The equation of a line

$$y = mx + b$$

Variables

m: slope - the rate at which the line increases or decreases

- Need 2 points on the line to find the slope
  - label the points (x, y)
    point 1 (x_1, y_1)
    point 2 (x_2, y_2)

- "rise over run" → rate → $\frac{\text{rise}}{\text{run}} = \frac{y}{x}$

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

- Given 2 points on a line: $(3, 11)$ (x_1, y_1) and $(2, 8)$ (x_2, y_2)
  Find the slope

point 1: $(x_1, y_1) = (3, 11)$

point 2: $(x_2, y_2) = (2, 8)$

* Rewrite the equation w/ the values (points) plugged in

$$m = \frac{8 - 11}{2 - 3} = \frac{-3}{-1} = \frac{3}{1} = 3$$

$-3 = -1 \cdot 3$

$-1 = -1 \cdot 1$

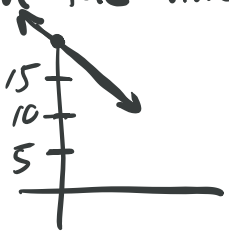
$$m = \frac{3}{1} = 3$$

* A positive slope implies an increasing / incline / accelerate

* Negative slope

- Variable 'b' is the y-intercept

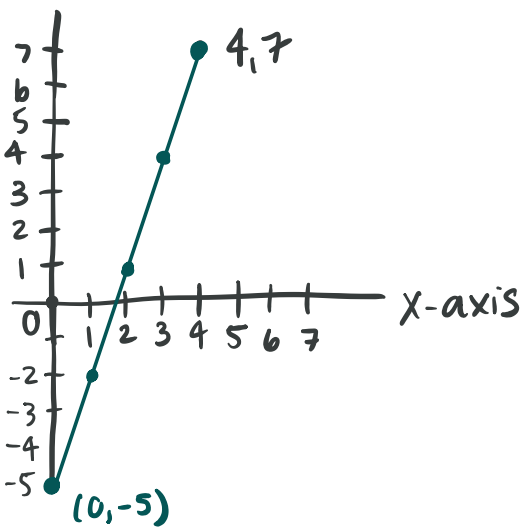
  y-intercept is the y-coordinate of the point at which the line crosses the y-axis



b = 20

(0, 20)

EX: 2 points on a line: (0, -5) and (4, 7)



* positive slope

$m = \frac{y_2 - y_1}{x_2 - x_1}$ *Recall slope formula

*Label the points

pt 1: $(0, -5) = (x_1, y_1)$

pt 2: $(4, 7) = (x_2, y_2)$

*Rewrite equation

$$m = \frac{7 - (-5)}{4 - 0} = \frac{12}{4} = \frac{3}{1}$$

: b y-intercept

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

(x, y)

$$y = mx + b = \frac{3}{1}x + (-5)$$

Given: $(0,-5)$ and $(4,7)$

$y = \frac{3}{1}x - 5$

Is there another point on the line? YES → Infinitely many points

If $x=0$, $y=$?

- Can you list 2?

$y = \frac{3}{1}(0) - 5$

$y = -5$

If $x=4$, $y=7$? $y = \frac{3}{1}(4) - 5 = 12 - 5 = 7$

If $x=1$ and $y = \frac{3}{1}x - 5$ what does $y=$?

(x,y)

$(1,-2)$

$y = 3x - 5$

$y = 3 \cdot x - 5 \rightarrow y = 3 \cdot 1 - 5 = -2$

$y = -2$