Name ____ Date _____________ Section __________

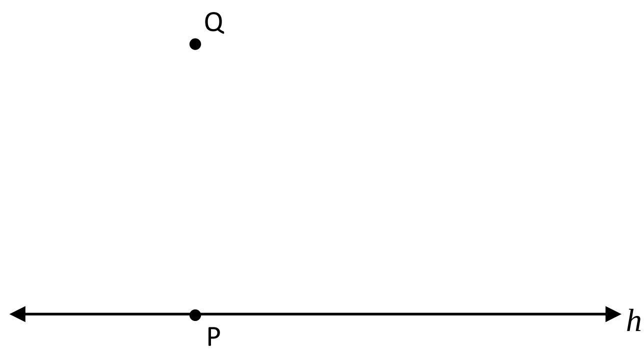
Geometry Unit 3 Day 7 Transformations of Lines

Coordinate Plane Tools

- Slope: $m = \frac{\Delta y}{\Delta x}$
- Slope-Intercept: $y = mx + b$
- Point-Slope: $y - y_1 = m(x - x_1)$

RIGID MOTION TRANSFORMATIONS THROUGH CONSTRUCTIONS

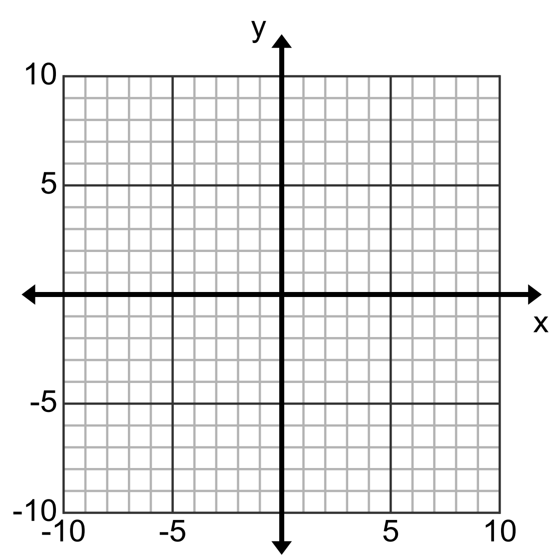
1) Rotate line h 90° around point P using a formal geometric construction.
   a. How does line h' relate to line h? ___________________
2) Rotate line h' 90° around point Q using a formal geometric construction.
   a. How does line h'' relate to line h'? __________________
   b. How does line h'' relate to the original line h? ______________________
3) Rotating a line 180° can create a line that is _______________ and could equate the rigid motion
   a. ____________________________. Draw the line of reflection that maps line h to line h''.
   b. ____________________________. Draw the translation vector that maps line h to line h''.



TRANSLATIONS IN THE COORDINATE PLANE

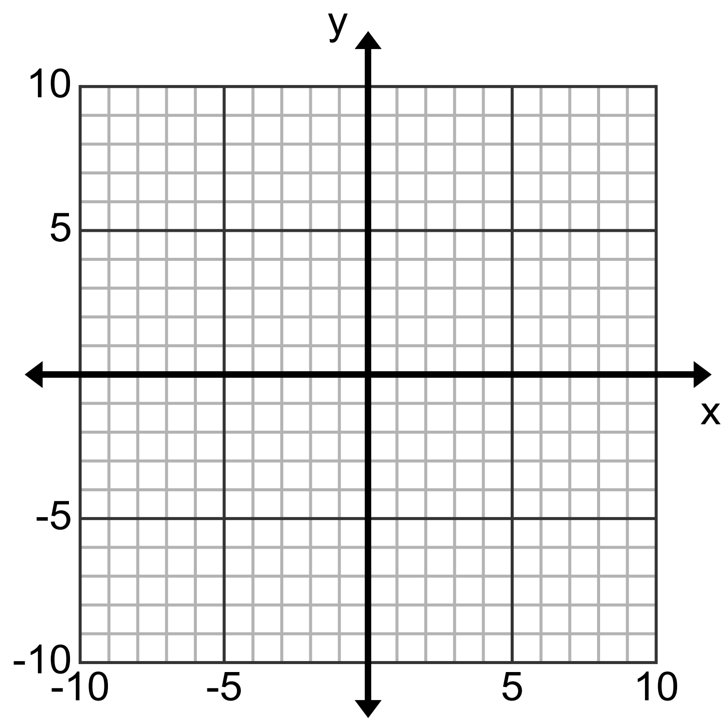
1) Graph line t: $y = -2x + 5$.
2) Perform the following transformation on the graph $T_{-3,1}$(Line t) → Line t'.
3) What is the relationship between line t and its image? _____
   Will this always be the relationship between the pre-image and image lines under a translation? Explain:

4) Write the equation of the image line t'.



