Day 2: Reflections

Warm-Up:

Using the points A(3, -4), B(1, 3), C(-2,1), D(-3, -5), perform each rule and give the resulting image points and the requested information.

1) translate right 2, down 5

A'(5,-9) B'(3,-2) C'(0,-4) D'(-1,-10)

Algebraic Rule: $(x,y) \to (x+2, y-5)$

2) translate left 6, up 4

A'(-3,0) B'(-5,7) C'(-8,5) D'(-9,-1)

Algebraic Rule: $(x,y) \to (x-6, y+4)$

3) translate using the rule (x, y) -> (x, y - 6)

A'(3,-10) B'(1,-3) C'(-2,-5) D'(-3,-11)

Description: translated down 6

4) translate using the vector < -1, 2 >

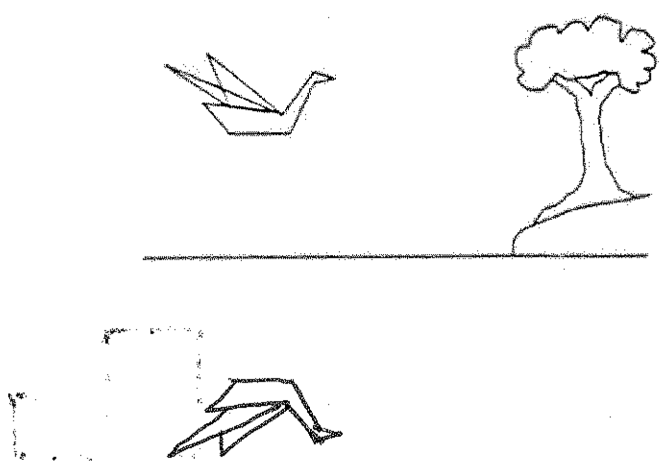
A'(2,-2) B'(0,5) C'(-3,3) D'(-4,-3)

Description: translated left 1 and up 2

Reflections

Reflections Introduction

Bill is sitting on a boat on a smooth, placid mountain lake. In the distance he sees the scene picture below, in which a swan is flying over the lake toward a distant tree. He also sees an image of the swan in the lake. Draw a picture of what Bill sees in the lake. Answer the questions.



1. How did you draw your picture?

   folded paper along lake line and traced swan twice OR traced swan and lake line on patty paper & used pencil to pierce points through the paper

2. What type of transformation would you call this?

   reflection

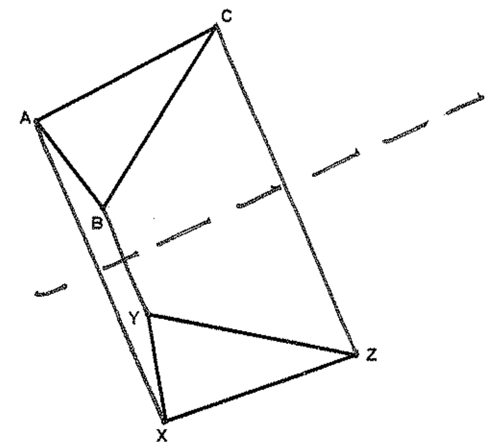
3. What transformations term would you use to describe the swan?

