

4 - 2

**Transformations on the
Coordinate Plane**

preimage: position before transformation

image: position after transformation



reflection: flip over an axis

translation: slide



dilation: enlargement or reduction

rotation: turned about a point



Reflections

across the x-axis: change the sign
of the y

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

across the y-axis: change the sign
of the x

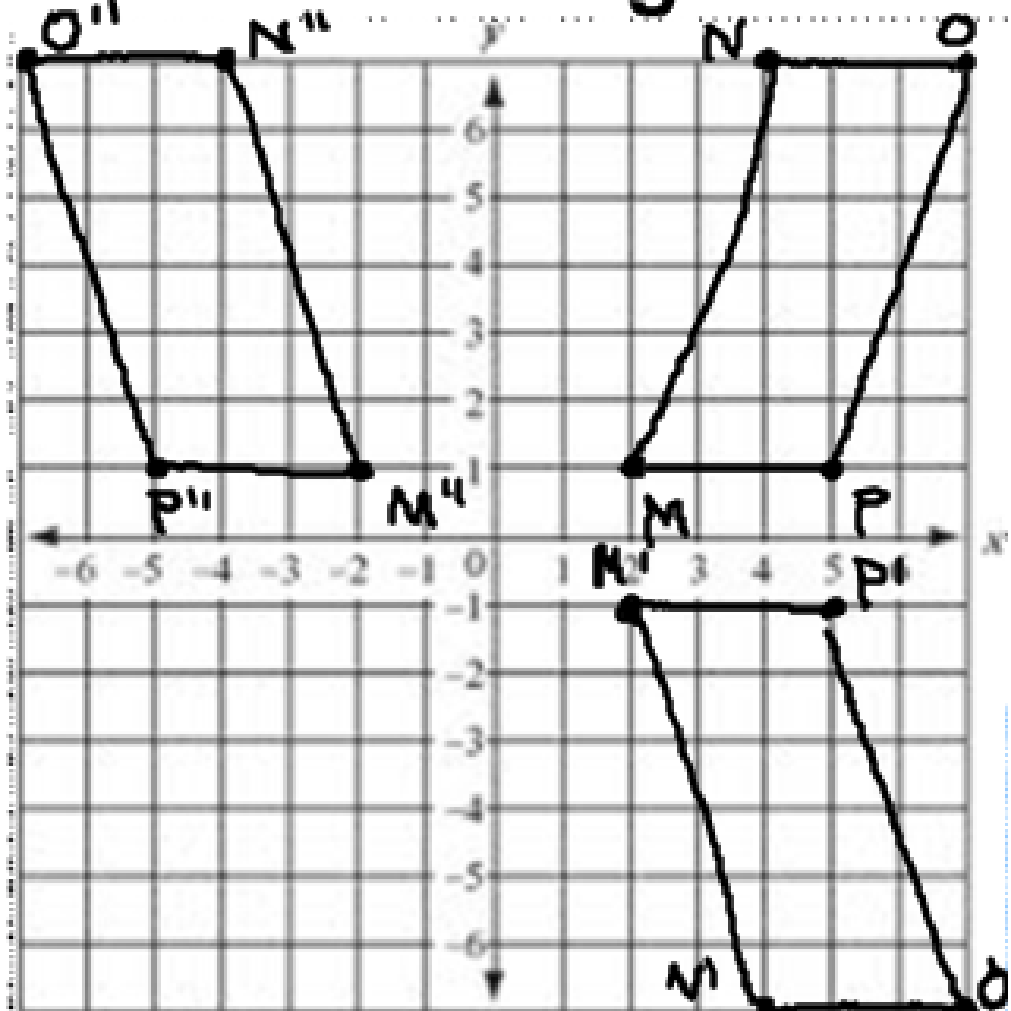
$$(x, y) \longrightarrow (-x, y)$$



Ex: Graph the preimage and image of parallelogram MNOP with vertices $M(2,1)$, $N(4,7)$, $O(7,7)$, $P(5,1)$ under each transformation from the original position.

a.) reflected across the x-axis ($M'N'O'P'$)

b.) reflected across the y-axis ($M''N''O''P''$)



Translations

Which coordinates are changing? How?