REFLECTIONS IN THE COORDINATE PLANE

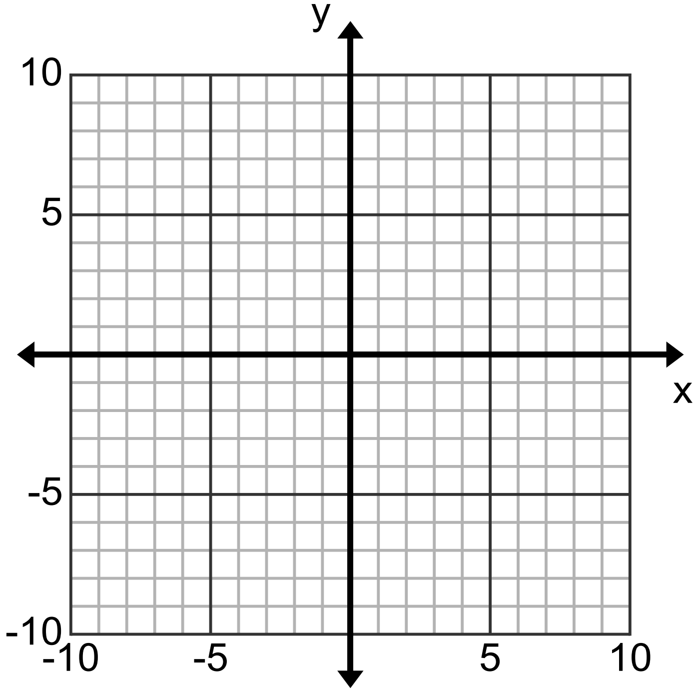
Example: Given $\overleftrightarrow{MN}$ with M(0,1) and N(1,3). Perform each of the following rigid motion transformations and compare the relationships between each image and the pre-image in the table below.



Line	Points	Slope	Equation	Relationship to $\overleftrightarrow{MN}$
$\overleftrightarrow{MN}$	M(0,1) N(1,3)			
$r_{x-axis}(\overleftrightarrow{MN})$				
$r_{y-axis}(\overleftrightarrow{MN})$				
$r_{y=x}(\overleftrightarrow{MN})$				

ROTATIONS IN THE COORDINATE PLANE

Given the equation for $\overleftrightarrow{PQ}$ is $(y-4)=\frac{2}{3}(x-3)$, perform each of the following rigid motion transformations and compare the relationships between each image and the pre-image in the table below.



Line	Point Coordinates	Slope	Point-Slope Equation	Slope-Intercept Equation	Relationship to $\overleftrightarrow{PQ}$
$\overleftrightarrow{PQ}$	P ( ) Q( )				
$R_{90°}(\overleftrightarrow{PQ})$	P' ( ) Q'( )				
$R_{180°}(\overleftrightarrow{PQ})$ $r_{Origin}(\overleftrightarrow{PQ})$	P'' ( ) Q''( )				

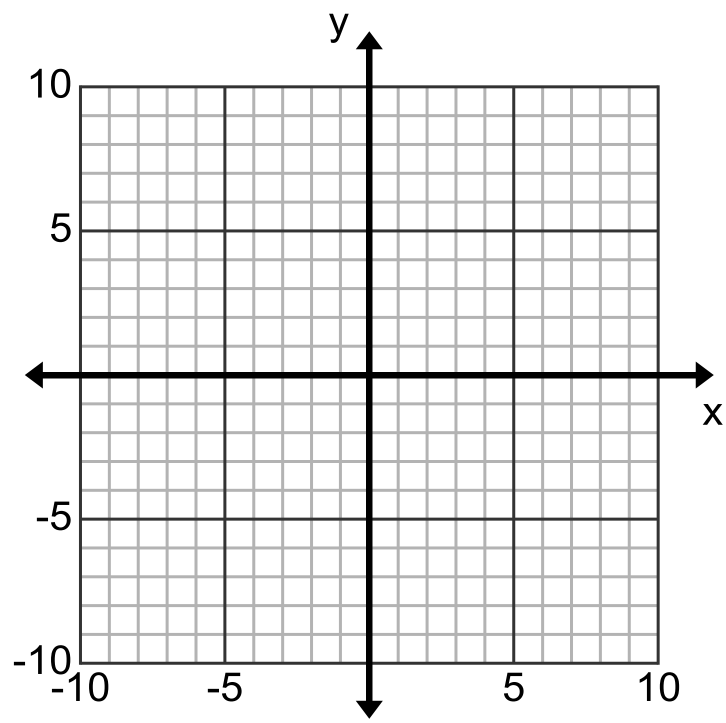
Try the next rotations **on your own**

$R_{270°}(\overleftrightarrow{PQ})$	P''' ( ) Q'''( )				
$R_{360°}(\overleftrightarrow{PQ})$	P'''' ( ) Q''''( )				

- Summarize the relationships you see overall (make a conjecture about the relationships among lines undergoing rotations):

ON YOUR OWN

Given: $y=-\frac{5}{2}x+3$, graph and label it. Perform each of the following rigid motion transformations and graph, label, and write the equation of each image.



$T_{4,-5}$

r_{y-axis}

$r_{y=x}$

$R_{90°}$

$R_{180°}$ or r_{origin}

- Which transformation will always create an image parallel to the pre-image?
- How will you decide if a rigid motion creates an image that is parallel/coincident/intersecting/perpendicular to the pre-image?

Extra Credit:

Describe a sequence/composition of rigid motion transformations that will map the image from $r_{y=x}$ line back onto itself such that the pre-image and image are coincident. (You can't just reverse the first rigid motion).