

Fix it 1 Change in x and change in y

Equation of a line · ANSWERS

Across first, then up or down. Go from the first point to the second for both: the second x take away the first, then the second y take away the first. Goes down? The change in y is negative.

EXAMPLE

A line goes through (2, 3) and (6, 11). Find the change in x and the change in y .

1. From (2, 3) to (6, 11).
2. Across first: change in $x = 6 - 2 = 4$
3. Then up or down:
change in $y = 11 - 3 = 8$
4. It goes up, so the change in y is positive.

YOUR TURN

- 1 A line goes through (1, 4) and (4, 19). Find the change in x and the change in y .

change in $x = 3$, change in $y = 15$

- 2 A line goes through (3, 9) and (5, 1). Find the change in x and the change in y .

change in $x = 2$, change in $y = -8$

- 3 A line goes through (-3, 4) and (2, -6). Find the change in x and the change in y .

change in $x = 5$, change in $y = -10$

Check: Start at the first point. Add on the change in x and the change in y . You land on the second point.

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Fix it 2 The gradient

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The gradient is the change in y over the change in x : the change in y as the numerator. Simplify it. A negative change in y gives a negative gradient.

EXAMPLE

The change in x is 4 and the change in y is -12. Find the gradient.

1. $m = \frac{\text{change in } y}{\text{change in } x}$
2. $m = \frac{-12}{4}$
3. $m = -3$
4. It goes down, so the gradient is negative.

YOUR TURN

- 1 The change in x is 3 and the change in y is 12. Find the gradient.

$m = \frac{4}{3}$

- 2 The change in x is 6 and the change in y is 3. Find the gradient.

$m = \frac{1}{2}$

- 3 The change in x is 4 and the change in y is -6. Find the gradient.

$m = -\frac{3}{2}$

Check: Multiply your gradient by the change in x . You get the change in y back.

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Fix it 3 Substitute a point

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Substitute the gradient and one point into $y = mx + c$: the y value for y , the gradient for m and the x value for x . A negative number goes in brackets.

EXAMPLE

The gradient is 2 and the line goes through (3, 11).

Substitute into $y = mx + c$.

1. The y value is 11, the x value is 3.
2. y value = $m \times x$ value + c
3. $11 = 2 \times 3 + c$

YOUR TURN

- 1 The gradient is 4 and the line goes through (5, 17).
Substitute into $y = mx + c$.

$$17 = 4 \times 5 + c$$

- 2 The gradient is -3 and the line goes through (2, 1).
Substitute into $y = mx + c$.

$$1 = -3 \times 2 + c$$

- 3 The gradient is $\frac{1}{2}$ and the line goes through (-4, 1).
Substitute into $y = mx + c$.

$$1 = \frac{1}{2} \times (-4) + c$$

Check: The point is (x , y): the first number is multiplied by the gradient, the second stands on its own.

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Fix it 4 Find c

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Work out the gradient $\times$ the x value first (BIDMAS). Then c is the y value take away that answer.

EXAMPLE

$11 = 2 \times 3 + c$. Find c .

1. 2×3 first: $11 = 6 + c$
2. 6 add what makes 11?
3. $c = 11 - 6 = 5$

YOUR TURN

- 1 $8 = 5 \times 3 + c$. Find c .

$$c = -7$$

- 2 $1 = -4 \times 2 + c$. Find c .

$$c = 9$$

- 3 $-1 = \frac{1}{2} \times 6 + c$. Find c .

$$c = -4$$

Check: Substitute your c back in. Both sides come to the same number.

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Fix it 5 Write the equation

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Substitute m and c into $y = mx + c$. A gradient of 1 is just x . A negative c is written -4 , not $+ -4$. If $c = 0$ there is nothing on the end.

EXAMPLE

The gradient is -2 and $c = 9$.
Write the equation of the line.

1. Substitute $m = -2$ and $c = 9$ into $y = mx + c$.
2. $y = -2x + 9$

YOUR TURN

- 1 The gradient is 3 and $c = -4$. Write the equation of the line.

$$y = 3x - 4$$

- 2 The gradient is 1 and $c = -6$. Write the equation of the line.

$$y = x - 6$$

- 3 The gradient is -1 and $c = 0$. Write the equation of the line.

$$y = -x$$

Check: Read the gradient and where it crosses the y axis off your equation. They match m and c .

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Fix it 6 Check with the other point

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Substitute the x value of the other point into your equation. You get its y value. If not, look back for the slip.

EXAMPLE

Is $y = 3x - 1$ the line through $(2, 5)$ and $(4, 11)$?

1. $(2, 5)$ was used to find c , so check $(4, 11)$.
2. $x = 4: 3 \times 4 - 1 = 11 \checkmark$
3. It works: yes.

YOUR TURN

- 1 Is $y = 2x + 3$ the line through $(1, 5)$ and $(4, 11)$? Check with $(4, 11)$.

$$\text{Yes: } x = 4 \text{ gives } 11$$

- 2 Sam says the line through $(2, 3)$ and $(6, 5)$ is $y = 2x - 1$. He found c with $(2, 3)$. Is Sam right?

$$\text{No: } x = 6 \text{ gives } 11, \text{ not } 5$$

- 3 Is $y = -4x + 5$ the line through $(-1, 9)$ and $(3, -7)$? Check with $(3, -7)$.

$$\text{Yes: } x = 3 \text{ gives } -7$$

Check: Use the point you did not use for c . The one you used always works, so it cannot show a slip.

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