**Lesson 7.2: Creating Equations of Lines**   Date: _April 30, 2025_

Learning Goal: We are learning to write the equation of a line without using a graph.

Recall that the slope intercept form is $y = mx + b$, where m is the slope of the line and b is the y-intercept. In today's lesson, we are going to focus on creating the equation of a line given various pieces of information.

Here are the steps:
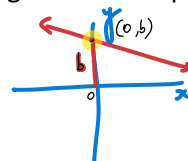
1. Are you given slope? If yes, move to step 3. If no, do step 2.
2. Calculate the slope using the slope formula.
3. Do you have the y-intercept, meaning **b** or **(0,#)**? If yes, insert the **m** and **b** into $y = mx + b$ then done! If no, next step.
4. Pick a point, labeling it (x_1, y_1), then insert the slope (m) and that point into the *Point-Slope Form*, $y - y_1 = m(x - x_1)$. You will then need to work it from there, but I will show you.

For all the following examples, create $y = mx + b$.

1. $m = \dfrac{4}{3}$ and $b = -8$

$$y = mx + b$$

$$y = \frac{4}{3}x - 8$$

2. $m = 5$ and $(-2, 3)$

$$y = mx + b$$

$$3 = 5(-2) + b$$
$$3 = -10 + b$$
$$3 + 10 = b$$
$$13 = b$$

$$\therefore y = 5x + 13$$

3. $m = \dfrac{-3}{5}$ and $(10, 6)$

$$y = mx + b$$

$$6 = \frac{-3}{5}(10) + b$$
$$6 = -\frac{30}{5} + b$$
$$6 = -6 + b$$
$$6 + 6 = b$$
$$12 = b$$

$$y = -\frac{3}{5}x + 12$$

4. $m = -7$ and $(0, 5)$

$(0, b)$ $b = 5$

$$y = mx + b$$

$$\therefore y = -7x + 5$$

x_1, y_1 $x_2 y_2$

5. $(-3,3)$ and $(-2,5)$

$M = \dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{5-3}{-2--3} = \dfrac{2}{-2+3} = \dfrac{2}{1} = 2$

$y = mx + b$

$5 = 2(-2) + b$

$5 = -4 + b$

$5 + 4 = b$

$9 = b$

∴ $y = 2x + 9$

x_1, y_1 $x_2 y_2$

6. $(-4,5)$ and $(5,2)$

$M = \dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{2-5}{5--4} = \dfrac{-3}{9} = -\dfrac{1}{3}$

$y = mx + b$

$5 = -\dfrac{1}{3}(-4) + b$

$5 = \dfrac{4}{3} + b$

$5 - \dfrac{4}{3} = b$

$b = \dfrac{15-4}{3} = \dfrac{11}{3}$

∴ $y = -\dfrac{1}{3}x + \dfrac{11}{3}$

7. Create the equation of a line which has the same slope as $4x - 5y = -5$ and has the same y-intercept as $3y + 5x - 9 = 0$.

b

$3y + 5x - 9 = 0$

$\dfrac{3y}{3} = \dfrac{-5x}{3} + \dfrac{9}{3}$

$y = -\dfrac{5}{3}x + 3$

m

$+4x - 5y = -5$

$\dfrac{-5y}{-5} = \dfrac{+4x}{-5} + \dfrac{-5}{-5}$

$y = \dfrac{4}{5}x + 1$

∴ $y = \dfrac{4}{5}x + 3$

8. Create the equation of a line which has the same slope as $8 - 3y = 7x$ and passes through the point $(4,-5)$.

x y

m

$+8 - 3y = 7x$

$\dfrac{-3y}{-3} = \dfrac{7x}{-3} + \dfrac{8}{+3}$

$y = -\dfrac{7}{3}x + \dfrac{8}{3}$

$y = mx + b$

$-5 = -\dfrac{7}{3}(4) + b$

$-5 = -\dfrac{28}{3} + b$

$-5 + \dfrac{28}{3} = b$

$b = \dfrac{-15+28}{3} = \dfrac{13}{3}$

∴ $y = -\dfrac{7}{3}x + \dfrac{13}{3}$

Success Criteria:
- I can write the equation of a line if I am given the slope and the y-intercept
- I can use the point-slope form to create the equation of a line.