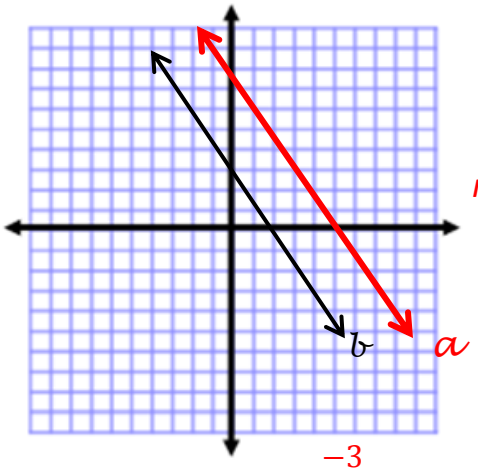
Geometry (G.GPE.B.5) Name: _____

Unit One B: Slopes of Parallel and Perpendicular Lines (IC32) Date: _____ Period: _____

Using what you remember about transformations:

1. Translate the graphed line 3 units to the right. Label your new line a.

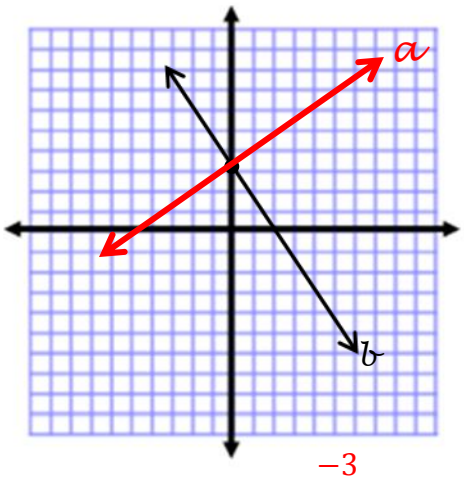


m = slope = $\frac{rise}{run}$

Find the slope of line b: $\frac{-3}{2}$

Find the slope of line a: $\frac{-3}{2}$

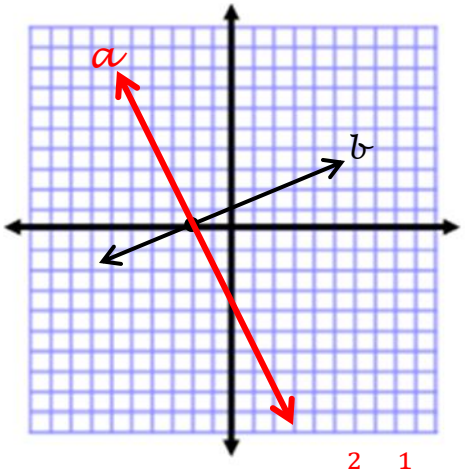
2. Rotate the line 90° clockwise about the point. Label the new line a.



Find the slope of line b: $\frac{-3}{2}$

Find the slope of line a: $\frac{2}{3}$

3. Rotate the line 90° counter-clockwise about the point. Label the new line a.



Find the slope of line b: $\frac{2}{4} = \frac{1}{2}$

Find the slope of line a: -2

Summarize:

The slopes of parallel lines are equal.

The slopes of $\perp$ lines are opposite reciprocals.

Ex: $m_{\text{line a}} = \frac{1}{3}$ and $m_{\text{line b}} = -3$

The symbol for slope is m.

The formula for slope is $\frac{y_2 - y_1}{x_2 - x_1} = \frac{rise}{run}$.

The symbol for the y-intercept is b.

Using Slope to write the Equation of the Line in Slope-Intercept Form

Example: Write the equation of the line through (0, 9) and (1, 5).

(x_1, y_1) (x_2, y_2)

y-intercept since x = 0

Step One – Find slope:

$m = \frac{5-9}{1-0} = \frac{-4}{1} = -4$

Step Two – Use **y = mx + b** (the slope-intercept form for the equation of a line):

Using (1,5)
5 = -4(1) + b
5 = -4 + b
b = 9

y = -4x + 9

(x_1, y_1) (x_2, y_2)

You Try: Write the equation of the line through the points (-3, 2) and (-4, 5).

$m = \frac{5-2}{-4-(-3)} = \frac{3}{-1} = -3$

Using (-3, 2)
2 = -3(-3) + b
2 = 9 + b
b = -7

Using (-4, 5)
5 = -3(-4) + b
5 = 12 + b
b = -7

y = -3x - 7

Writing Equations of Parallel and Perpendicular Lines

Example: Write the equation for a line parallel to one with m = 2 and passing through the point (3, 7).

same slope

7 = 2(3) + b
7 = 6 + b
b = 1

y = 2x + 1

Example: Write the equation for a line perpendicular to one with m = $\frac{3}{2}$ and passing through the point (3, 5).

opp reciprocal slope

5 = $\frac{-2}{3}$(3) + b
5 = -2 + b
b = 7

y = $\frac{-2}{3}$x + 7

Example: Write the equation for a line through the point (-9, 5):

a. parallel to y = 9x + 3

slope

5 = 9(-9) + b
5 = -81 + b
b = 86

y = 9x + 86

b. perpendicular to y = 9x + 3

Slope = opp reciprocal
m = $\frac{-1}{9}$

5 = $\frac{-1}{9}$(-9) + b
5 = 1 + b
b = 4

y = $\frac{-1}{9}$ x + 4

Example: Are the following lines parallel, perpendicular, or neither? $7x - 5y = 10$ and $y = \frac{5}{7}x + 4$

Solve for "y" to see slope

7x – 5y = 10
-5y = -7x + 10
y = $\frac{7}{5}$x -2

$\frac{7}{5}$ & $\frac{5}{7}$ are reciprocals, but not opposite → neither