Name _____ Date _____ Period 6

Transformation #2: Reflections

Lesson Objective I WBAT perform reflections in the x- and y-axis; perform glide reflections; identify lines of symmetry.

Reflection: A reflection is a transformation that uses a line like a mirror to reflect a figure.

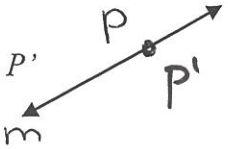
→ The "mirror" is called the line of reflection

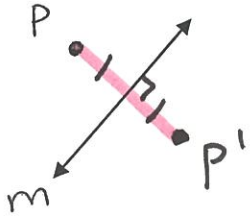
A reflection in a line m maps every point P in the plane to a point P', so that for each point one of the following properties is true:

1. If P is NOT on line m, then m is the ⊥ bisector of $\overline{PP'}$

   OR

2. If p is ON line m, then $P = P'$

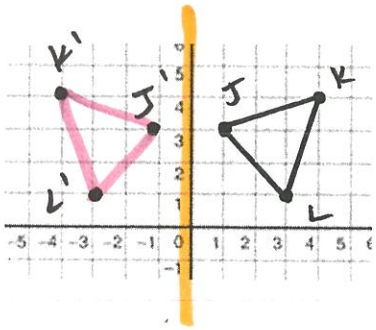




Reflection across the x- and y-axis

Example:

1. The vertices of ΔJKL are J(1, 3), K(4, 4) and L(3, 1). Graph the image of ΔJKL after a reflection in the y-axis



**Use the MIRA!

J' (-1 , 3) K' (-4 , 4) L' (-3 , 1)

Think About It…what happens to the x-coordinates from J to J'? The y-coordinates?

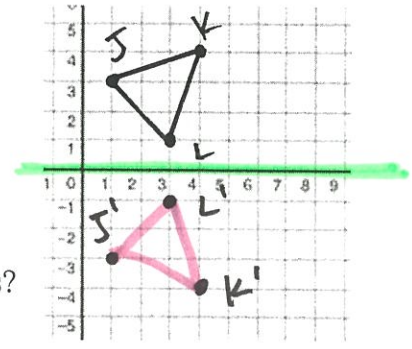
x-coord are opp signs
y-coord stay same.

From these observations, we can make the following rules:

If (x, y) is reflected in the y-axis, then its image is the point (-x , y)

preimg → img
$(x, y) \rightarrow (-x, y)$

2. The vertices of ΔJKL are J(1, 3), K(4, 4) and L(3, 1). Graph the image of ΔJKL after a reflection in the x-axis



**Use the MIRA!

J' (1 , -3) K' (4 , -4) L' (3 , -1)

Think About It…what happens to the x-coordinates from J to J'? The y-coordinates?

From these observations, we can make the following rules:

If (x, y) is reflected in the x-axis, then its image is the point (x , -y)

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

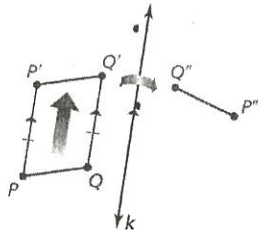
GENERAL RULES

Reflection in x-axis: (x, y) → (x , −y)

Reflection in y-axis: (x, y) → (−x , y)

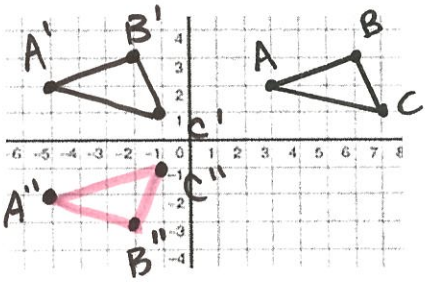
Glide Reflection: A glide reflection is a transformation involving a translation followed by a reflection in which every point P is mapped to P'' by the following steps:

1. First, a translate maps P to P'
2. Then, a reflection in a line k parallel to the direction of the translation maps P' to P''



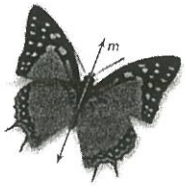
Example:

3. Graph ΔABC with vertices A(3, 2), B(6, 3) and C(7, 1) and its image after the glide reflection.
   Translation: $(x, y) \rightarrow (x - 8, y)$
   Reflection: in the x-axis



Line Symmetry: A figure in the plane has line symmetry when the figure can be mapped onto itself by a reflection in a line.

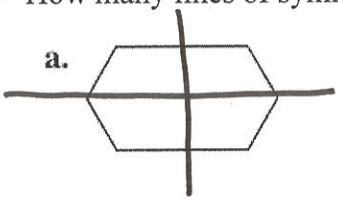
➔ The line of reflection is a line of symmetry, such as line m here:



Example:

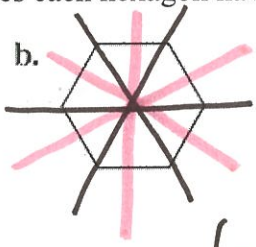
4. How many lines of symmetry does each hexagon have? Draw them in with a highlighter.

a.



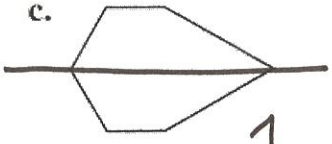
2

b.



6

c.



