



# Finding the equation of a line

Year 9  
Mathematics

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## Learning Objectives

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By the end of the lesson I hope that you understand and can apply the following to a range of questions from the Year 9 Mathematics course.

- To be able to find the equation of a line given two points
- To find the equation(s) of straight lines.



## RECAP

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Everything we have been doing this topic is leading to you being able to either:

- Find equations of straight lines
- Sketch straight lines from their equations

If we remember that every straight line can be written in one of two ways:

- $y = mx + c$
- $ax + by = c$

Reading the **gradient** and **intercept** from a sketch means we can write the equation using the first form shown above.

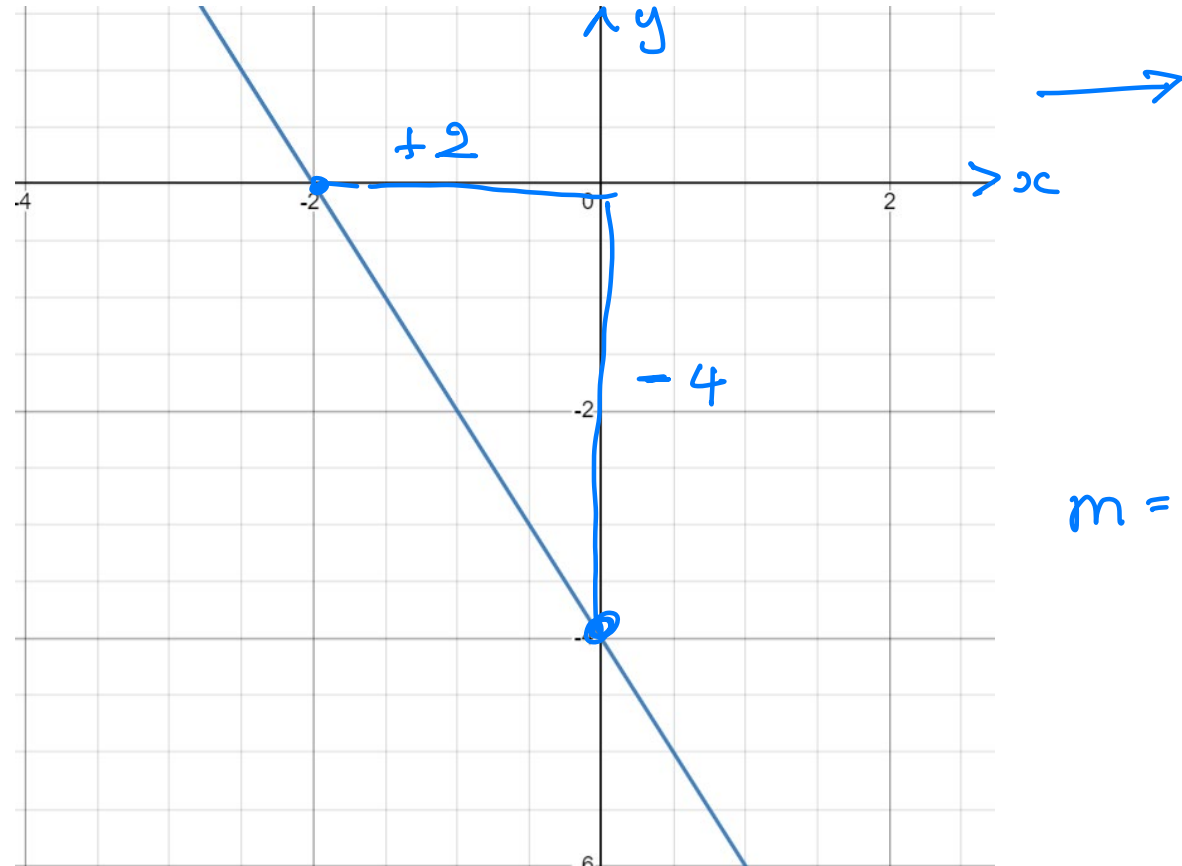


## Example of finding an equation from a graph

Determine the equation of a straight line shown to the right:.

