

You want to find the equation for a line that passes through the two points:
(4,0) and (6,-8).

First of all, remember what the equation of a line is:

$$y = mx + b$$

Where:

- m is the slope, and
- b is the y-intercept

First, let's find what m is, the slope of the line...

The slope of a line is a measure of how fast the line "goes up" or "goes down". A large slope means the line goes up or down really fast (a very steep line). Small slopes means the line isn't very steep. A slope of zero means the line has no steepness at all; it is perfectly horizontal.

For lines like these, the slope is always defined as "the change in y over the change in x " or, in equation form:

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

So what we need now are the two points you gave that the line passes through. Let's call the first point you gave, (4,0), point #1, so the x and y numbers given will be called x_1 and y_1 . Or, $x_1=4$ and $y_1=0$.

Also, let's call the second point you gave, (6,-8), point #2, so the x and y numbers here will be called x_2 and y_2 . Or, $x_2=6$ and $y_2=-8$.

Now, just plug the numbers into the formula for m above, like this:

$$m = \frac{-8 - 0}{6 - 4}$$

or...

$$m = \frac{-8}{2}$$

or...

$$m = -4$$

So, we have the first piece to finding the equation of this line, and we can fill it into $y=mx+b$ like this:

$$y = -4x + b$$

Now, what about b , the y -intercept?

To find b , think about what your (x,y) points mean:

- $(4,0)$. When x of the line is 4, y of the line *must be* 0.
- $(6,-8)$. When x of the line is 6, y of the line *must be* -8.

Because you said the line passes through each one of these two points, right?

Now, look at our line's equation so far: $y = -4x + b$. b is what we want, the -4 is already set and x and y are just two "free variables" sitting there. We can plug anything we want in for x and y here, but we want the equation for the line that specifically passes through the two points $(4,0)$ and $(6,-8)$.

So, why not plug in for x and y from one of our (x,y) points that we know the line passes through? This will allow us to solve for b *for the particular line that passes through the two points you gave!*

You can use either (x,y) point you want..the answer will be the same:

- $(4,0)$. $y=mx+b$ or $0=-4 \times 4+b$, or solving for b : $b=0-(-4)(4)$. $b=16$.
- $(6,-8)$. $y=mx+b$ or $-8=-4 \times 6+b$, or solving for b : $b=-8-(-4)(6)$. $b=16$.

See! In both cases we got the same value for b . And this completes our problem.

The equation of the line that passes through the points

$(4,0)$ and $(6,-8)$

is

$$y = -4x + 16$$