

## Composition of Transformations

Review of Transformation Notation:

Translations:

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

Left or Right

Up or down

Reflections:

flip line of reflection

$y = x$   
Flip  $x \leftrightarrow y$

$y = -x$   
Flip  $x \leftrightarrow y$   
change signs

$x = \#$   
(vertical)

$y = \#$   
(horizontal)

Rotations:

turn  $90^\circ \text{ CW} \rightarrow 270^\circ \text{ CCW}$        $90^\circ \text{ CCW} \rightarrow 270^\circ \text{ CW}$

need the center point.

A Composition is a combination. So a Composition of Transformations is a combination of translations, reflections, rotations, and dilations. Just perform one transformation then the following transformation.

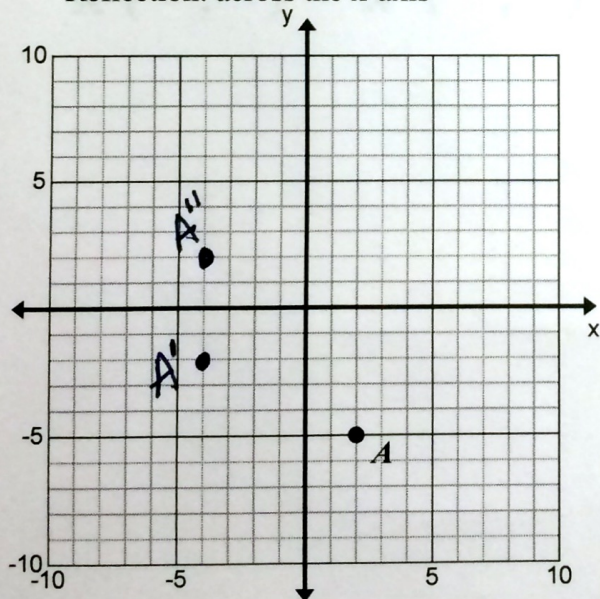
Rigid Transformation: a transformation that preserves congruency.

Same

Graph and label the image of  $A(2, -5)$  after the described composition of transformations.

1. Translation:  $(x, y) \rightarrow (x-6, y+3)$

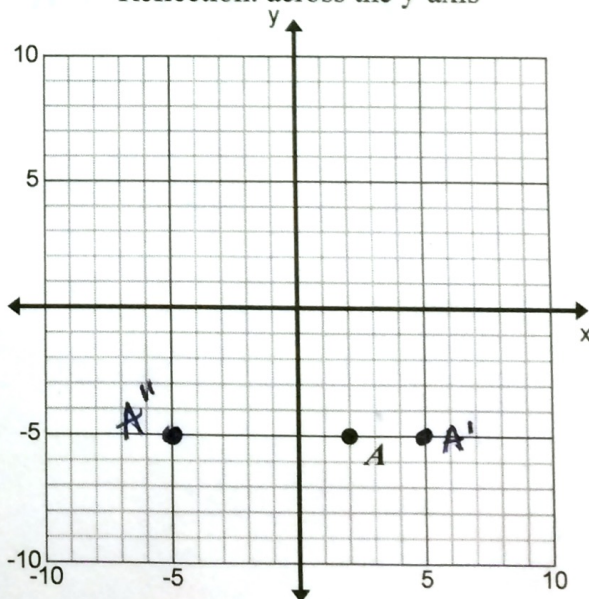
Reflection: across the x-axis



$A'(-4, -2)$        $A''(-4, 2)$

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

Reflection: across the y-axis



$A'(5, -5)$        $A''(-5, -5)$

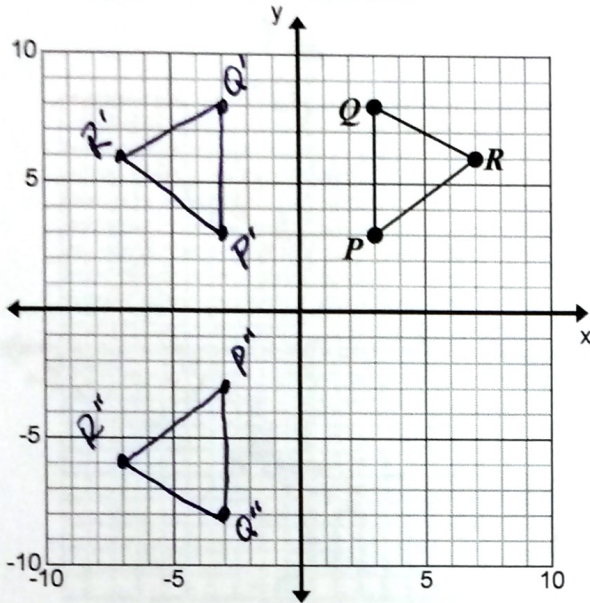


Graph and label the image of  $\triangle PQR$  after the given composition of transformations in the order they appear.