$$y = mx + c$$

$$y = -2x - 4$$



$$m = \frac{-4}{2} = -2$$

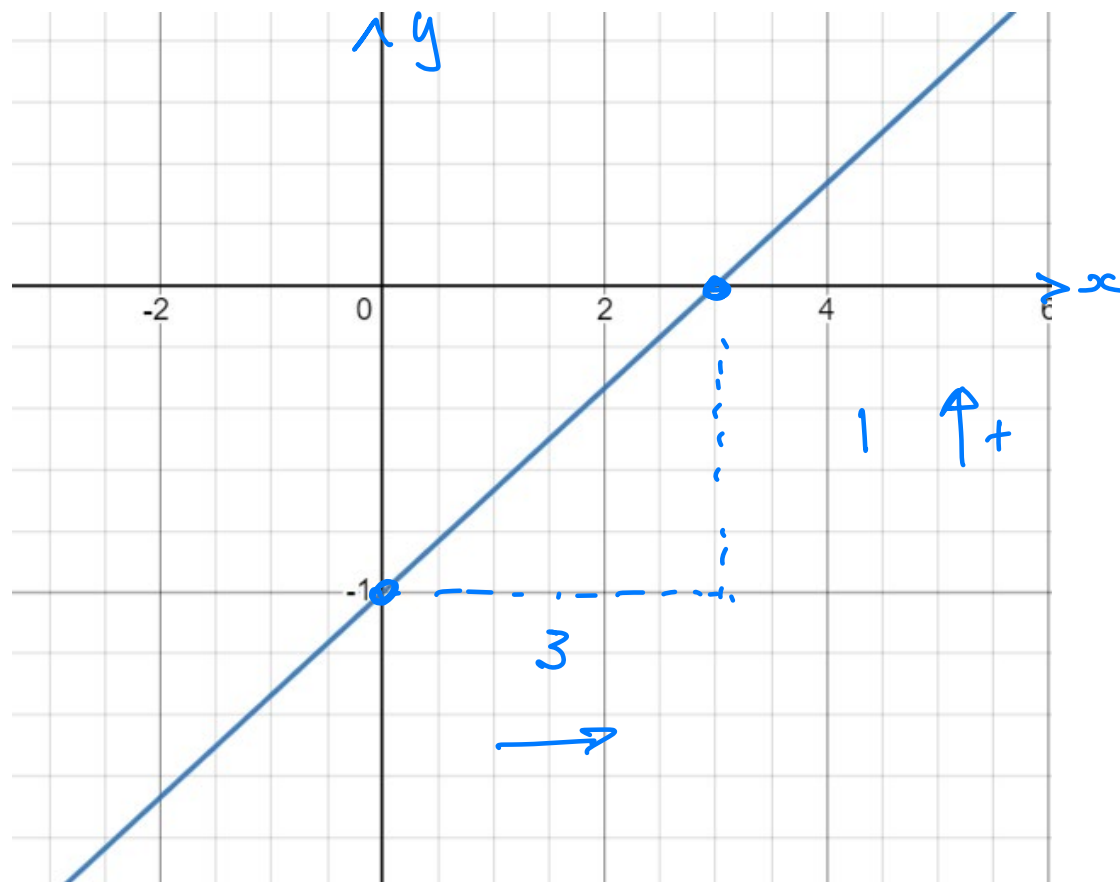


## Example of finding an equation from a graph

Determine the equation of a straight line shown to the right:.

$$y = mx + c$$

$$y = \frac{1}{3}x - 1$$



$$m = \frac{1}{3}$$



## Example of finding an equation from a worded question

Find the equation of a straight line which has a gradient  $m$  of  $\frac{1}{3}$  and passes through the point (9,2)

