4.2 - Reflections

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Lesson Objectives

- Perform reflections
- Perform glide reflections
- Identify lines of symmetry
- Solve real-life problems involving symmetry

4 Types of Transformations

1.) Translation (Translate)
   - Move or slide

2.) Reflection (Reflect)
   - **Mirror image over a line**

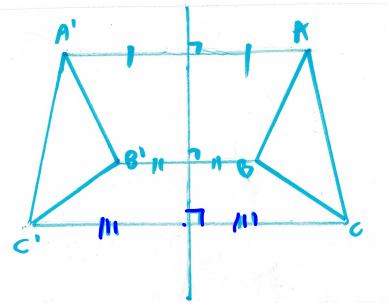
3.) Rotation (Rotate)
   - Turn or spin around a point

4.) Dilation (Dilate)
   - Increase or decrease scale/size

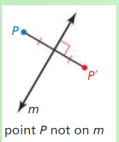
Exploration - Reflecting a Triangle

Work with your group.

1. Fold your paper in half along the long side (hamburger fold). Unfold it and use your straightedge to draw a line along the fold. Label the line *m*.
2. Use a ruler or a straightedge to draw any triangle on one half of your paper. Label it ABC.
3. Fold your paper again along the same fold so your triangle ABC is showing on the outside. Using a pen or pencil, poke a hole in your paper at each of the 3 vertices, A,B, and C.
4. Unfold your paper. You should have a hole at A, B, and C, along with 3 additional holes that are unlabeled. Draw points on your paper at these new locations and label them A' B' and C' to match up with your original triangle.
5. Connect each point with its image (new point) by drawing 3 segments, $\overline{AA'}$, $\overline{BB'}$, and $\overline{CC'}$.
6. Discuss and write down any observations you make regarding these 3 segments and line *m*.

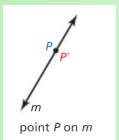


Reflection = Reflects every point over a line of reflection to create a mirror image.



point *P* not on *m*

If P ***is not on*** the line of reflection, then:
- Line *m* is perpendicular to segment $\overline{PP'}$
- Line *m* bisects $\overline{PP'}$



point *P* on *m*

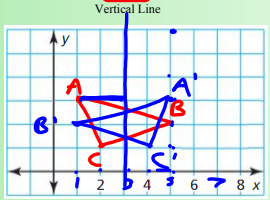
If P ***is on*** the line of reflection, then:
- $P=P'$

EXAMPLE 1 **Reflecting in Horizontal and Vertical Lines**

Graph $\triangle ABC$ with vertices $A(1, 3)$, $B(5, 2)$, and $C(2, 1)$ and its image after the reflection described.

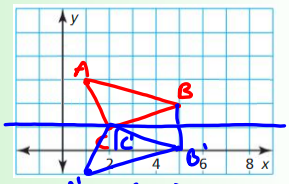
a. In the line n: $x = 3$ **b.** In the line m: $y = 1$

Vertical Line



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

Horizontal Line



$A'(1,-1)$
$B'(5,0)$
$C'(2,1)$

4.2 - Reflections

4.2 p.186
#3-6,8-12E
#14,16,17,20
#21-24,28,30,34

3.5 and 4.1 HW Check tomorrow (Tues 10/31)

Mental Floss: Thursday Nov 2nd

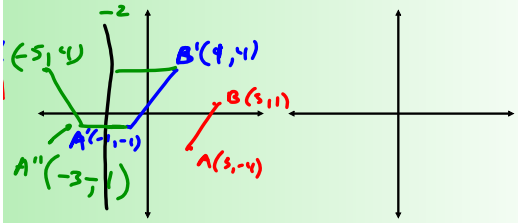
Given the segment AB with endpoints at:

$A(3,-4)$ and $B(5,1)$

List the coordinates when segment AB is transformed according to the rules (in order):

1.) $(x,y) \rightarrow (x-4, y+3)$ A'(-1,-1) B'(1,4)

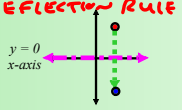
2.) Reflected over the line $x=-2$



Coordinate Rules for Reflections

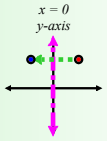
Reflection over *x*-axis
- *x*-value stays same
- *y*-value changes signs

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



Reflection over *y*-axis
- *x*-value changes signs
- *y*-value stays same

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

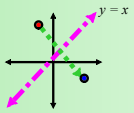


Preimage (Original) Image (Final)

Coordinate Rules for Reflections

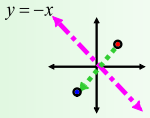
Reflection over line $y=x$
- *x*- and *y*-values flip

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



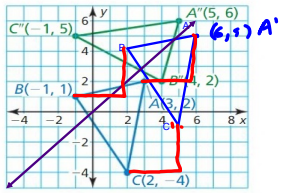
Reflection over line $y=-x$
- *x*- and *y*-values flip and change signs

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



Preimage (Original) Image (Final)

28. ATTENDING TO PRECISION Use the numbers and symbols to create the glide reflection resulting in the image shown.



Translation: $(x, y) \rightarrow$ (x+3, y+3)

Reflection: in $y = x$

1.) Write the component form of a vector that translates *P(5,-1)* to *P'(-3,4)*.

<-8, 5>

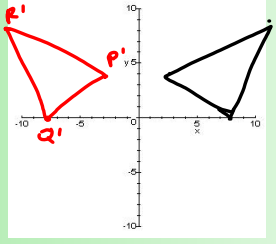
2.) Write the vector from part (1) as a translation rule.

(x,y) → (x−8, y+5)

3.) Apply this same translation to *Q(0,-5)* and *R(-3,3)*.

Q'(−8, 0) (−11, 8) R'

4.) Graph the vertices of triangle *P'Q'R'*. Then, list the coordinates (*P''*, *Q''*, and *R''*) when this triangle is reflected over the *y*-axis.



P''(3,4)
Q''(8,0)
R''(11,8)

NaCl-e

4.2 - Reflections

Glide Reflection

A translation followed by a reflection.

Original Point	Transformation #1	First Image	Transformation #2	Second Image
A	Translation	A'	Reflection	A''

Lines of Symmetry = Divide a shape so that the parts of the figure on each side of the line are mirror images.

Determine the number of lines of symmetry for the figure.