

Different ways to write the equation of a line.

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## Ways to write an equation of line

There are different ways to write the equation of a line. If we consider the line above through the points  $P_1(0, 6)$  and  $P_2(3, 2)$  we can write the equation as,

$$y = mx + b$$

where,

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2 - 6}{3 - 0} = \frac{-4}{3}$$

and  $b = 6$ , or

$$l : y = -\frac{4}{3}x + 6$$

Another way to write the equation of the line is to use one of the points in the formula below,

$$m(y - y_0) = (x_1 - x_0)$$

say the point  $P_1(0, 6)$  which gives,

$$-\frac{4}{3}(y - 6) = x - 0$$

giving,

$$l : -\frac{4}{3}(y - 6) = x$$

The last way to write the equation of the line is in the form

$$Ax + By + C = 0$$

Using the first form,

$$y = mx + b$$

let's try and rewrite this form into this third and final form of the equation of a line,  $Ax + By + C = 0$ .

$$y = -\frac{4}{3}x + 6 \quad \text{multiply both sides by 3}$$

$$3y = -4x + 18 \quad \text{bring all terms to one side of the = sign}$$

$$4x + 3y - 18 = 0$$

Now we have our third way to write the equation of a line.

$$l : 4x + 3y - 18 = 0.$$

## Exercises

1. Find the equation of the line that goes through the points  $P_1 = (2, -3)$  and  $P_2 = (-1, 0)$ .
  
  
  
  
  
  
  
  
  
  
2. Write the equation of the line found in #1 in the following three forms:
  - a)  $y = mx + b$
  - b)  $m(y_1 - y_0) = x_1 - x_0$
  - c)  $Ax + By + C = 0$ .