

Equation of a Line Using Two Points

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Recall: We can find the equation of a line if we know the **slope** and a **point** on the line.

What if we have only two points?

Ex. Find the equation of the line passing through (4,-8) and (-2,10).

$$\begin{array}{l}
 x_1 \ y_1 \quad x_2 \ y_2 \\
 m = \frac{y_2 - y_1}{x_2 - x_1} \\
 = \frac{10 - (-8)}{-2 - (4)} \\
 = \frac{18}{-6} \\
 \boxed{m = -3}
 \end{array}
 \quad
 \left\{
 \begin{array}{l}
 \text{Sub } P_1(4, -8) \\
 y = mx + b \\
 -8 = (-3)(4) + b \\
 -8 = -12 + b \\
 +12 \quad +12 \\
 4 = b \\
 \boxed{b = 4}
 \end{array}
 \right.$$

$$\begin{array}{l}
 \text{Sub } P_2(-2, 10) \\
 10 = (-3)(-2) + b \\
 10 = 6 + b \\
 -6 \quad -6 \\
 4 = b \\
 \boxed{b = 4}
 \end{array}$$

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- (1) Use the slope formula: $m = \frac{y_2 - y_1}{x_2 - x_1}$
- (2) Substitute the slope and any point into $y = mx + b$ and solve for b.
- (3) Write the new equation using m and b.
- (4) Answer any other questions.

Ex. Find the equation of the line that passes through the points (-1,8) and (6, 20)

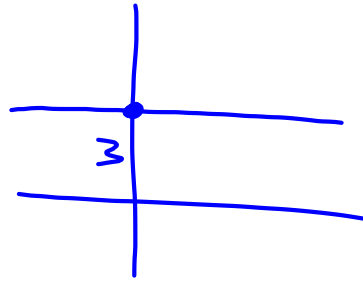
$$\begin{array}{l}
 \textcircled{1} \ m = \frac{y_2 - y_1}{x_2 - x_1} \\
 m = \frac{20 - (8)}{6 - (-1)} \\
 \boxed{m = \frac{12}{7}}
 \end{array}
 \quad
 \begin{array}{l}
 \textcircled{2} \ \text{Sub } m \text{ and } P_1 \\
 y = mx + b \\
 8 = \left(\frac{12}{7}\right)(-1) + b \\
 8 = -\frac{12}{7} + b \\
 \frac{7 \times 8}{7 \times 1} + \frac{12}{7} = b \\
 \frac{56}{7} + \frac{12}{7} = b \\
 b = \frac{68}{7}
 \end{array}$$

$$\boxed{y = \frac{12}{7}x + \frac{68}{7}}$$

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4(a)

$$\begin{aligned}
 m &= \frac{y_2 - y_1}{x_2 - x_1} \\
 &= \frac{3 - 3}{5 - 0} \\
 &= \frac{0}{5} \\
 &= 0
 \end{aligned}$$



$$y = 3$$

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$$\begin{array}{c}
 5. \quad C = mg + b \\
 \begin{array}{ccc}
 \uparrow & & \uparrow \\
 \text{cost} & & \# \text{ of games}
 \end{array}
 \end{array}$$

(a) variable cost \rightarrow slope

$$\underbrace{P_1(5, 20.50) \quad P_2(9, 28.50)}_{m = \frac{y_2 - y_1}{x_2 - x_1}}$$

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