   preimage

4. What transformations term would you use to describe the swan's reflection?

   image

Reflection Exploration

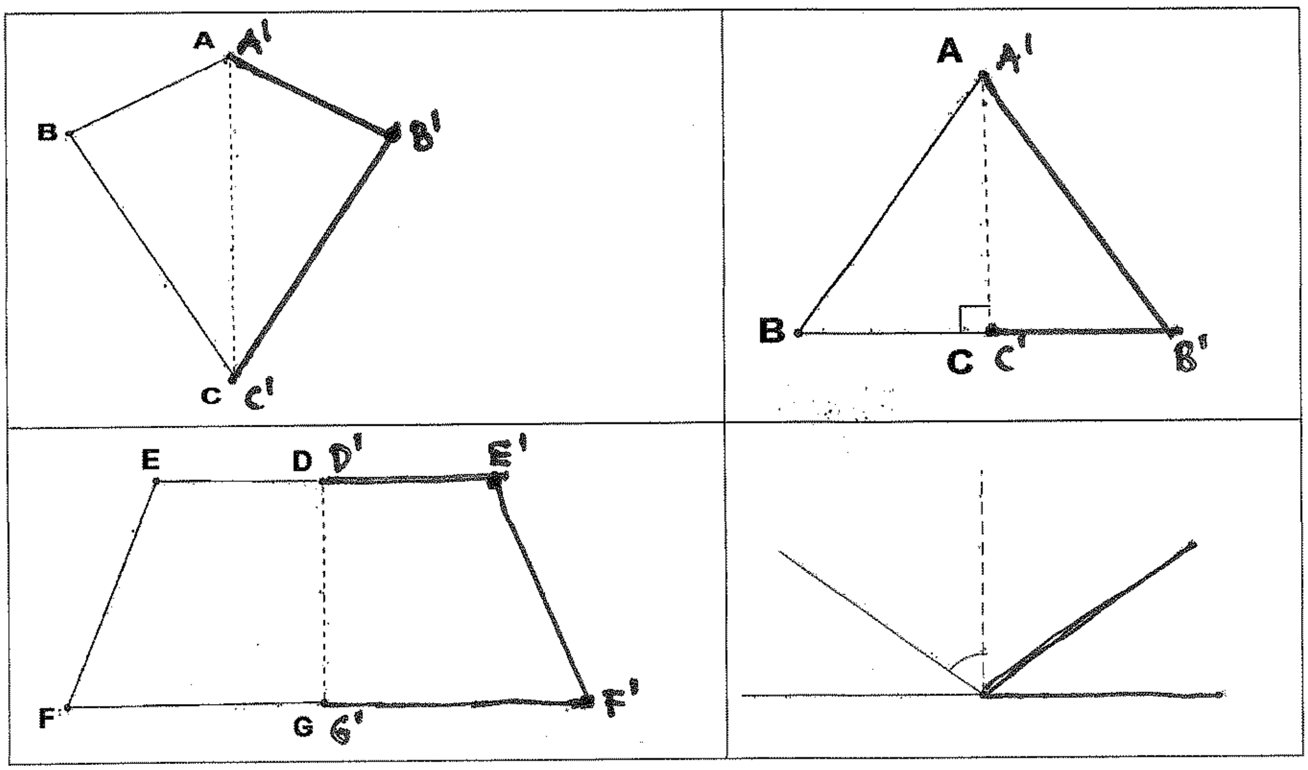


1) $\triangle ABC$ and $\triangle XYZ$ are reflections of each other. While holding the paper towards the light, fold the paper so that the triangles coincide (line up on top of each other). Crease the fold. Then open your paper back up and trace over this fold line using a straightedge to keep it neat.

2) Using a straightedge, draw $\overline{AX}$, $\overline{BY}$, and $\overline{CZ}$. Look at each segment in relationship to the reflection line. What appears to be true about the reflection line? the reflection line is the perpendicular bisector of each segment

Patty Paper Reflections

Use patty paper to reflect each figure across the dashed line. Label the image points with proper notation.



Checkpoint: **Reflections:**

- A reflection is a transformation in which the image is a mirror image of the preimage.
- A point on the line of reflection maps to itself.
- Other points map to the opposite side of the reflection line so that the reflection line is the perpendicular bisector of the segment joining the preimage and the image.
- Preimage and image points are equidistant from the mirror line.
- Notation for reflections is $R_{\text{line of reflection}}$. Example: $R_{\text{x-axis}}$ means reflection across the x-axis.

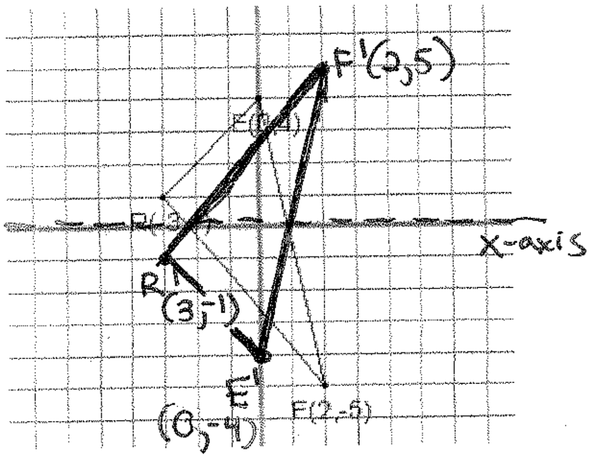
Activity: Reflections in the coordinate plane. Given ΔREF: R(-3, 1), E(0, 4), F(2, -5)