Left 5

$$X - 5$$

Down 6

$$Y - 6$$

Up 7

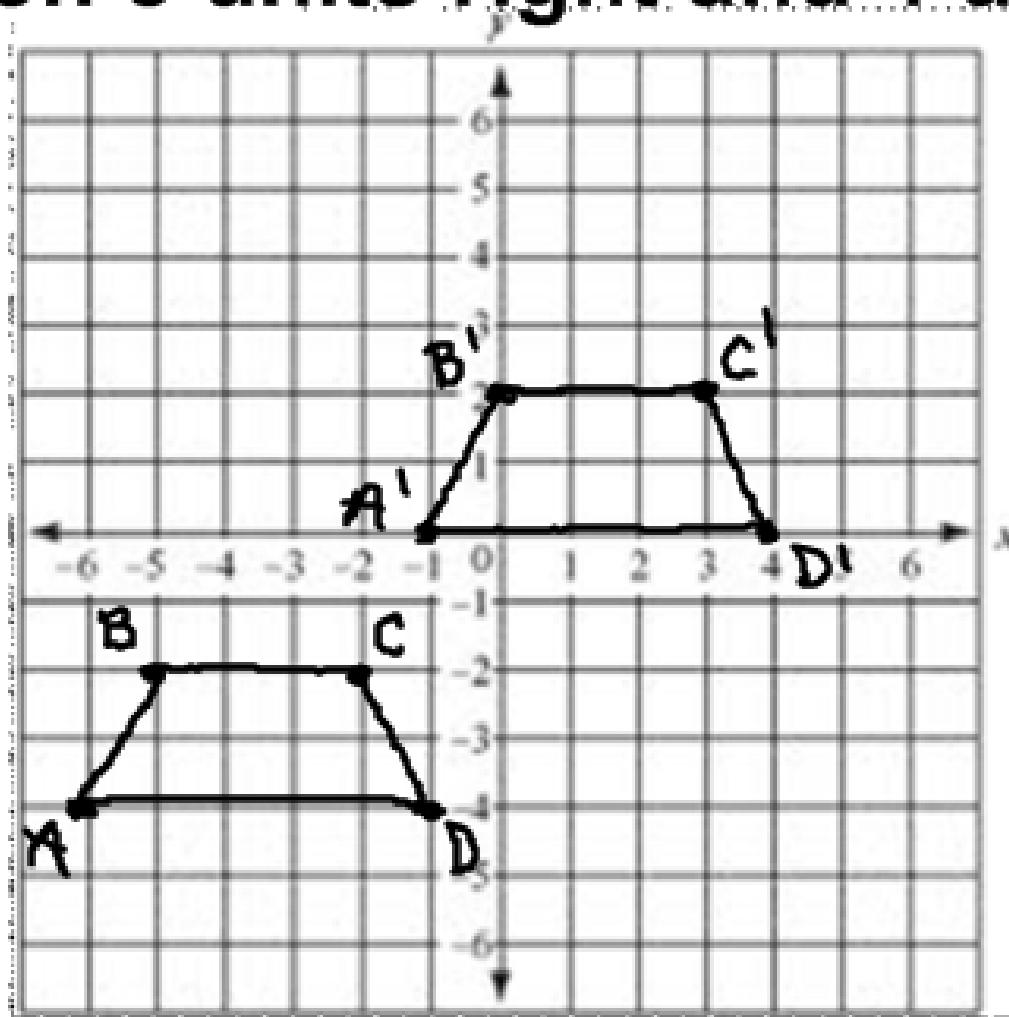
$$Y + 7$$

Right 2

$$X + 2$$



Ex: Graph the preimage and image of trapezoid ABCD with vertices $A(-6,-4)$, $B(-5,-2)$, $C(-2,-2)$, and $D(-1,-4)$ under a translation 5 units right and 4 units up.



$$(x, y) \rightarrow (x-3, y+2)$$

left 3 up 2

Dilations

How do the coordinates change?

multiply both coordinates
by a scale factor (k)

The figure is enlarged when...

$$k > 1$$

The figure is reduced when...