3.  $P(3,3)$ ,  $Q(3,8)$ ,  $R(7,6)$

Reflection: across the y-axis

Reflection: across the x-axis



$P'( \quad , \quad )$      $P''( \quad , \quad )$

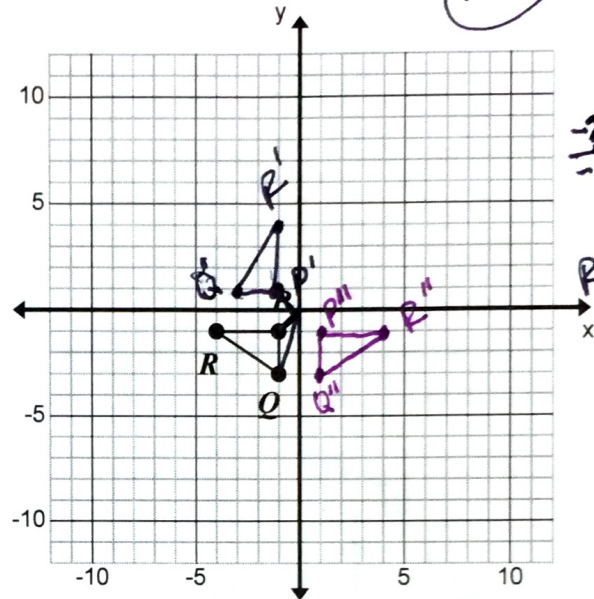
$Q'( \quad , \quad )$      $Q''( \quad , \quad )$

$R'( \quad , \quad )$      $R''( \quad , \quad )$

4.  $P(-1,-1)$ ,  $Q(-1,-3)$ ,  $R(-4,-1)$

$90^\circ$  Rotation Clockwise around the origin

Reflection: across the line  $y = x$



$\frac{-3}{-1} = \frac{3}{1} = \frac{1}{3}$   
 $R = \frac{1}{-4} = \frac{1}{4}$   
 $-\frac{4}{1}$

$P'(-1, 1)$      $P''( 1, -1)$

$Q'(-3, 1)$      $Q''( 1, -3)$

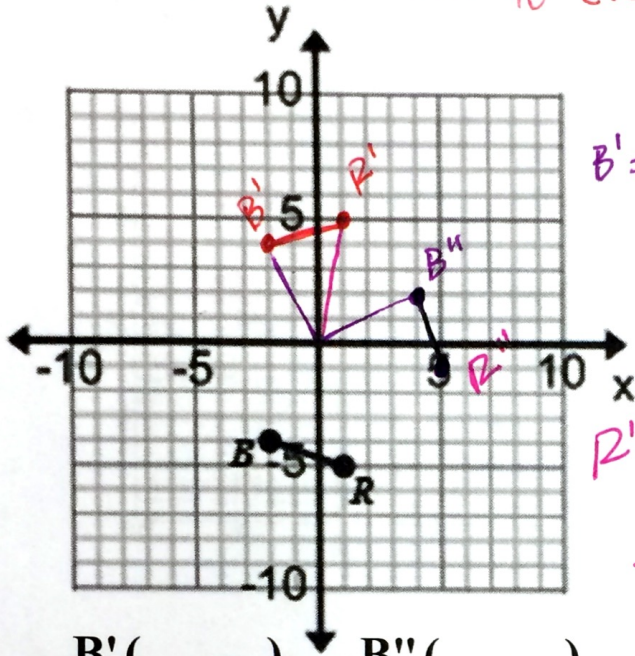
$R'(-1, 4)$      $R''( 4, -1)$

Graph and label the image of  $\overline{BR}$  after the given composition of transformations in the order they appear.

