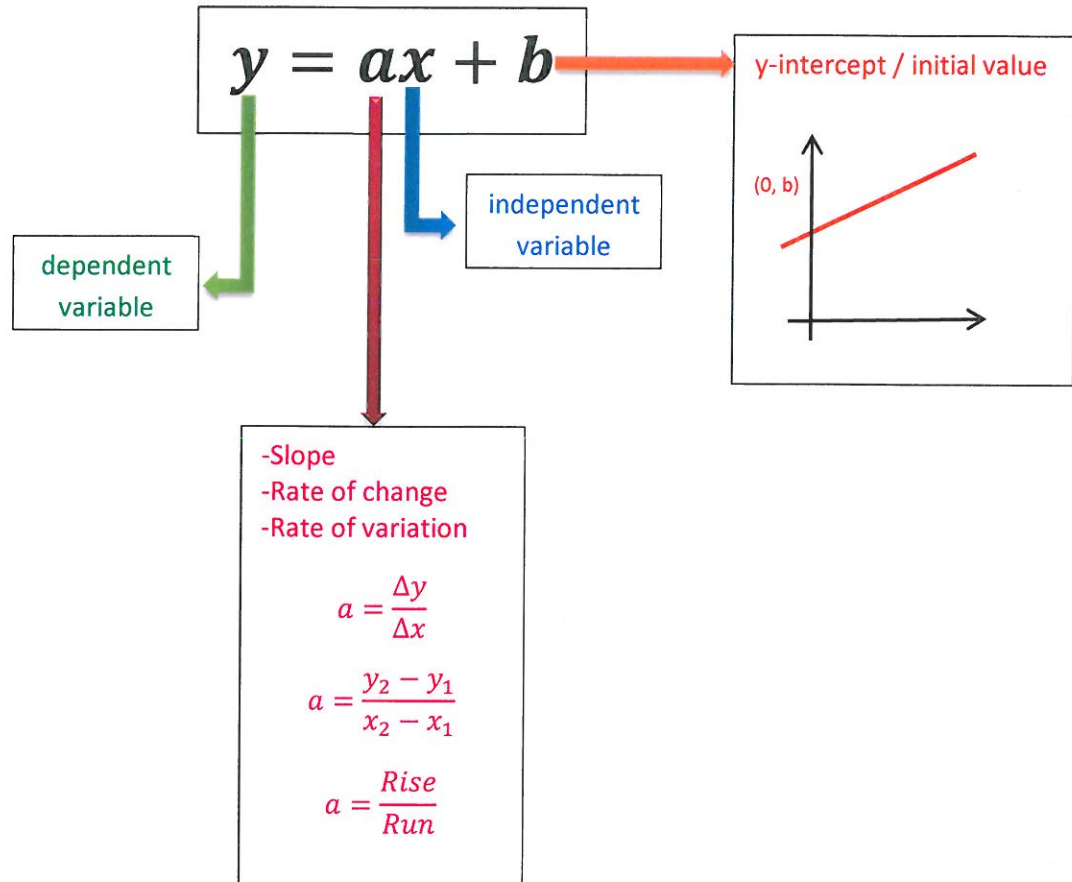


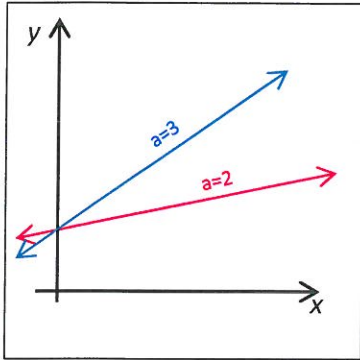
## Linear Relations

Equation of a line (in standard form)

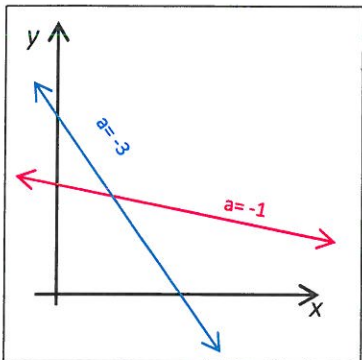


### Slope

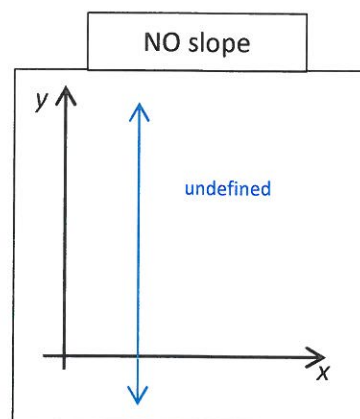
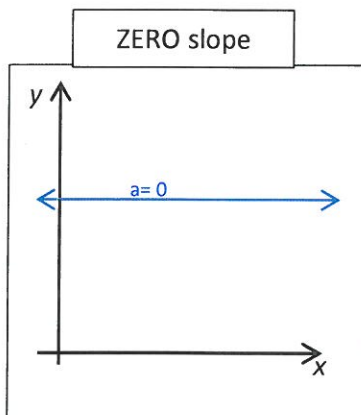
The slope has many names including the rate of change and the rate of variation. The slope gives us the steepness of a line.



The higher the value of the slope, the more steep the line.



If the slope is negative the line decreases.



**Solving for the Slope**  
(Algebraically)

You can find the slope of any line using two points from that line.

Example Given two points on the line: A(1,-2) B(4,-8)

Step 1: Set up the x and y by point1 and point2

$$\begin{array}{cc} A(1, -2) & B(4, -8) \\ x_1 \ y_1 & x_2 \ y_2 \end{array}$$

Step 2: Write the formula and plug in the values using brackets

$$\begin{aligned} a &= \frac{y_2 - y_1}{x_2 - x_1} \\ a &= \frac{(-8) - (-2)}{(4) - (1)} \\ a &= \frac{-8 + 2}{4 - 1} \\ a &= \frac{-6}{3} \\ a &= -2 \end{aligned}$$

Example Given two points on the line: C(12, -6) D(5, -9)

Step 1: Set up the x and y by point1 and point2

$$\begin{array}{cc} A(12, -6) & B(5, -9) \\ x_1 \ y_1 & x_2 \ y_2 \end{array}$$

Step 2: Write the formula and plug in the values using brackets

$$\begin{aligned} a &= \frac{y_2 - y_1}{x_2 - x_1} \\ a &= \frac{(-9) - (-6)}{(5) - (12)} \\ a &= \frac{-9 + 6}{5 - 12} \\ a &= \frac{-3}{-7} \\ a &= \frac{3}{7} \end{aligned}$$

### Solving for the Y-Intercept (Algebraically)

The y-intercept is also referred to as the initial value. It is the point where the line crosses the y-axis. Finding the y-intercept of the equation of a line occurs after one solves for the slope. Solving for the y-intercept will complete the equation of the line.

Eg (1) Determine the equation of the line passing through the two given points.

A(-3, 4) B (1, 12)

Solve for the slope:  $a = 2$  and plug it into the equation of a line  $y = ax + b$

**How we solved for the slope:**

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

$$a = \frac{(12) - (4)}{(1) - (-3)}$$

$$a = \frac{12 - 4}{1 + 3}$$

$$a = \frac{8}{4}$$

$$a = 2$$

Plug in the values of **one and only one** of the given points so that the only remaining variable is "b"

Solving for "b" is solving the y-intercept.