$$0 < k < 1$$



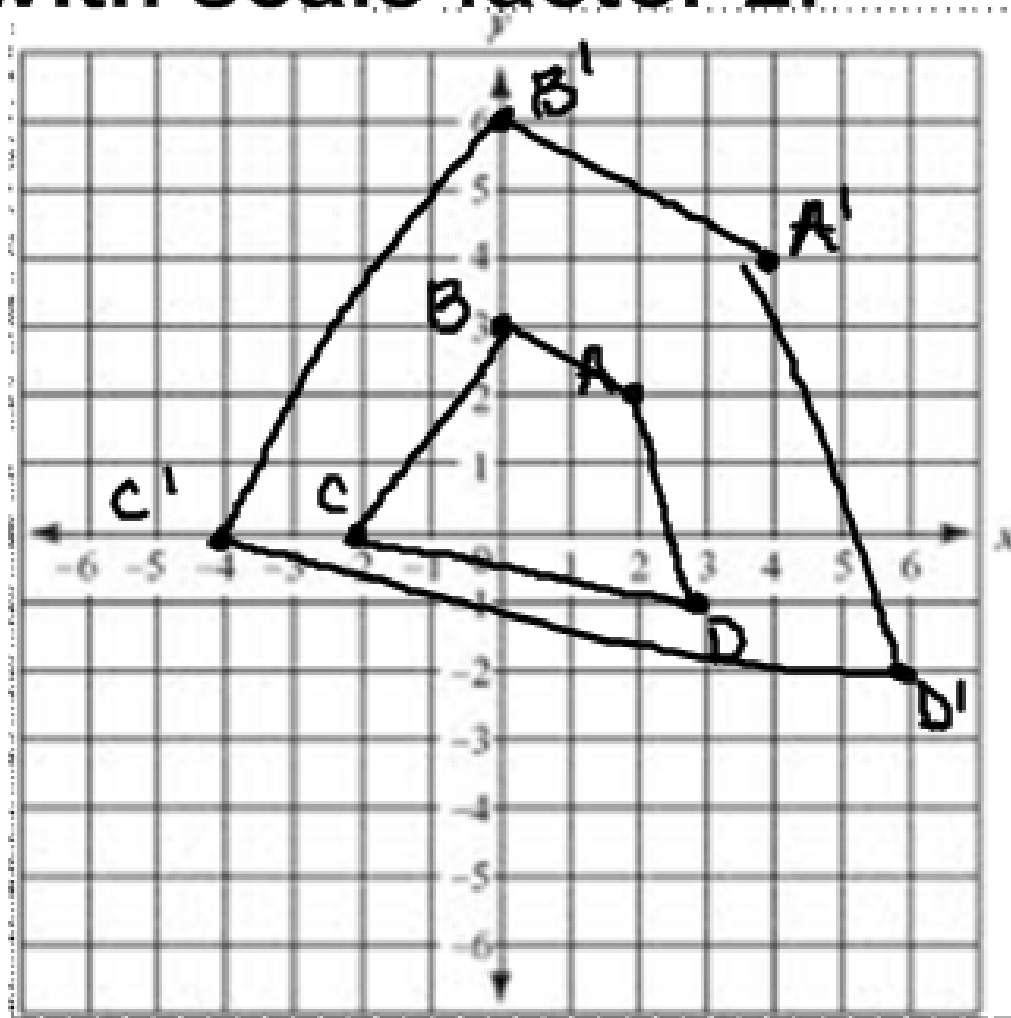
Ex: Graph the preimage and image of quadrilateral ABCD with vertices $A(2,2)$, $B(0,3)$, $C(-2,0)$, and $D(3,-1)$ under a dilation with scale factor 2.

$$A'(4,4)$$

$$B'(0,6)$$

$$C'(-4,0)$$

$$D'(6,-2)$$



Rotations

Rotating a figure 90° counterclockwise about the origin:

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

$$(2, 3) \longrightarrow (-3, 2)$$

$$(-1, -4) \longrightarrow (4, -1)$$

Rotating a figure 180° about the origin:

