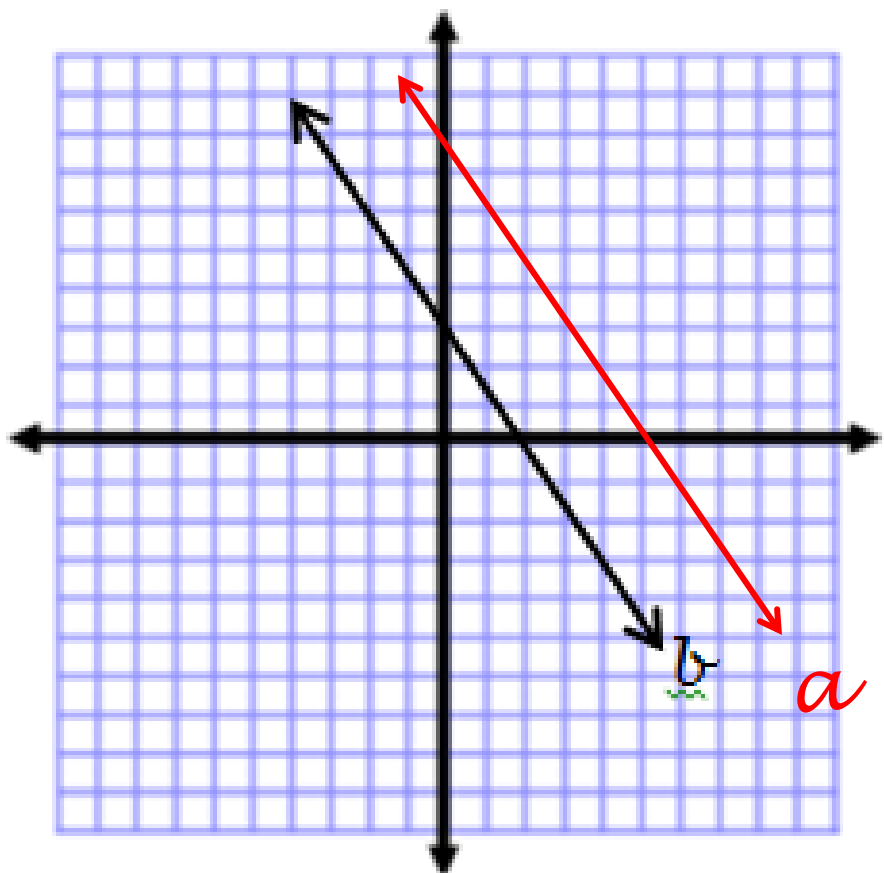


# IC25

Slopes of Parallel and perpendicular  
Lines

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



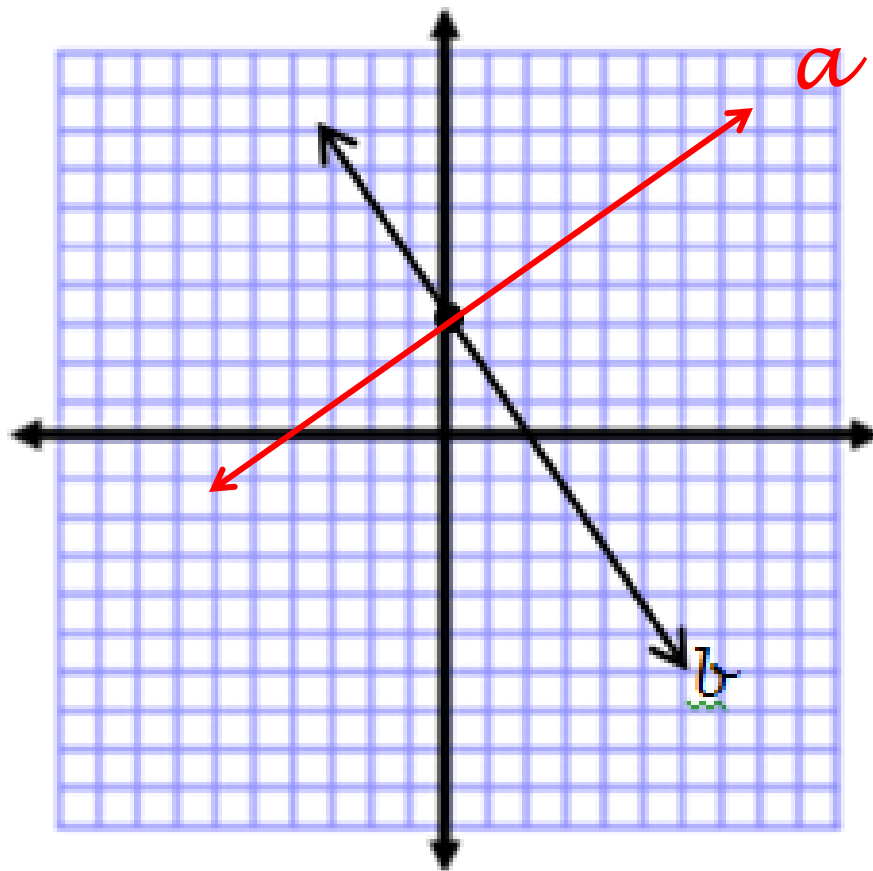
$m = \text{slope} = \frac{\text{rise}}{\text{run}}$

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

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

2. Rotate the line  $90^\circ$  clockwise about the point.

Label the new line  $a$ .



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

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

Summarize:

The slopes of parallel lines are equal.

The slopes of ⊥ 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  $\frac{y_2 - y_1}{x_2 - x_1} = \frac{\text{rise}}{\text{run}}$ .

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  $(1, 5)$ .

Step One – Find slope:

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

$(x_1, y_1)$   $(x_2, y_2)$   
 $(0, 9)$  and  $(1, 5)$   
y-intercept since  $x = 0$

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

Using  $(1, 5)$

$$5 = -4(1) + b$$

$$5 = -4 + b$$

$$b = 9$$

$$y = -4x + 9$$

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

$(x_2, y_2)$

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

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  $y = 9x + 3$

$$5 = 9(-9) + b$$

$$5 = -81 + b$$

$$b = 86$$

$$y = 9x + 86$$

slope

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