

$$y = mx + c$$

m = slope of the line

c = y -intercept of the line

x & y refer to x & y coordinates on the line

Hence, for the line $y = mx + c$:

- the y -intercept is c
- the x -intercept is $-c/m$

How do you work out the slope of a straight line (m)?

Slope is the vertical change compared to horizontal change.

For example: To find the slope of a line that passes through the points $(4, 10)$ and $(6, 20)$ let $(x_1, y_1) = (4, 10)$ and $(x_2, y_2) = (6, 20)$.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{20 - 10}{6 - 4} = \frac{10}{2} = 5$$

So the slope of the line is: $m = 5$.

How do you work out the equation of a straight line?

For example: What is the equation of the line going through $(2.5, 20)$ and $(5, 30)$?

Step 1: Work out the slope $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{30 - 20}{5 - 2.5} = \frac{10}{2.5} = 4$

Step 2: Work out the y -intercept, by substituting a coordinate back in the equation.

From step 1 we know $m = 4$ so using $y = mx + c$ formula, the equation becomes $y = 4x + c$. We know that $(5, 30)$ is a point of the line.

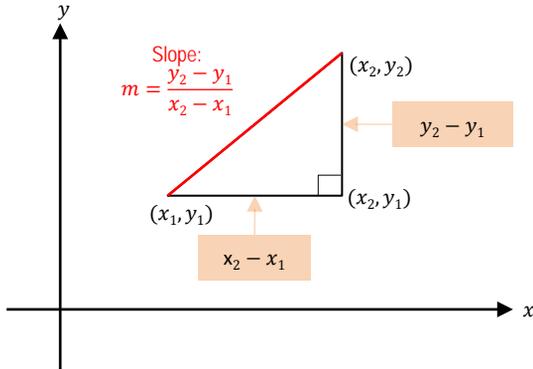
So, we can substitute $x = 5$ and $y = 30$ into $y = 4x + c$ to work out c .
(However, you can substitute either coordinate)

Step 3: Write down the equation.

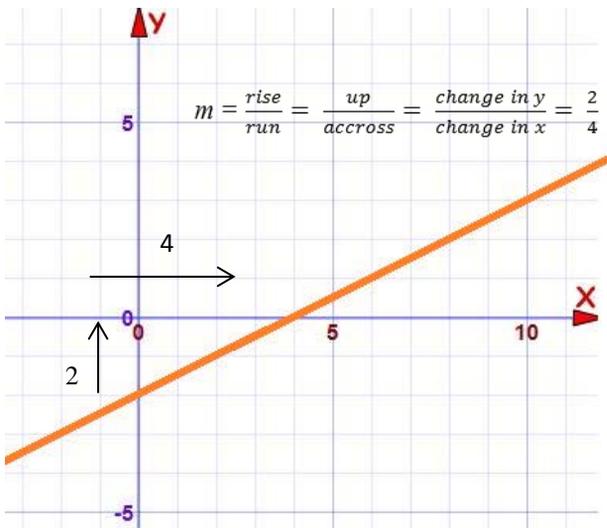
$$\begin{aligned} y &= 4x + c \\ 30 &= 4 \times 5 + c \\ 30 &= 20 + c \\ 30 - 20 &= 20 + c - 20 \\ 10 &= c \end{aligned}$$

We have found that $m = 4$ and $c = 10$, so the question of the line is: $y = 4x + 10$

Can we figure it out just looking at the graph?
Yes we can...



What is the equation of the straight line shown in the diagram below?



Step 1: Find the slope or gradient (these are two names for the same thing):

$$\text{Slope} = \frac{2}{4} = \frac{1}{2} \text{ so } m = \frac{1}{2}$$

Step 2: Find the y -intercept.

$$y\text{-intercept} = -2. \text{ So } c = -2$$

The general equation of a straight line is $y = mx + c$
So the given line has equation $y = (\frac{1}{2})x - 2$

The general form for the **slope/intercept equation of a straight line** is given by: $y = mx + c$

Where, m is the slope of the line
 c is the y -intercept of the line

The general form for the **slope/point form of an equation** is given by;

$$y - y_1 = m(x - x_1)$$

Where, m is the slope of the line
 x_1 is the x -coordinate of a point (x_1, y_1)
 y_1 is the y -coordinate of a point (x_1, y_1)

There is another way you can do it: $y - y_1 = m(x - x_1)$

What is the equation of the straight line that passes through the points $(-2, 5)$ and $(3, -5)$?

Step 1: First find the slope as usual

$$m = \frac{y\text{ change}}{x\text{ change}} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-5 - 5}{3 - (-2)} = \frac{-10}{5} = -2$$

Step 2: Substitute a coordinate into the equation. Let's choose $(-2, 5)$ for x_1 and y_1 .

$$y - y_1 = m(x - x_1)$$

$$y - 5 = -2(x - (-2))$$

$$y - 5 = -2(x + 2)$$

$$y - 5 = -2x - 4$$

$$y = -2x + 1$$

Try this one: What is the equation of the straight line that passes through the points $(-5, 2)$ and $(7, -1)$?

Check your answer: $y = -\frac{1}{4}x + \frac{3}{4}$

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