Warm-Up Questions: $y = mx + b$

1. Determine the equation of the line with slope 3 and y-intercept 2.

$m = 3$

$b = 2$

$\therefore y = 3x + 2$

2. Determine the equation of the line with slope 2.5 and passing through (50, 220)

$m = 2.5$

$x = 50$
$y = 220$

$y = 2.5x + b$

$220 = 2.5(50) + b$

$220 = 125 + b$

$220 - 125 = b$

$95 = b$

$\therefore y = 2.5x + 95$

Ex. 1 Write the equation of the line given that it passes through (1,5) and (4,2).

Step 1: Calculate the slope (m) using formula $m = \frac{y_2 - y_1}{x_2 - x_1}$ (rise / run)

(x_1, y_1) (x_2, y_2)

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

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

$m = -1$

OR

$(4,2) - (1,5)$

$(3,-3)$

run, rise

$m = \frac{-3}{3} = -1$

Step 2: Substitute the slope (m) and one of the points (x,y) into y = mx + b to solve for y-intercept (b).

Choose either point: (1,5)

$x = 1$

$y = 5$

$m = -1$

$y = mx + b$

$5 = -1(1) + b$

$5 + 1 = -1 + 1 + b$

$5 + 1 = b$

$6 = b$

Step 3: Write the equation with slope (m) and y-intercept (b). The *x* and *y* stay as variables since they change along the line.

$m = -1$ $b = 6$

$\therefore y = -1x + 6$

or $y = -x + 6$

Ex. 2 Write the equation of the line that passes through (-2,3) and (1, 6).

(x_2, y_2) (x_1, y_1)

Step 1: Find slope (m)

$m = \frac{y_2 - y_1}{x_2 - x_1}$

$m = \frac{6-3}{1-(-2)}$

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

$m = 1$

$\frac{(-2,3) - (1,6)}{(-3,-3)}$

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

$m = 1$

$\frac{(1,6) - (-2,3)}{(3,3)}$

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

$m = 1$

Step 2: Find y-intercept (b) → (-2,3)

$m = 1 \quad x = -2 \quad y = 3$

$y = mx + b$

$3 = 1(-2) + b$

$3 \overset{+2}{} = -2 \overset{+2}{} + b$

$3 + 2 = b$

$5 = b$

Step 3: Write in $y = mx + b$

$y = x + 5$

Ex. 3 Write the equation of the line that passes through (3,1) and (9,-3).

Step 1:

$m = \frac{y_2 - y_1}{x_2 - x_1}$

$m = \frac{-3-1}{9-3}$

$m = \frac{-4}{6}$

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

$\frac{(9,-3) - (3,1)}{(6,-4)}$

$m = \frac{-4}{6}$

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

Step 2: $(3,1) \rightarrow x = 3, \; y = 1$

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

$y = mx + b$

$1 = \left(-\frac{2}{3}\right)(3) + b$

$1 = \left(-\frac{2}{3}\right)\left(\frac{3}{1}\right) + b$

$1 = \frac{-2 \times 3}{3 \times 1} + b$

$1 = \frac{-6}{3} + b$

$1 = -2 + b$

$1 + 2 = b$

$3 = b$

Step 3:

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