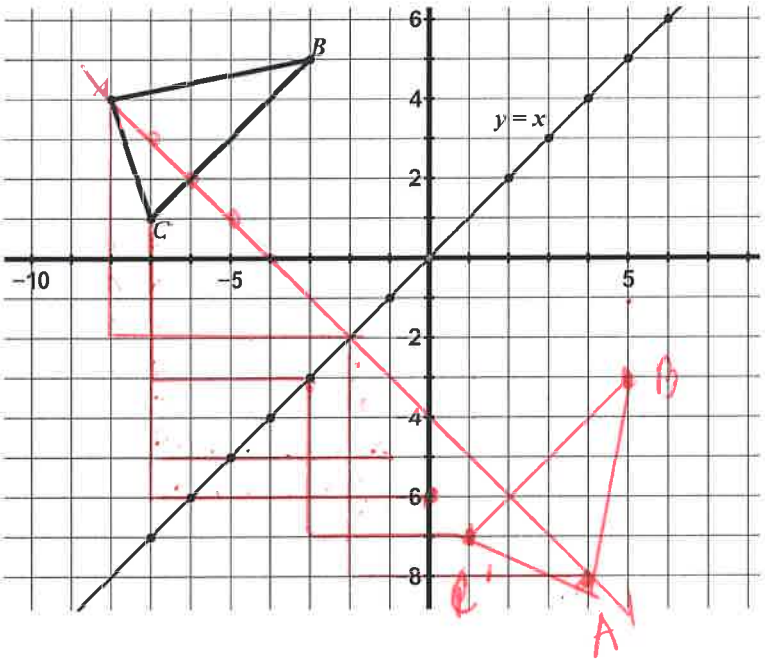
(-5, 1) (-5, 2) (-5, 0)




6. Reflect $\Delta ABC$ over the $y$-axis and label the image.



7. Reflect $\Delta ABC$ across the line $y = x$ and label the image.




a. Describe the method you used to solve this problem.

- may use mira
- could use rules
- slope of reflection line ($y=x$) is 1 so slope of all segments connecting corresponding vertices shd be -1.
- also correspond. vertices are equidistant from line of reflect.

b. In the table below, write the coordinates for the vertices of the pre-image and image.

| Pre-Image | Image |
|---|---|
| $A$: $-8, 4$ | $A'$: $4, -8$ |
| $B$: $-3, 5$ | $B'$: $5, -3$ |
| $C$: $-7, 1$ | $C'$: $1, -7$ |

c. Write a coordinate rule to describe this reflection.

$(x, y) \rightarrow (y, x)$

d. Will this coordinate rule hold true for any figure reflected over the line $y = x$? Why or why not?

Yes

e. Find the slopes of the following segments:

$\overline{AB} = \frac{1}{5}$ $\overline{AC} = -3$ $\overline{BC} = 1$

$\overline{A'B'} = 5$ $\overline{A'C'} = -\frac{1}{3}$ $\overline{B'C'} = 1$

f. Compare the slopes of the corresponding segments of the image and pre-image. What do you notice? How does this connect to the coordinate rule?

The x and y values switch under a reflection across $y=x$. Therefore the rise + run switch

g. **Bonus:** What is the coordinate rule for a figure reflected across the line $y = -x$?

$(x, y) \rightarrow (-y, -x)$

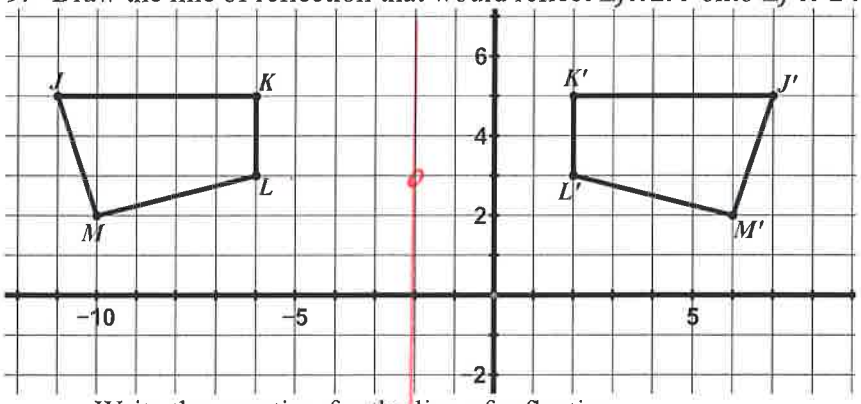
they shd. prove it

8. The following table lists the properties of translations discovered in the previous lesson. Put a checkmark in the box if the property is also true for reflections. Add additional statements to the table that are only true for reflections.