1

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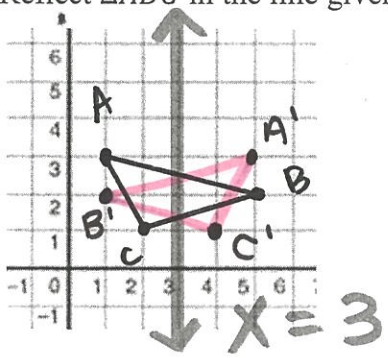
Transformation #2: Reflections (continued)

Lesson Objective IWBAT reflect in vert./ horiz. lines and the lines $y=x$ and $y=-x$

Reflecting in Horizontal and Vertical Lines

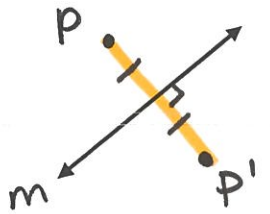
Examples:

1. Reflect ΔABC in the line given below. Use the MIRA!



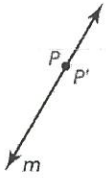
REMEMBER: A reflection in a line m maps every point P in the plane to a point P', so that for each point one of the following properties is true:

1. If P is NOT on the line of reflection, then the line of reflection is the ⊥ bisector of $\overline{PP'}$

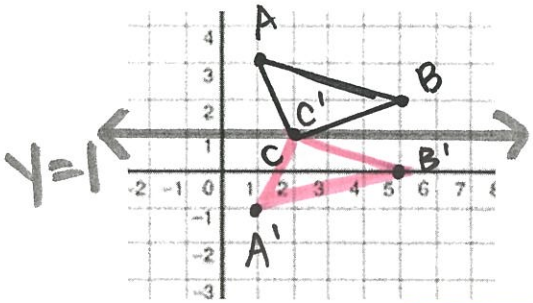


OR

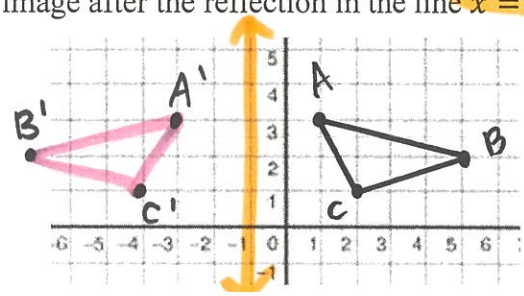
2. If p is ON line m, then $P = P'$



2. Reflect ΔABC in the line given below, using the properties of reflections in the box above.
   a. Count how many units each point is away from the line of reflection.
   b. Count that same amount of units on the *other side* of the line of reflection, then plot the image point



3. Graph ΔABC with vertices A(1, 3), B(5, 2), and C(2, 1) and its image after the reflection in the line $x = -1$



Reflecting Across the lines $y = x$ and $y = -x$

Examples

4. Graph $\overline{FG}$ with endpoints F(-1, 2) and G(1, 2) and its image after a reflection in the line $y = x$. Use the MIRA!

x y

5.

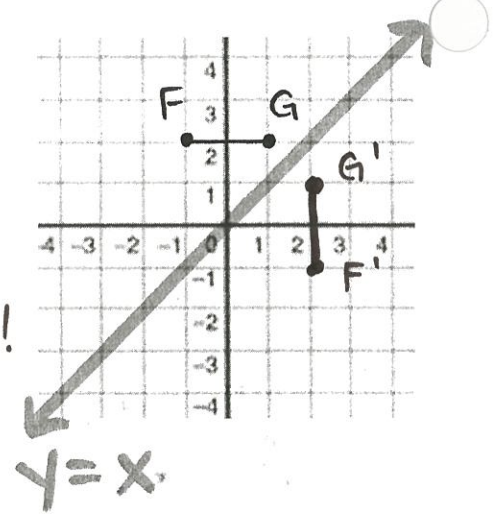
Where are F' and G' located? F' (2 , -1) and G' (2 , 1)

y x

What similarities/differences do you see between the *x-coordinates* of F and F'? G and G'?

x/y coords of preimg/img are switched!

What similarities/differences do you see between the y-*coordinates* of F and F'? G and G'?



GENERAL RULE

Reflection in the line $y = x$: (x, y) → (y , x)

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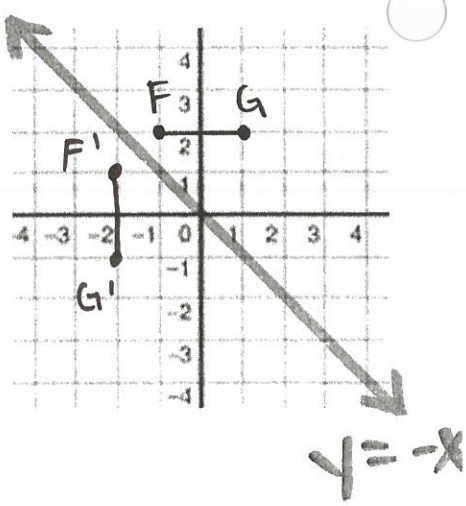
6. Graph $\overline{FG}$ with endpoints F(-1, 2) and G(1, 2) and its image after a reflection in the line $y = x$. Use the MIRA!

Where are F' and G' located? F' (-2 , 1) and G' (-2 , -1)

What similarities/differences do you see between the *x-coordinates* of F and F'? G and G'?

What similarities/differences do you see between the y-*coordinates* of F and F'? G and G'?



GENERAL RULE

Reflection in the line $y = -x$: (x, y) → (-y , -x)

7. Graph ΔJKL with vertices at J(1, 3), K(4, 4) and L(3, 1) and its image after a reflection in the line $y = -x$

J'(-3 , -1) K'(-4 , -4) L'(-1 , -3)