Equation of a straight line

> **A LEVEL LINKS**
> **Scheme of work:** 2a. Straight-line graphs, parallel/perpendicular, length and area problems

Key points

- A straight line has the equation $y = mx + c$, where m is the gradient and c is the y-intercept (where $x = 0$).
- The equation of a straight line can be written in the form $ax + by + c = 0$, where a, b and c are integers.
- When given the coordinates (x_1, y_1) and (x_2, y_2) of two points on a line the gradient is calculated using the formula $m = \dfrac{y_2 - y_1}{x_2 - x_1}$
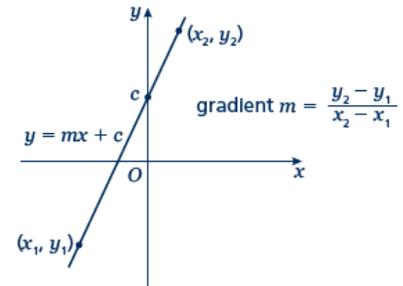
Example 4 Find the equation of the line passing through the points with coordinates (2, 4) and (8, 7).

$x_1 = 2$, $x_2 = 8$, $y_1 = 4$ and $y_2 = 7$ $m = \dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{7-4}{8-2} = \dfrac{3}{6} = \dfrac{1}{2}$ $y = \dfrac{1}{2}x + c$ $4 = \dfrac{1}{2} \times 2 + c$ $c = 3$ $y = \dfrac{1}{2}x + 3$	**1** Substitute the coordinates into the equation $m = \dfrac{y_2 - y_1}{x_2 - x_1}$ to work out the gradient of the line. **2** Substitute the gradient into the equation of a straight line $y = mx + c$. **3** Substitute the coordinates of either point into the equation. **4** Simplify and solve the equation. **5** Substitute $c = 3$ into the equation $y = \dfrac{1}{2}x + c$

Practice questions

1 Write an equation for the line passing through each of the following pairs of points.

    a   (4, 5), (10, 17)   **b**   (0, 6), (–4, 8)

    c   (–1, –7), (5, 23)   **d**   (3, 10), (4, 7)

Answers

1 **a** $y = 2x - 3$ **b** $y = -\dfrac{1}{2}x + 6$

    c $y = 5x - 2$ **d** $y = -3x + 19$