Math 10
Unit 0 – Grade 9 Skills Review
Lesson 3: Equation of a Line using Algebra

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Problem 1

⇨ Find the equation of a line that passes through the point (8, -14), and has a slope of $-\frac{5}{4}$.

⇨ The line passes through the point:

⇨ The slope of the line is: = m

$$(8,-14)$$

$$-\frac{5}{4}$$

$$y = mx + b$$

Equation of Line is:

$$y = -\frac{5}{4}x - 4$$

$$-14 = \left(-\frac{5}{4}\right)(8) + b$$

⇒ $-14 = -10 + b$
⇒ $-14 + 10 = b$

$b = -4$

2.) Find the equation of a line that passes through (– 24, – 14), and has a slope of $\frac{9}{8}$.

(x , y)   = m

$$y = mx + b$$

⇒ $-14 = \frac{9}{8}(-24) + b$

⇒ $-14 = -27 + b$

⇒ $-14 + 27 = b$

⇒ $13 = b$

EQUATION of LINE

$$y = \frac{9}{8}x + 13$$

Perpendicular and Parallel Slopes

3.) Which of the following equations is parallel or perpendicular

to $y = -\frac{3}{2}x + 1$?   m

$m = -\frac{3}{2}$

$m_\perp = \frac{2}{3}$

PARALLEL SLOPES

ℓ_1

$m_1 = m_2$

SLOPES are EQUAL

ℓ_2
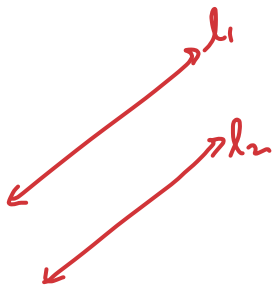
$y = -\frac{3}{2}x + 19$ ||

$y = \frac{3}{2}x - 100$ NEITHER

$y = -\frac{3}{2}x$ ||

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

$y = \frac{2}{3}x$ ⊥

PERPENDICULAR SLOPES.
⊥
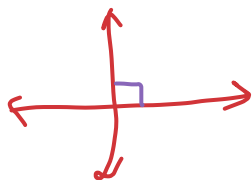
$m_\perp$ — NEGATIVE
RECIPROCAL of m

i.e. (i) FLIP THE FRACTION

(ii) CHANGE THE SIGN.

$+3x + 2y - 6 = 0$

$\frac{2y}{2} = \frac{-3x + 6}{2}$

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

$+2x - 3y - 12 = 0$

$\frac{-3y}{-3} = \frac{-2x + 12}{-3}$

$y = \frac{2}{3}x - 4$ ⊥

4.) Find the equation of a line that is perpendicular to $y = \frac{8}{7}x + 1$ and has a y-intercept at -15

$m_\perp = -\frac{7}{8}$

$b = -15$

$y = mx + b$

EQUATION of LINE:

$y = -\frac{7}{8}x - 15$

5.) Find the equation of a line that is parallel to $y = -\frac{4}{3}x - 5$ and passes through $(-9, 6)$.

$y = mx + b$

$m = -\frac{4}{3}$

$x \quad y$

$6 = -\frac{4}{3} \frac{(-9)}{1} + b$

$6 = 12 + b$

$6 - 12 = b$

$\boxed{-6 = b}$

∴ EQUATION:

$y = -\frac{4}{3}x - 6$

Calculating Slope

6.) Find the equation of a line that passes through $(0, -4)$ and $(-2, 2)$.

$P_1 \quad P_2$

$x_1 \, y_1 \qquad x_2 \, y_2$

SLOPE $= \frac{RISE}{RUN} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$

EQUATION of LINE:

$y = mx + b$

∴ $y = -3x - 4$

y-int ∴ $b = -4$

$m = \frac{2 - -4}{-2 - 0} = \frac{6}{-2} = -3$

7.) Find the equation of a line that passes through $(-6, 2)$ and $(10, 8)$

$P_1 \quad\quad P_2$

$x_1 \, y_1 \quad\quad x_2 \, y_2$

$y = mx + b$

$2 = \frac{3}{8}\frac{(-6)}{1} + b$

$2 = -\frac{9}{4} + b$

$\frac{4 \times 2}{4 \times 1} + \frac{9}{4} = b$

$\frac{8}{4} + \frac{9}{4} = b$

$\frac{17}{4} = b$

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{8 - 2}{10 - -6} = \frac{6}{16} = \frac{3}{8}$

∴ EQUATION of LINE

$y = \frac{3}{8}x + \frac{17}{4}$

$$y = mx + b$$

8.) Find the equation of a line that passes through $(-5, -3)$ and $(6, -3)$. Graph this line on the Cartesian Plane below:

P_1, P_2
x_1, y_1 x_2, y_2

$$M = \frac{y_2 - y_1}{x_2 - x_1} = \frac{(-3) - (-3)}{(6) - (-5)} = \frac{-3 + 3}{6 + 5} = \frac{0}{11} = 0$$

$$y = mx + b$$

$$-3 = 0(-5) + b \quad \therefore \text{ EQUATION:}$$

$$\boxed{-3 = b} \qquad y = 0x - 3$$

$$\boxed{y = -3}$$
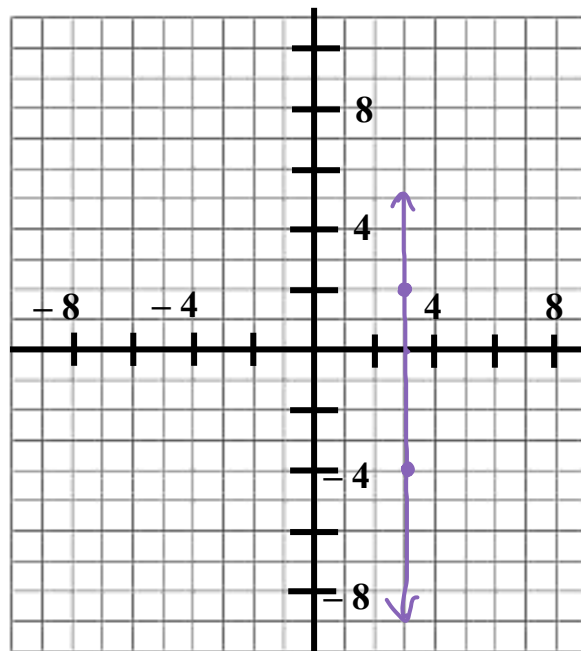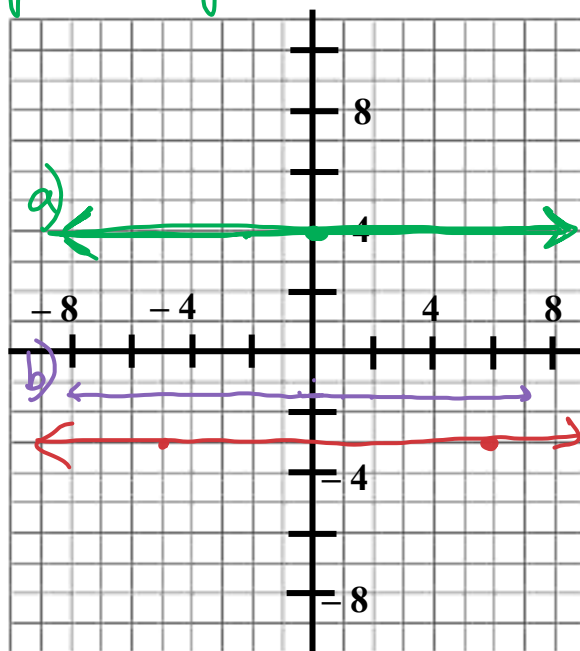
More Practice with Horizontal Lines

a.) Graph $y = 4$

b.) Graph $y = \dfrac{-3}{2} = -1.5$

c.) Write the equation of a horizontal line that passes through $(-1, 9)$

$$y = 9$$

9.) Write the equation of a line that passes through $(3, 2)$ and $(3, -4)$. Graph this line on the Cartesian Plane below:
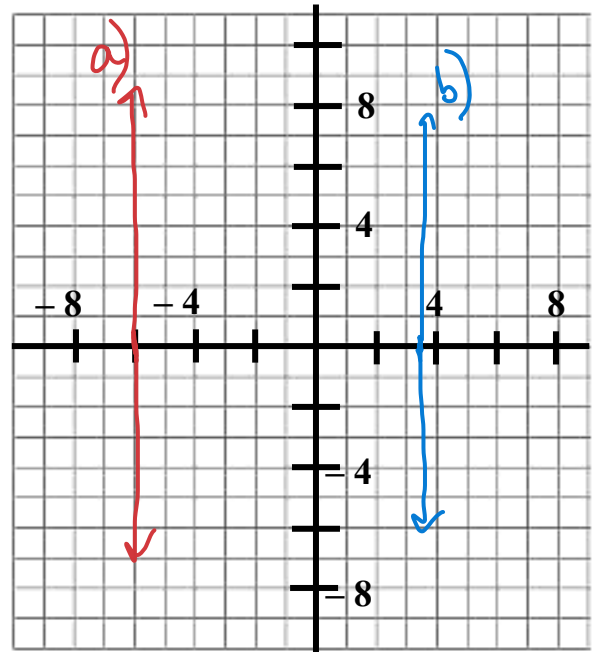
$$x = 3$$

More Practice with Vertical Lines

a.) Graph $x = -6$

b.) Graph $x = \dfrac{7}{2}$ $= 3.5$

c.) Write the equation for a vertical line that passes through (8, -19)

$x = 8$

Big Finish!!!

☺ Write an equation of a line that fulfills the following conditions:
   - Is **PERPENDICULAR** to a line that passes through (9,– 9) and (0,– 5).
   - Passes through (0, 7).