



- 1 A straight line passes through the points (0, -3) and (2, 5).

Find the equation of the line.

Give your answer in the form $y = mx + c$

(3 marks)

$$\text{Gradient} = \text{change in } y \text{ divided by change in } x = \frac{5 - (-3)}{2 - 0} = 8 \div$$

$$2 = 4$$

The line crosses the y-axis at (0, -3), so $c = -3$

The equation is $y = 4x - 3$. Check with (2, 5): $4 \times 2 - 3 = 5$, correct

$$y = 4x - 3$$

- 2 A straight line passes through the points (1, 7) and (3, 13).

Find the equation of the line.

Give your answer in the form $y = mx + c$

(3 marks)

$$\text{Gradient} = \frac{13 - 7}{3 - 1} = 6 \div 2 = 3$$

Substitute (1, 7) into $y = 3x + c$: $7 = 3 + c$, so $c = 4$

The equation is $y = 3x + 4$. Check with (3, 13): $3 \times 3 + 4 = 13$, correct

$$y = 3x + 4$$

- 3 A straight line has gradient -2 and passes through the point (3, 1).

Find the equation of the line.

(3 marks)

The equation has the form $y = -2x + c$

Substitute (3, 1)

$$1 = -2 \times 3 + c, \text{ so } 1 = -6 + c \text{ and } c = 7$$

The equation is $y = -2x + 7$

$$y = -2x + 7$$

- 4 A straight line passes through the points A (2, 5) and B (6, 17).

Work out the gradient of the line.

(2 marks)

$$\begin{aligned}\text{Gradient} &= \text{change in } y \text{ divided by change in } x \\ \text{Change in } y &= 17 - 5 = 12. \text{ Change in } x = 6 - 2 = 4 \\ \text{Gradient} &= 12 \div 4 = 3\end{aligned}$$

3

- 5 A straight line passes through the points (-2, 1) and (2, 9).

Find the equation of the line.

Give your answer in the form $y = mx + c$

(3 marks)

$$\text{Gradient} = \frac{9 - 1}{2 - (-2)} = 8 \div 4 = 2$$

Substitute (2, 9) into $y = 2x + c$: $9 = 4 + c$, so $c = 5$

The equation is $y = 2x + 5$. Check with (-2, 1): $2 \times (-2) + 5 = 1$, correct

$$y = 2x + 5$$

- 6 A straight line passes through the points P (-3, 4) and Q (5, -8).

Work out the gradient of the line.

(2 marks)

$$\begin{aligned}\text{Gradient} &= \text{change in } y \text{ divided by change in } x \\ \text{Change in } y &= -8 - 4 = -12. \text{ Change in } x = 5 - (-3) = 8 \\ \text{Gradient} &= -12 \div 8 = -\frac{3}{2} = -1.5\end{aligned}$$

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

- 7 A straight line passes through the points (4, -1) and (6, -7).

Find the equation of the line.

(3 marks)

$$\text{Gradient} = \frac{-7 - (-1)}{6 - 4} = -6 \div 2 = -3$$

Substitute (4, -1) into $y = -3x + c$: $-1 = -12 + c$, so $c = 11$

The equation is $y = -3x + 11$. Check with (6, -7): $-3 \times 6 + 11 = -7$, correct

$$y = -3x + 11$$

8

A straight line passes through the points (2, 1) and (6, 4).

Find the equation of the line.

Give your answer in the form $y = mx + c$.

(3 marks)

$$m = \{4 - 1\} / \{6 - 2\} = \frac{3}{4}$$

$$y = \frac{3}{4}x + c$$

Substitute (2, 1)

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

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

$$c = -\frac{1}{2}$$

$$y = \frac{3}{4}x - \frac{1}{2}$$

9

A straight line passes through the points (-3, 5) and (3, 1).

Find the equation of the line.

(3 marks)

$$m = \{1 - 5\} / \{3 - (-3)\} = \frac{-4}{6} = -\frac{2}{3}$$

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

Substitute (3, 1)

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

$$1 = -2 + c$$

$$c = 3$$

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

10

A straight line passes through the points $(-2, -1)$ and $(4, 8)$.

- Find the equation of the line.
- Show that the point $(8, 14)$ lies on the line.

(4 marks)

a)

$$m = \{8 - (-1)\} / \{4 - (-2)\} = \frac{9}{6} = \frac{3}{2}$$

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

Substitute $(4, 8)$

$$8 = \frac{3}{2} \times 4 + c$$

$$8 = 6 + c$$

$$c = 2$$

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

b)

put $x = 8$ into the equation

$$y = \frac{3}{2} \times 8 + 2$$

$$y = 12 + 2 = 14$$

$(8, 14)$ is on the line

11

A straight line passes through A(-4, 3) and B(6, -2).

a. Find the equation of the line.

b. Find the coordinates of the point where the line crosses the x-axis.

(4 marks)

a)

$$m = \{-2 - 3\} / \{6 - (-4)\} = \frac{-5}{10} = -\frac{1}{2}$$

$$y = -\frac{1}{2}x + c$$

Substitute (6, -2)

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

$$-2 = -3 + c$$

$$c = 1$$

$$y = -\frac{1}{2}x + 1$$

b)

on the x-axis, $y = 0$

$$0 = -\frac{1}{2}x + 1$$

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

$$x = 2$$

$$(2, 0)$$

12

A mobile phone company charges £ C for d GB of data a month. The cost is a straight line graph. The cost for 5 GB is £14 and the cost for 20 GB is £35.

- Find a formula for C in terms of d .
- What does the gradient of the line represent?

(4 marks)

a)

$$m = \{35 - 14\} / \{20 - 5\} = \frac{21}{15} = 1.4$$

$$C = 1.4d + c$$

Substitute (5, 14)

$$14 = 1.4 \times 5 + c$$

$$14 = 7 + c$$

$$c = 7$$

$$C = 1.4d + 7$$

b)

$$\text{£1.40 for each extra GB}$$

13

A is the point (2, 3) and B is the point (6, 11).

M is the midpoint of AB.

Find the equation of the straight line with gradient $\frac{1}{2}$ that passes through M.

(4 marks)

$$\text{The midpoint of AB is } \left(\frac{2+6}{2}, \frac{3+11}{2} \right) = (4, 7)$$

$$\text{The line has the form } y = \frac{x}{2} + c$$

Substitute (4, 7)

$$7 = 2 + c, \text{ so } c = 5$$

$$\text{The equation is } y = \frac{x}{2} + 5$$

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

14

A is the point (1, 2) and B is the point (9, 18).

The point P lies on AB so that $AP : PB = 3 : 1$

Show that P lies on the straight line with equation $y = 2x$

(5 marks)

AP

$AP : PB = 3 : 1$ means P is $\frac{3}{4}$ of the way from A to B

Change in x from A to B is $9 - 1 = 8$, so the x -coordinate of P is $1 + \frac{3}{4} \times 8 = 7$

Change in y from A to B is $18 - 2 = 16$, so the y -coordinate of P is $2 + \frac{3}{4} \times 16 = 14$

P is (7, 14). Substituting $x = 7$ into $y = 2x$ gives $y = 14$, so P lies on the line $y = 2x$