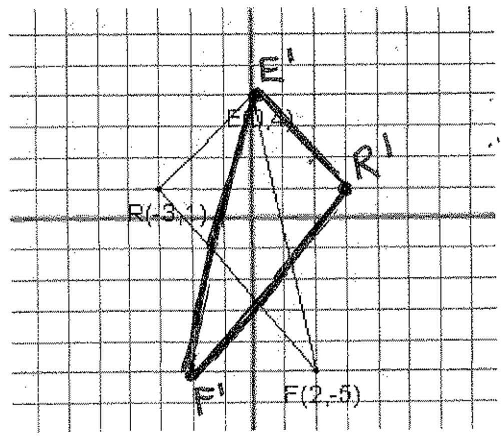
1) On the first grid, draw the reflection of ΔREF in the x-axis. Notation: $R_{x\text{-axis}}$
Record the new coordinates: R'(-3 , -1), E'(0 , -4), F'(2 , 5)

*Note: the y-values changed signs

2) On the second grid, draw the reflection of ΔREF in the y-axis. Notation: $R_{y\text{-axis}}$
Record the new coordinates: R'(3 , 1), E'(0 , 4), F'(-2 , -5)

*Note the x-values changed signs



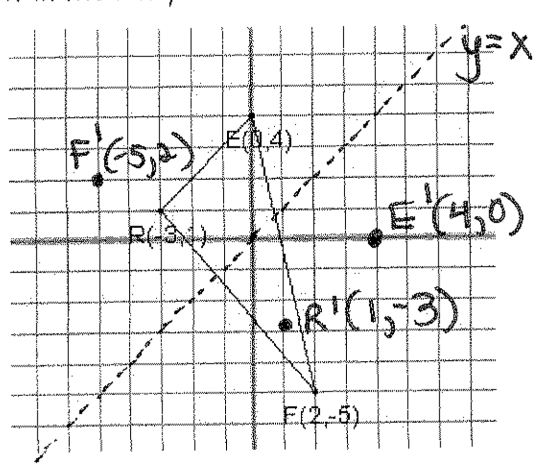


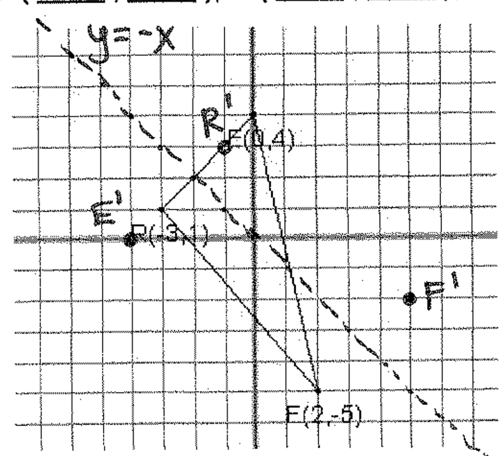
3) Graph the line y = x on the third coordinate grid. Trace ΔREF and the line y = x on patty paper. Then flip the patty paper over and line it up again to see where the triangle's image would be if you reflected it in the line y = x. Record the new coordinates: R'(1 , -3), E'(4 , 0), F'(-5 , 2)

*Note: x and y values switched places

4) Graph the line y = -x on the fourth coordinate grid. Trace ΔREF and the line y = -x on patty paper. Then flip the patty paper over and line it up again to see where the triangle's image would be if you reflected it in the line y = -x. Record the new coordinates: R'(-1 , 3), E'(-4 , 0), F'(5 , -2)

*Note: x and y values switched places AND switched signs





Checkpoint: Look at the patterns and complete the rule. Then write the rule using proper notation.