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

$$(-5, 1) \longrightarrow (5, -1)$$

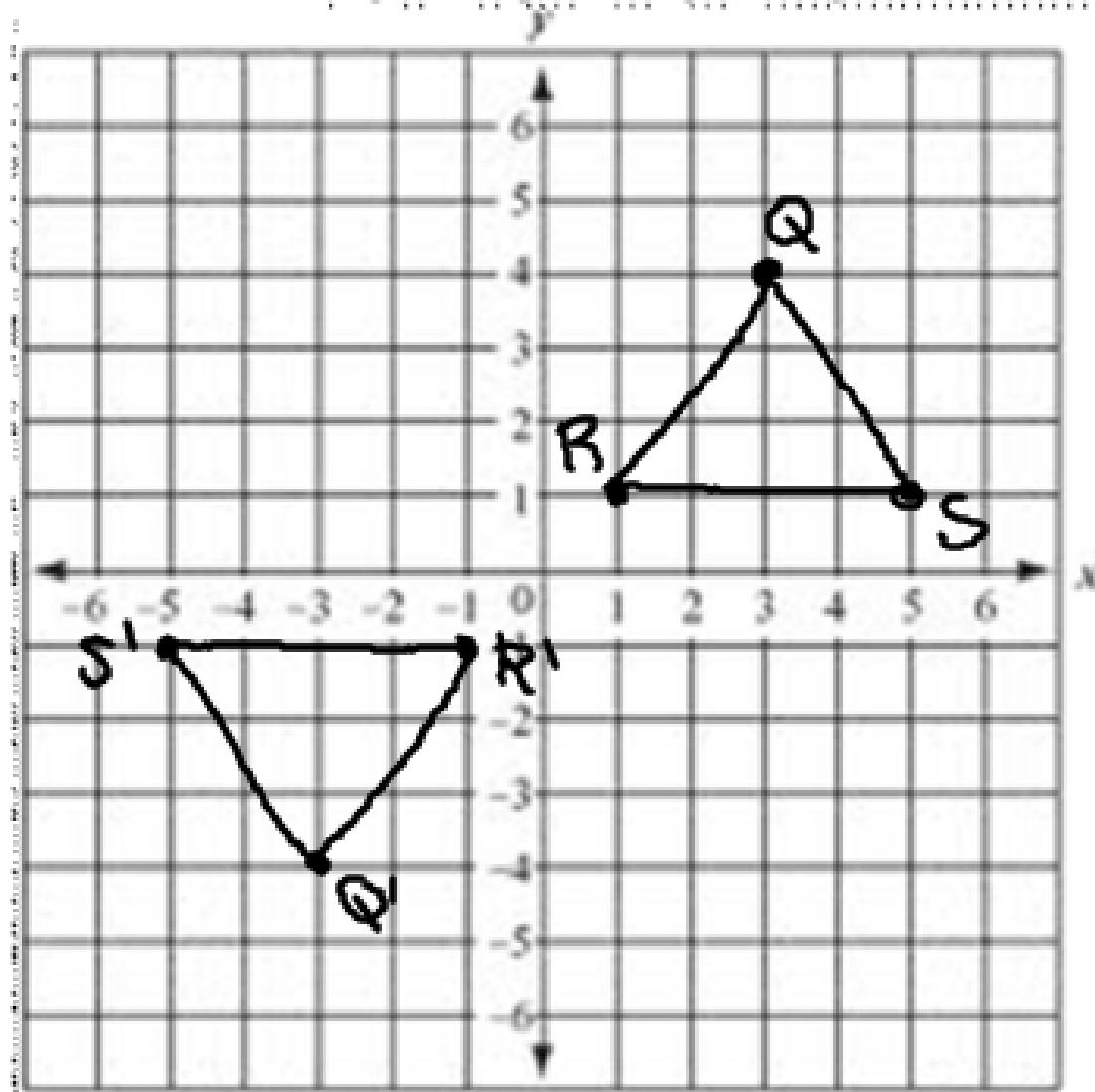


Ex: Graph $\triangle QRS$ and its image after a 180° rotation about the origin. $\triangle QRS$ has vertices $Q(3,4)$, $R(1,1)$, and $S(5,1)$.

