Unit 2: Solving Equations and Inequalities
Lesson 4: Writing Linear Equations

SLOPE:

The slope m of the line passing through (x_1, y_1) and (x_2, y_2) is given by:

$$m = \frac{y_2 - y_1}{x_2 - x_1} \quad \text{where } x_1 \neq x_2$$

rise / run

Find the slope between the points.

a. $(4,-1)$, $(6,-6)$ $m = \frac{-6-(-1)}{6-4} = \frac{-5}{2}$

b. $(4,9)$, $(11,9)$ $m = \frac{9-9}{11-4} = \frac{0}{7}$ 0

c. $(4,-2)$, $(4,3)$ $m = \frac{-2-3}{4-4} = \frac{-5}{0}$ undefined

Two lines are parallel if the slope is the same.

Two lines are perpendicular when you "flip" the slope and change the sign.

Determine if the lines are parallel, perpendicular or neither.

a. Line 1: (2,3) and (0,7) $m = \frac{7-3}{0-2} = \frac{4}{-2} = \frac{-2}{1}$
Line 2: (5,7) and (3,6) $m = \frac{6-7}{3-5} = \frac{-1}{-2} = \frac{1}{2}$
Perpendicular

b. Line 1: (6,5) and (3,7) $m = \frac{5-7}{6-3} = \frac{-2}{3}$
Line 2: (4,3) and (1,1) $m = \frac{1-3}{1-4} = \frac{-2}{-3} = \frac{2}{3}$
Neither

Write an equation in slope intercept form that satisfies each set of conditions.

Recall: what is slope intercept form? $y = mx + b$

- Given the slope and a point.

a. slope: 3, passes through (0,-6) (x, y)
$y = mx + b$
$-6 = 3(0) + b$
$-6 = 0 + b$
$-6 = b$
$y = 3x - 6$

b. slope: $\frac{-3}{4}$, passes through $(2, \frac{1}{2})$
$y = mx + b$
$\frac{1}{2} = \frac{-3}{4}(2) + b$
$\frac{1}{2} = \frac{-3}{2} + b$
$+\frac{3}{2} \quad +\frac{3}{2}$
$b = \frac{1}{2} + \frac{3}{2} = \frac{4}{2} = 2$
$y = \frac{-3}{4}x + 2$

c. slope: 0.5, passes through (6,4)
$y = mx + b$
$4 = 0.5(6) + b$
$4 = 3 + b$
$-3 \quad -3$
$1 = b$
$y = 0.5x + 1$

- Given two points.

a. passes through (3,11) and (–6,5)
$m = \frac{11-5}{3-(-6)} = \frac{6}{9} = \frac{2}{3}$
$y = mx + b$
$5 = \left(\frac{2}{3}\right)(-6) + b$
$5 = \frac{-12}{3} + b$
$5 = -4 + b$
$+4 \quad +4$
$9 = b$
$y = \frac{2}{3}x + 9$

b. passes through (0,0) and (–4,3)
$m = \frac{3-0}{-4-0} = \frac{3}{-4}$
$y = mx + b$
$0 = \left(\frac{-3}{4}\right)(0) + b$
$0 = 0 + b$
$0 = b$
$y = \frac{-3}{4}x + 0$

c. passes through (-1,4) (x, y) and (–4,5)
$m = \frac{4-5}{-1+(+4)} = \frac{-1}{3}$
$y = mx + b$
$4 = \frac{-1}{3}(-1) + b$
$4 = \frac{1}{3} + b$
$-\frac{1}{3} \quad -\frac{1}{3}$
$3.\ 4 - \frac{1}{3} = b$
$3.\ 1$
$\frac{12}{3} - \frac{1}{3} = b$
$\frac{11}{3} = b$
$y = \frac{-1}{3}x + \frac{11}{3}$

- Given a point and an equation.

a. passes through (-4,3) and is perpendicular to the line whose equation is $y = -4x - 1$.

$m = -4$ $\quad m = \frac{1}{4}$ $\quad 3 = \frac{1}{4}(-4) + b$ $\quad 3 = -1 + b$ $\quad +1 \; +1$ $\quad b = 4$ $\quad y = \frac{1}{4}x + 4$

b. passes through (8,7) and is parallel to the line whose equation is $y = \frac{3}{4}x - 5$.

$m = \frac{3}{4}$ $\quad m = \frac{3}{4}$ $\quad 7 = \frac{3}{4}(8) + b$ $\quad 7 = \frac{24}{4} + b$ $\quad 7 = 6 + b$ $\quad -6 \; -6$ $\quad 1 = b$ $\quad y = \frac{3}{4}x + 1$

Example 1: As a salesperson, Eric is paid a daily salary plus commission. When his sales are $1000, he makes $100. When his sales are $1400, he makes $120. Write a linear equation to model this situation.

$x \rightarrow$ sales
$y \rightarrow$ makes

(1000, 100) (1400, 120)

$m = \frac{120 - 100}{1400 - 1000} = \frac{20}{400} = \frac{1}{20}$

$y = mx + b$

$100 = \frac{1}{20}(1000) + b$

$100 = 50 + b$ $\quad -50 \; -50$ $\quad 50 = b$

$y = \frac{1}{20}x + 50$

What are Eric's daily salary and commission rate?

Daily salary: \$0 (x) $y = \frac{1}{20}(0) + 50$ $\quad y = 50$ \$50

commission rate: $\frac{1}{20} = 0.05$ 5%

How much would Eric make in a day if his sales were \$2000?*

$y = \frac{1}{20}(2000) + 50$ $\quad y = 100 + 50$ $\quad y = 150$ \$150

HW: pg. 74: 1-3, 9-12
13-17 odd (write the equation)
57-59, 64-65

* you don't have to graph ☺*