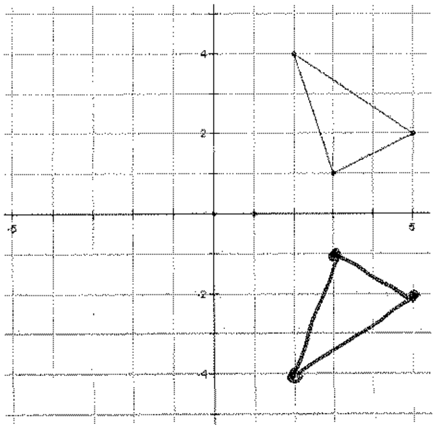
1. Reflection in the x-axis maps (x, y) → (x , -y) $R_{x\text{-axis}}$
2. Reflection in the y-axis maps (x, y) → (-x , y) $R_{y\text{-axis}}$
3. Reflection in the line y = x maps (x, y) → (y , x) $R_{y=x}$
4. Reflection in the line y = -x maps (x, y) → (-y , -x) $R_{y=-x}$

*Note: x and y switched places

*Note: x and y switched places AND switched signs

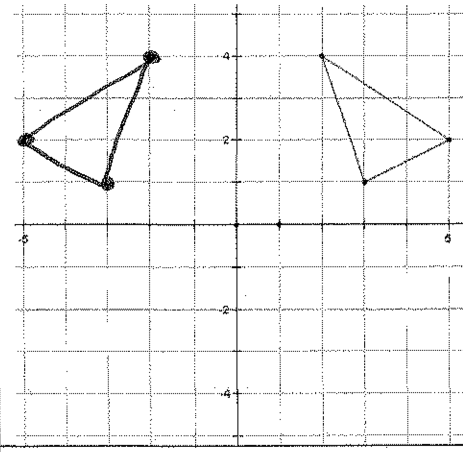
Practice: Find the image of the following transformations and give the requested information.
Hint: If you get stuck, review the Checkpoints after today's activities. ☺

The points (2,4), (3,1), (5,2) are reflected with the rule $(x, y) \rightarrow (x, -y)$ (2,-4) (3,-1) (5,-2)



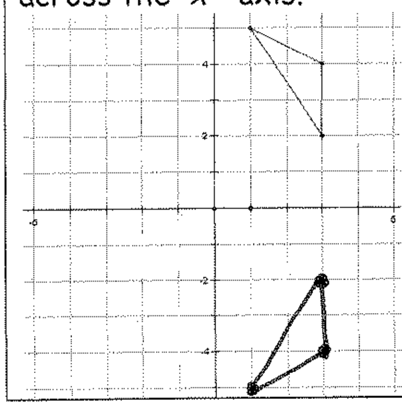
Description: reflection over the x-axis

The points (2,4), (3,1), (5,2) are reflected with the rule $(x, y) \rightarrow (-x, y)$ (-2,4) (-3,1) (-5,2)



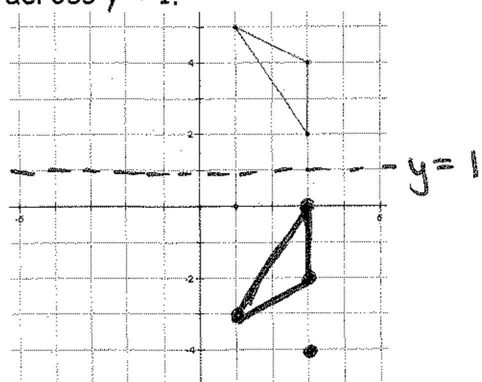
Description: reflection in the y-axis

The points (3,2), (1,5), (3,4) are reflected across the x - axis.



Algebraic Rule: $(x,y) \rightarrow (x,-y)$

The points (3,2), (1,5), (3,4) are reflected across y = 1.



(3,0)
(1,-3)
(3,-2)

Summarize with Algebraic Rules:

What type of transformation does each of the following algebraic rules produce?

(x, y) → (x, -y) reflection over the x-axis	(x, y) → (-x, y) reflection over the y-axis
(x, y) → (-x, -y) reflection over both axes	
(x, y) → (y, x) reflection over y=x	(x, y) → (-y, -x) reflection over y = -x
Can you figure out this one on your own? Describe the reflection the results from the following algebraic rule (x, y) → (x, y)	