

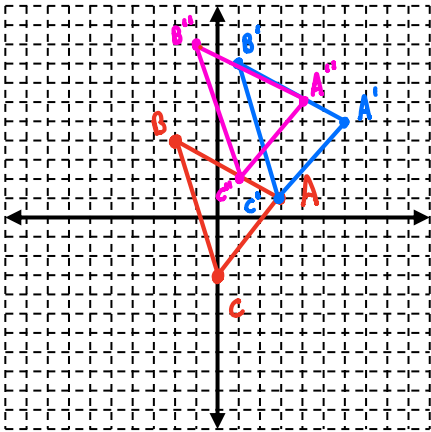
Investigation

A composition of transformations is multiple transformations performed in a specific order to a pre-image. Once you perform the first transformation, you will use the newest points with the next transformation. This continues until you have completed all of the transformations in the composition.

In the following activities, you will be completing several compositions of transformations. At the end of each composition, you will develop a rule that would minimize the step you took to get to the final image.

For all of the following compositions of transformations use the pre-image points $A(3, 1)$ $B(-2, 4)$ and $C(0, -3)$. Record all of the new points and the new rule.

1. Translate the triangle 3 units right and 4 units up. Then translate the figure 2 units left and 1 unit up.



Step 1 Points: $A'(6, 5)$ $B'(1, 8)$ $C'(3, 1)$

$$(x, y) \rightarrow (x + 3, y + 4)$$

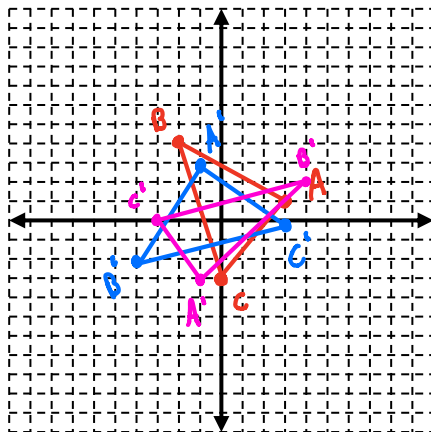
Step 2 Points: $A''(4, 6)$ $B''(-1, 9)$ $C''(1, 2)$

$$(x, y) \rightarrow (x - 2, y + 1)$$

Final Rule:

$$(x, y) \rightarrow (x + 1, y + 5)$$

2. Rotate the triangle 90° counterclockwise. Then rotate the triangle 180° clockwise.



Step 1 Points: $A'(-1, 3)$ $B'(-4, -2)$ $C'(3, 0)$

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

Step 2 Points:

$A''(1, -3)$ $B''(4, 2)$ $C''(-3, 0)$

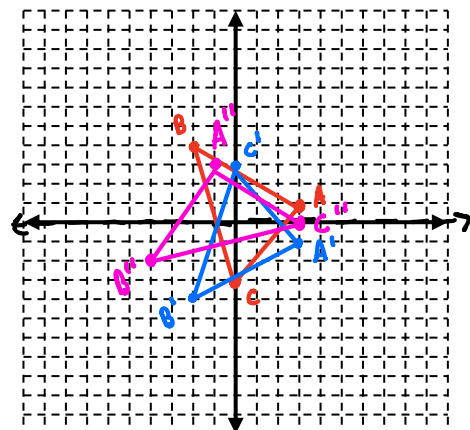
$$(x, y) \rightarrow (-x, -y)$$

Final Rule:

$$(x, y) \rightarrow (y, -x) \quad R_0 \ 270^\circ \text{ (ccw)}$$

$$R_0 \ 90^\circ \text{ (cw)}$$

3. Reflect the triangle over the x axis. Then reflect the triangle over the line $y=x$.



Step 1 Points: $A'(3, -1)$ $B'(-2, -4)$ $C'(0, 3)$

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

Step 2 Points:

$A''(-1, 3)$ $B''(-4, -2)$ $C''(3, 0)$

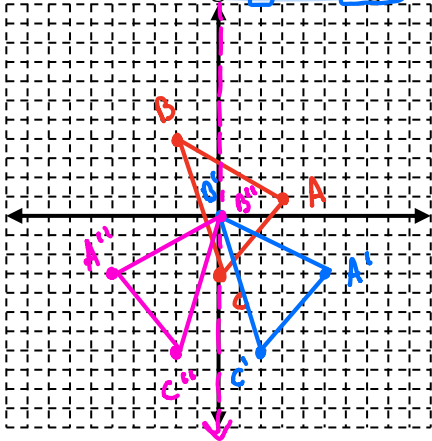
$$(x, y) \rightarrow (y, x)$$

Final Rule:

$$(x, y) \rightarrow (y, -x) \quad R_0 \ 270^\circ \text{ (ccw)}$$

$$R_0 \ 90^\circ \text{ (cw)}$$

4. Translate the triangle 2 units right and four units down. Then reflect over the y-axis.



Step 1 Points: $A'(5, -3)$ $B'(0, 0)$ $C'(2, -7)$

$$(x, y) \rightarrow (x+2, y-4)$$

Step 2 Points:

$$A''(-5, -3)$$
 $B''(0, 0)$ $C''(-2, -7)$

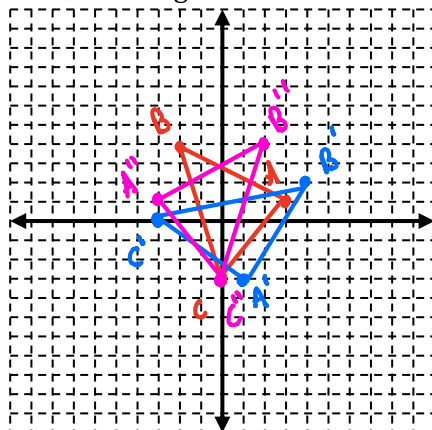
$$(x, y) \rightarrow (-x, y)$$

Final Rule:

$$(x, y) \rightarrow (-x-2, y-4)$$

HW

5. Rotate the triangle 90° clockwise. Then reflect over the line $y=x$.



Step 1 Points: $A'(1, -3)$ $B'(4, 2)$ $C'(-3, 0)$

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

Step 2 Points:

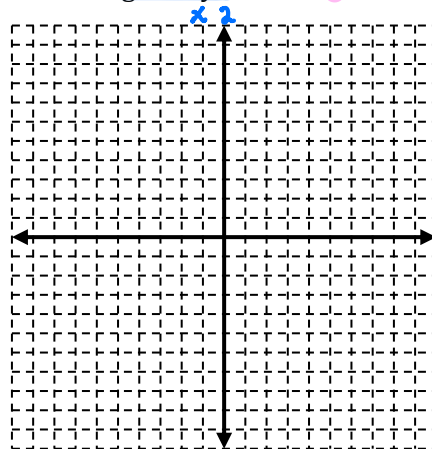
$$A''(-3, 1)$$
 $B''(2, 4)$ $C''(0, -3)$

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

Final Rule:

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

6. Dilate the figure by 2. Then dilate the figure by 3.



$$A(3, 1)$$
 $B(-2, 4)$ $C(0, -3)$

Step 1 Points: $A'(6, 2)$ $B'(-4, 8)$ $C'(0, -6)$

$$(x, y) \rightarrow (2x, 2y)$$

Step 2 Points:

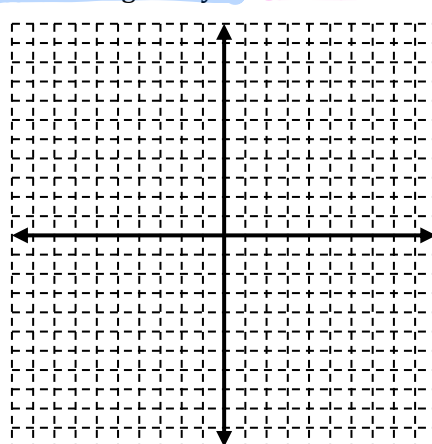
$$A''(18, 6)$$
 $B''(-12, 24)$ $C''(0, -18)$

$$(x, y) \rightarrow (3x, 3y)$$

Final Rule:

$$(x, y) \rightarrow (6x, 6y)$$

7. Dilate the figure by 3. Then rotate the figure 180°.



$$A(3, 1)$$
 $B(-2, 4)$ $C(0, -3)$

Step 1 Points: $A'(9, 3)$ $B'(-6, 12)$ $C'(0, -9)$

$$(x, y) \rightarrow (3x, 3y)$$

Step 2 Points:

$$A''(-9, -3)$$
 $B''(6, -12)$ $C''(0, 9)$

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

Final Rule:

$$(x, y) \rightarrow (-3x, -3y)$$