### Questions to ask:

- Do you know the gradient?
- Do you know the intercept?
- Can we simply place values in  $y = mx + c$

$$y = mx + c$$

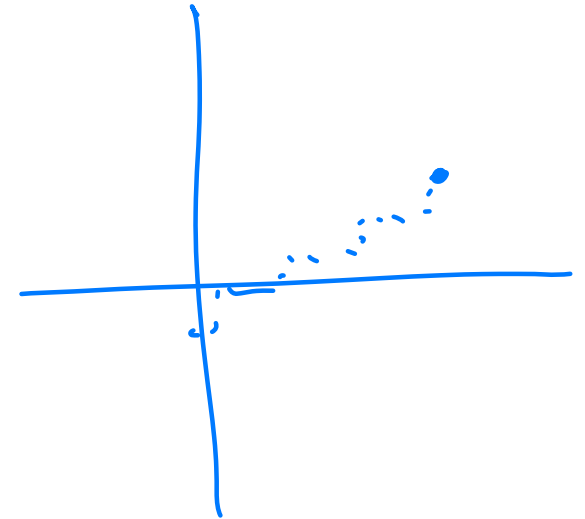
$$2 = \frac{1}{3} \cdot 9 + c$$

$$2 = 3 + c \quad -3$$

$$c = \underline{\underline{-1}}$$

$$\therefore y = \underline{\underline{\frac{1}{3}x - 1}}$$

$$\begin{matrix} (9, 2) \\ x \quad y \end{matrix}$$



## Example of finding an equation from a worded question

Find the equation of a straight line which has a gradient  $m$  of  $\frac{2}{3}$  and passes through the point  $(-3, 4)$

### Questions to ask:

- Do you know the gradient?
- Do you know the intercept?
- Can we simply place values in  $y = mx + c$

$$y = \frac{2}{3}x + \underline{\underline{6}}$$

$$y = mx + c$$

$$y = \frac{2}{3}x + c$$

$$4 = \frac{2}{3}(-3) + c$$

$$4 = \frac{2}{3} \cdot \frac{-3}{1} + c$$

$$4 = \frac{-6}{3} + c$$

$$\begin{array}{l} (-3, 4) \\ x \quad y \end{array}$$

$$\begin{array}{l} 4 = -2 + c \\ \underline{\underline{c = 6}} \end{array}$$



## Example of finding an equation from two points

We can use the same idea we used in the last question to find the equation of a straight line which joins two points.

Remember, the equation  $y = mx + c$  is a relationship. If you have the values of three out of the four letters, you can find the missing letter using algebra.

This is what we did in the last example.

So, let's look at what we can do with (2, 6) and (4, 10)

$$y = mx + c$$

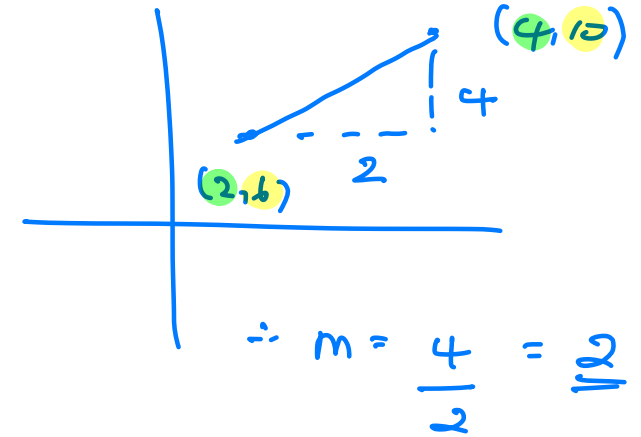
$$y = 2x + c$$

$$6 = 2 \cdot 2 + c$$

$$6 = 4 + c$$

$$c = \underline{\underline{2}}$$

$$\therefore y = \underline{\underline{2x + 2}}$$



## Using the equation $y = mx + c$

The great thing about equations is we can use them in lots of ways.

**Remember:** So long as they give you the values of three of the letters you can find the fourth.

Example:

A line has gradient  $-2$  and  $y$ -intercept  $5$ . Find its  $x$ -axis intercept.

$$y = mx + c$$

$$y = -2x + 5$$

$$0 = -2x + 5 \quad -5$$

$$-5 = -2x$$

$$\underline{\underline{y = 0}}$$

$$2x = 5 \quad \div 2$$

$$x = \frac{5}{2}$$

$$\underline{\underline{(\frac{5}{2}, 0)}}$$



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