$$Q'(-3,-4)$$

$$R'(-1,-1)$$

$$S'(-5,-1)$$

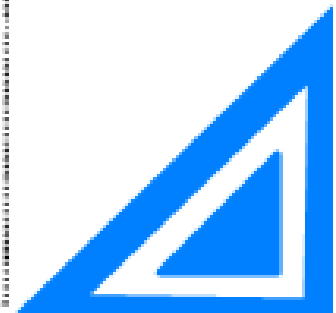
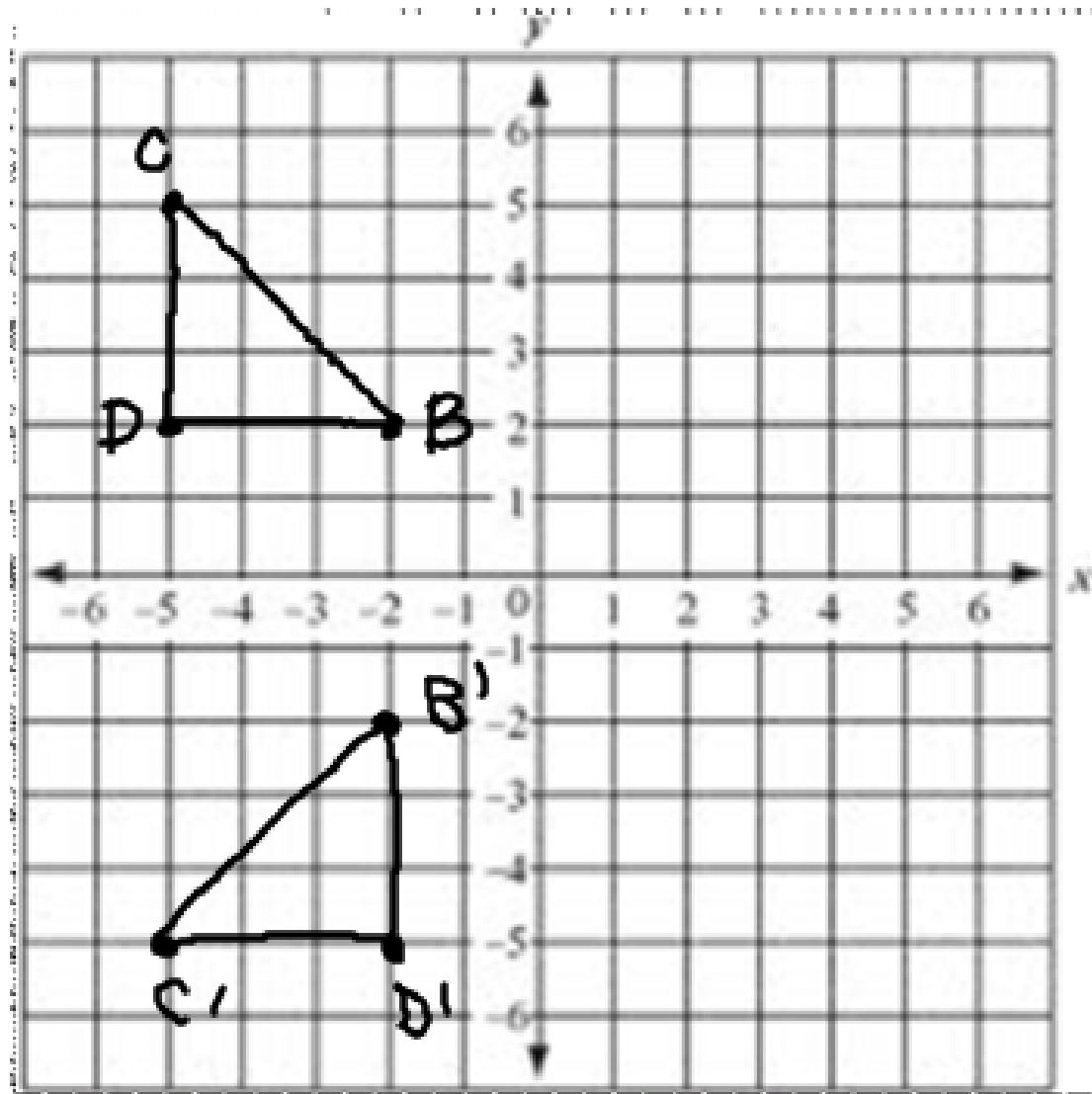


Ex: $\triangle BCD$ has vertices $B(-2,2)$, $C(-5,5)$, and $D(-5,2)$. Graph this triangle and its image after a 90° counterclockwise rotation.

$$B'(-2,-2)$$

$$C'(-5,-5)$$

$$D'(-2,-5)$$



Homework:

4-2 WS

and Journal #1

(Name 2 examples each of a rotation, reflection, translation, and dilation in real life.)

