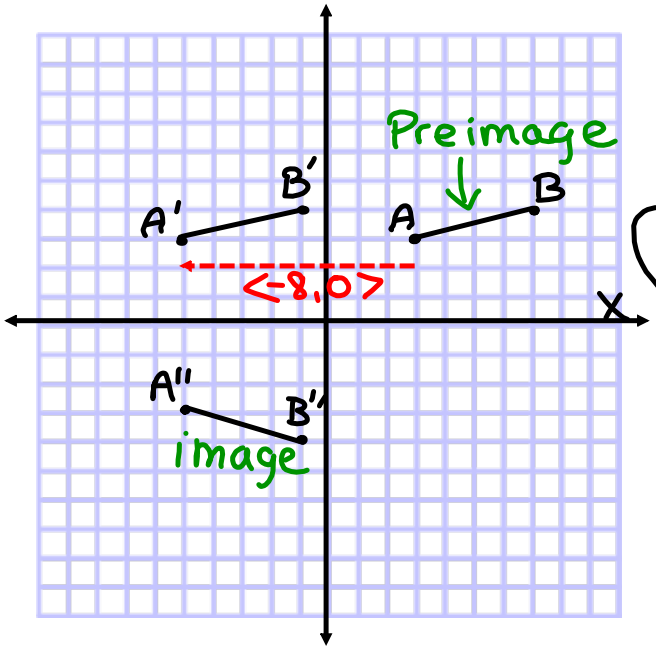
A **composition** of transformations is one transformation immediately followed by a second transformation.

Example: glide reflection

As you already know, a **glide reflection** is the composition of a translation and a reflection.



Plot points A(3, 3) and B(7, 4). Connect to form $\overline{AB}$.

Do translation $\langle -8,0 \rangle$. (x-8, y)
A'(-5,3) and B'(-1,4). Connect to form $\overline{A'B'}$. A'(3-8,3) B'(7-8,4)

Do reflection r_{x-axis}. (x,-y)
A"(-5,-3) and B"(-1,-4). Connect to form $\overline{A"B"}$.

$\overline{A"B"}$ is a glide reflection of $\overline{AB}$.

New Today

new notation: ∘ "is composed with"

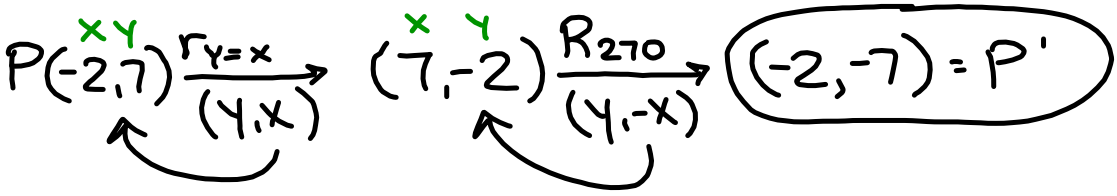
The previous composition could be denoted like this: $(r_{x-axis} \circ T_{-8,0})(\overline{AB})$. In ***any*** composition denoted in this manner, you always work from **RIGHT to LEFT**. So for this composition, you would graph $\overline{AB}$ first, then do $\langle -8, 0 \rangle$, and finally do r_{x-axis}.

L ← R

Also, must know coordinate rules. L ← R

Composition problems can be done without graphs. Just make sure you know your composition rules.

1. If the coordinates of P are (-2, 7), what are the coordinates of $(R_{270} \circ r_{y=x})(P)$?



What single transformation maps $(-2,7) \rightarrow (-2,-7)$?

$(x,y) \rightarrow (x,-y) = r_{x\text{-axis}}$

2. If the coordinates of P are (2, -3), what are the coordinates of $(R_{90} \circ R_{180})(P)$?

2 1

$P(\overset{x\ y}{2,-3}) \xrightarrow[(-x,-y)]{R_{180}} (\overset{x\ y}{-2,3}) \xrightarrow[(-y,x)]{R_{90}} (-3,-2) = P'$

Do this in a single transformation.

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

$(x,y) \longrightarrow (y,-x) = R_{270}$

3. What is the image of P(-4, 6) under the composition $(r_{y=x} \circ r_{y\text{-axis}})(P)$?

$P(-4,6) \xrightarrow[(-x,y)]{r_{y\text{-axis}}} (4,6) \xrightarrow[(y,x)]{r_{y=x}} (6,4) = P'$

4. The coordinates of point A are (3, -1). What are the coordinates of A', the image of A under the composition $(T_{2,5} \circ r_{x\text{-axis}})$?

2 1

$A(3,-1) \xrightarrow{r_{x\text{-axis}}} (3,1) \xrightarrow{\langle 2,5 \rangle} (5,6) = A'$

(x, y) → (x, −y) → (x+2, y+5)

Do this as a single transformation:

$(3,-1) \longrightarrow (5,6)$

$(x,y) \longrightarrow (x+2, y+7) = \langle 2,7 \rangle$

5. If the coordinates of A are (3, 5), what are the coordinates of $(r_{x\text{-}axis} \circ R_{180})(A)$?

$A(3,5) \xrightarrow[(-x,-y)]{R_{180}} (-3,-5) \xrightarrow[(x,-y)]{r_{x\text{-}axis}} (-3,5) = A'$