| Properties of Translations | Also True for Reflections? |
|---|---|
| Segments connecting the corresponding vertices of the image and pre-image are the same length. | |
| Segments connecting the corresponding vertices of the image and pre-image are parallel to each other. | ✓ |
| *Corresponding segments in the image and pre-image are the same length. | ✓ |
| *Corresponding angles in the image and pre-image have the same measure. | ✓ |
| *Parallel lines in the pre-image remain parallel lines in the image. | ✓ |
| Corresponding segments in the image and pre-image have the same slope. | |
| | line of reflection is the perpendicular bisector of all segments connecting corresp. vertices of the image + pre-image |
| | slopes may change |
| | orientation changes |
| | |

**Directions:** For #9 – 11, draw the line of reflection that would reflect one figure onto the other. Then, write the equation for the line of reflection and the coordinate rule that describes the reflection.

9. Draw the line of reflection that would reflect $\Delta JKLM$ onto $\Delta J'K'L'M'$.




$x = -2$

a. Write the equation for the line of reflection.

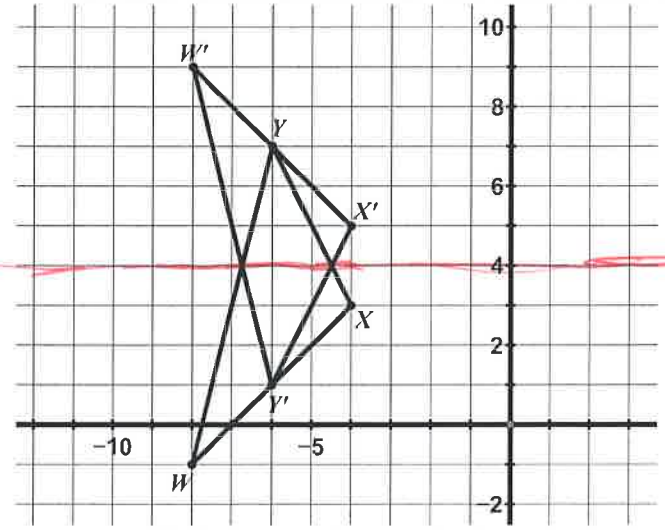
$x = -2$

b. Write a coordinate rule for the reflection.

$(x, y)$ $((-x-4), y)$

Hint: write coordinates to help come up with rule.

10. Draw the line of reflection that would reflect $\Delta WXY$ onto $\Delta W'X'Y'$.




$y = 4$

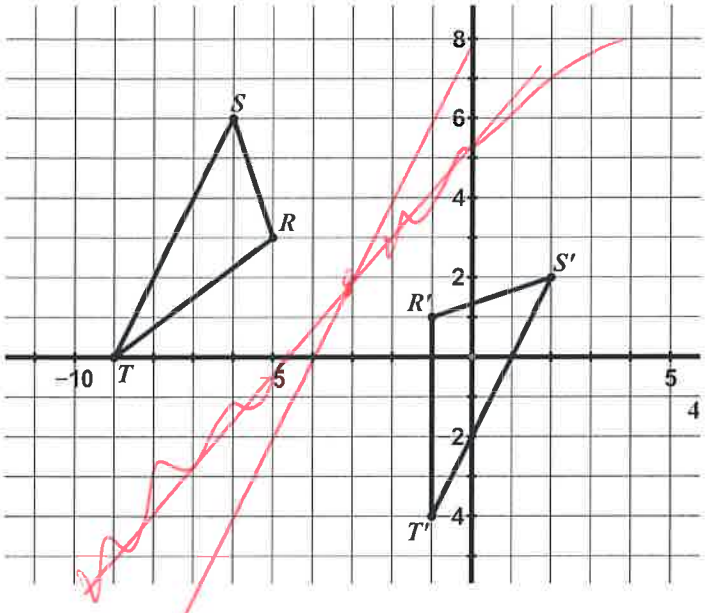
a. Write the equation for the line of reflection.

$y = 4$

b. Write a coordinate rule for the reflection.

$(x, y)(x, y + 8)$

11. Draw the line of reflection that would reflect $\Delta RST$ onto $\Delta R'S'T'$.




a. Write the equation for the line of reflection.

$y = 2x + 8$

Challenge