
MATHEMATICS

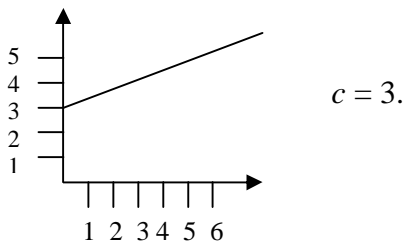
SUPPORT CENTRE

Title: $y = mx + c$

Target: On completion of this worksheet you should be able to find the equation of a straight-line graph.

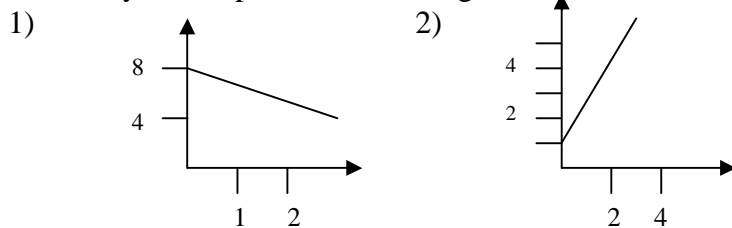
The **y-intercept** of a graph is the y-coordinate of the point where the graph cuts the y-axis. It is usually denoted by c .

Example.



Exercise.

Find the y-intercept of the following:



(Answers: 8; 1.)

The gradient, steepness, of a line and its y-intercept define a line uniquely. In fact any straight line has an equation of the form:

$$y = mx + c,$$

where m is the gradient and c is the y-intercept.

Example.

Find the equation of the line with gradient 3 and y-intercept 4.

Here $m = 3$ and $c = 4$.

We substitute the values of m and c into the equation to obtain: $y = 3x + 4$.

Exercise.

Find the equations of the straight lines with the following gradients and y-intercepts:

1. Gradient of 4 and y-intercept of 2.
2. Gradient of -6 and y-intercept of 8
3. Gradient of $\frac{1}{2}$ and y-intercept of -7 .

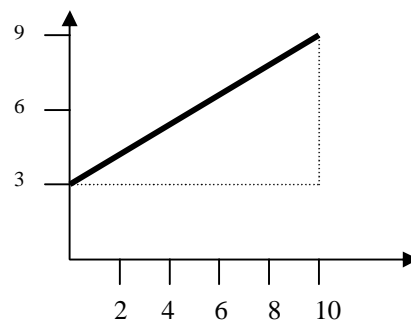
(Answers: $y = 4x + 2$; $y = -6x + 8$; $y = \frac{1}{2}x - 7$.)

We frequently need to find the equation of a line directly from its graph. We should:

- Find the y-intercept, c .
- Find the gradient, m , of the line.
- Substitute these values into $y = mx + c$.

Example.

Find the equation of the graph.



First we find the y-intercept: $c = 3$.

Then we find the gradient: $m = \frac{9-3}{10-0} = \frac{3}{5}$.

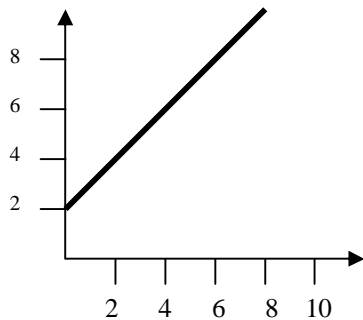
Thus $y = \frac{3}{5}x + 3$.

If you have difficulty with this refer to the graph sheet on gradients.

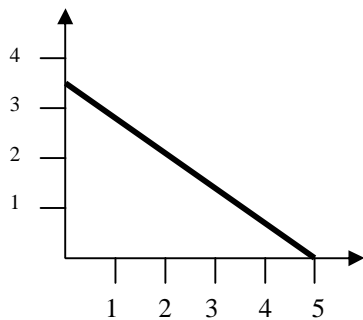
Exercise.

Find the equations of the following graphs:

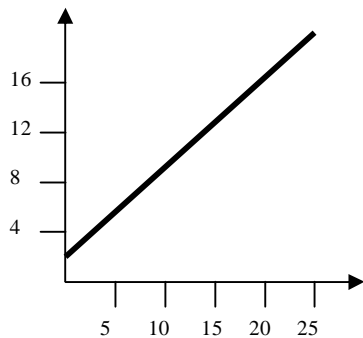
1)



2)



3)



(Answers: $y = x + 2$; $y = -\frac{7}{10}x + 3\frac{1}{2}$; $y = \frac{18}{25}x + 2$.)

Example.

Find the equation of the line that goes through the points (2, 4) and (6, 12).

- $m = \frac{12 - 4}{6 - 2} = 2$.
- Choosing the point (6, 12) and substituting gives: $12 = 2 \times 6 + c$.
- Rearranging gives: $c = 0$.
- Hence $y = 2x + 0 \Rightarrow y = 2x$.

Exercise.

Find the equations of the lines that pass through the following points:

1. (0, 7) and (3, 13).
2. (2, 1) and (5, -1).
3. (4, 8) and (8, 0).
4. (-4, 2) and (12, 10).

(Answers:

$$y = 2x + 7; y = -\frac{2}{3}x + \frac{7}{3}; y = -2x + 16;$$

$$y = \frac{1}{2}x + 4.)$$

If we are given two points on a graph we can work out the equation of the line.

We should:

- Find the gradient of the line.
- Substitute the value of the gradient, the x -coordinate and y -coordinate of one of the points into the equation $y = mx + c$.
- Rearrange the equation to find c .
- Then state the equation using the found values of m and c .