5.  $B(-2, -2), R(1, -2)$

Reflection: across the x-axis

Rotation: ~~270° counterclockwise~~  $90^\circ$  cw



$B' = \frac{4}{-2}$   
 $\frac{2}{4}$   
 $R' = \frac{5}{1}$   
 $-\frac{1}{5}$

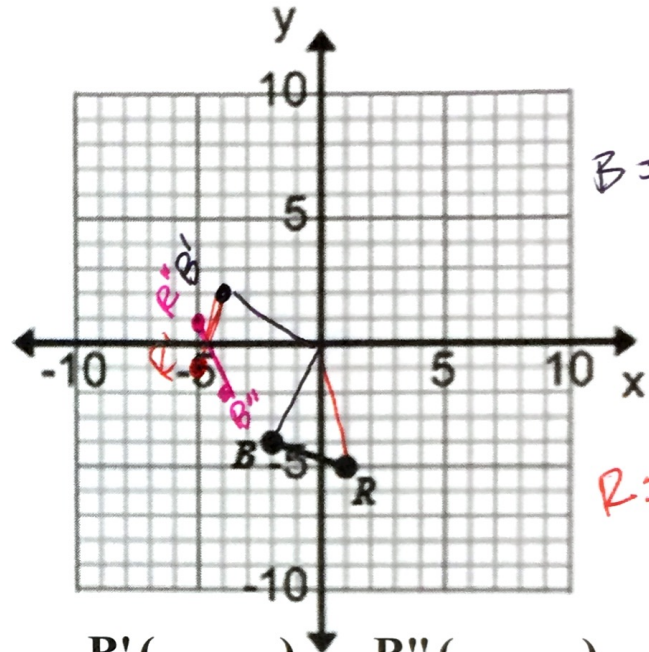
$B'( \quad , \quad )$      $B''( \quad , \quad )$

$R'( \quad , \quad )$      $R''( \quad , \quad )$

6.  $B(-2, -2), R(1, -2)$

Rotation: ~~270° counterclockwise~~  $90^\circ$  cw

Reflection: across the x-axis



$B = \frac{4}{-2}$   
 $\frac{4}{2}$   
 $x = \frac{2}{4}$   
 $R = \frac{-5}{1}$   
 $\frac{1}{5}$

$B'( \quad , \quad )$      $B''( \quad , \quad )$

$R'( \quad , \quad )$      $R''( \quad , \quad )$

7. Comparing #5 and #6, does the order in which you perform transformations matter?



For the following problems (#8 – 9)

a. Identify the transformations

(example: "reflection then translation")

b. Describe the details of the transformations

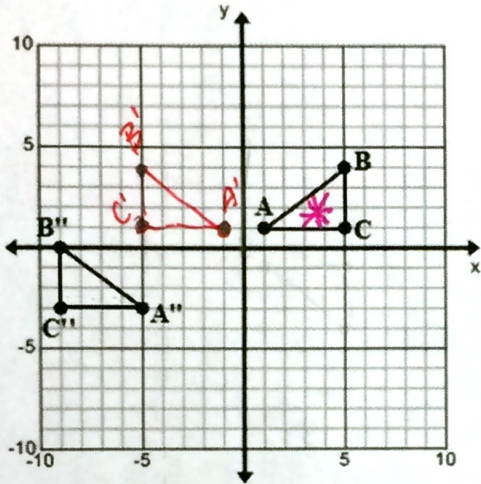
If there was a translation, write "slide" and the translation notation (example: "slide,  $(x + 2, y - 3)$ ")

If there was a reflection, write the axis of reflection (example: "y-axis")

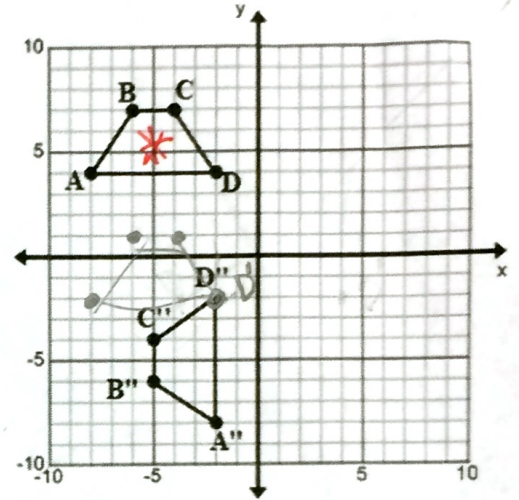
If there was a rotation, write the degree and direction (example:  $270^\circ$  clockwise)

If there was a dilation, write whether it was an "enlargement" or "reduction"

8.



9.



1<sup>st</sup> Transformation:

Identify: Reflection

Details: y-axis

2<sup>nd</sup> Transformation:

Identify: Translation

Details:  $(x, y) \rightarrow (x - 4, y - 4)$

1<sup>st</sup> Transformation:

rotation  
Identify:  $90^\circ$  CCW  $(90)$

Details: \_\_\_\_\_

2<sup>nd</sup> Transformation:

Identify: Translation

Details:  $(x, y) \rightarrow (x + 2, y)$

2 Right