



1

A straight line has equation $y = 3x - 2$

- Write down the gradient of the line.
- Write down the coordinates of the point where the line crosses the y -axis.

(2 marks)

In $y = mx + c$, m is the change in y for a 1-unit increase in x , called the gradient. c is the value of y when $x = 0$, called the y -intercept

The equation is in the form $y = mx + c$

a) The gradient is the coefficient of x , which is 3

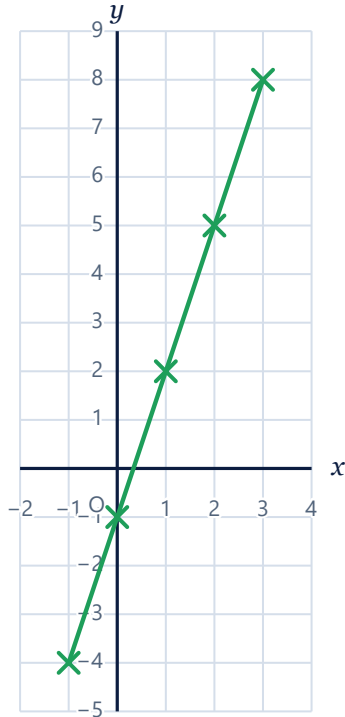
b) The line crosses the y -axis where $x = 0$, so at $(0, -2)$

2

Here is a table of values for $y = 3x - 1$

x	-1	0	1	2	3
y		-1			8

a. Complete the table.

b. On the grid, draw the graph of $y = 3x - 1$ for values of x from -1 to 3

(4 marks)

a)

$$x = -1: y = 3 \times (-1) - 1 = -4$$

$$x = 1: y = 3 \times 1 - 1 = 2$$

$$x = 2: y = 3 \times 2 - 1 = 5$$



b)

plot $(-1, -4)$, $(0, -1)$, $(1, 2)$, $(2, 5)$, $(3, 8)$

join with a ruler

straight line from $(-1, -4)$ to $(3, 8)$

3

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

Work out the gradient of the line.

(2 marks)

Gradient = change in y divided by change in x

Change in y = $17 - 5 = 12$. Change in x = $6 - 2 = 4$

Gradient = $12 \div 4 = 3$

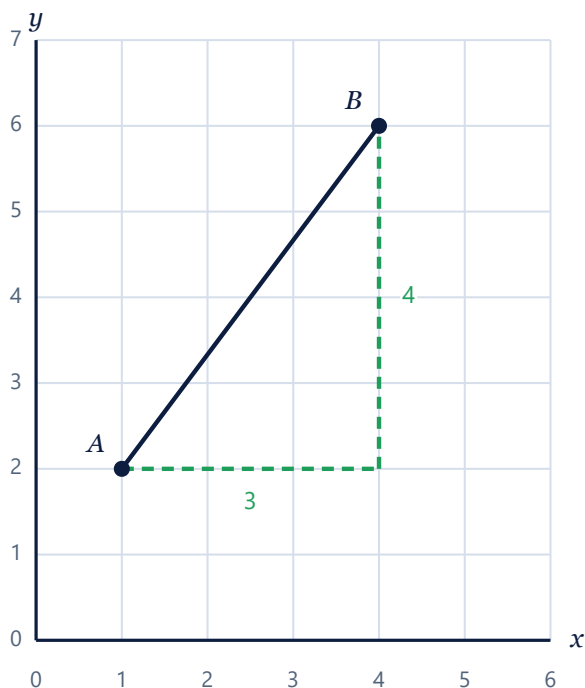
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4

The line segment AB is drawn on the grid. A is the point (1, 2) and B is the point (4, 6).

a. Work out the gradient of AB.

b. Work out the length of AB.



(4 marks)

a)

across 3, up 4

gradient = $\frac{\text{up}}{\text{across}}$

$$\text{gradient} = \frac{4}{3}$$

$$\boxed{\frac{4}{3}}$$

b) right-angled triangle, Pythagoras

$$AB^2 = 3^2 + 4^2$$

$$AB^2 = 9 + 16$$

$$AB^2 = 25$$

$$AB = \sqrt{25}$$

$$AB = 5$$

$\boxed{5 \text{ units}}$

5

- a. P is the point $(-2, 5)$ and Q is the point $(6, -1)$. Find the coordinates of the midpoint of PQ.
 b. M $(3, 4)$ is the midpoint of the line segment AB. A is the point $(1, -2)$. Find the coordinates of B.

(4 marks)

a) add and halve each coordinate

$$x = (-2 + 6) \div 2 = 2$$

$$y = (5 + -1) \div 2 = 2$$

$$(2, 2)$$

b) A to M:

x: 1 to 3, up 2

y: -2 to 4, up 6

M to B is the same step

$$x = 3 + 2 = 5$$

$$y = 4 + 6 = 10$$

$$B(5, 10)$$

6

Here are the equations of two straight lines.

Line P: $y = 4x - 3$ Line Q: $y = 2x + 5$

- a. Which line is steeper? Give a reason.
 b. Which line crosses the y-axis at the higher point? Give a reason.
 c. The two lines cross at one point. Work out the coordinates of this point.

(4 marks)

a) gradients: P is 4, Q is 2

$$P, \text{ as } 4 > 2$$

b) y-intercepts: P is -3, Q is 5

$$Q, \text{ as } 5 > -3$$

c) same y value where they cross

$$4x - 3 = 2x + 5$$

$$2x - 3 = 5$$

$$+3 \quad 2x = 8 \quad +3$$

$$\div 2 \quad x = 4 \quad \div 2$$

$$y = 2 \times 4 + 5$$

$$y = 13$$

$$(4, 13)$$

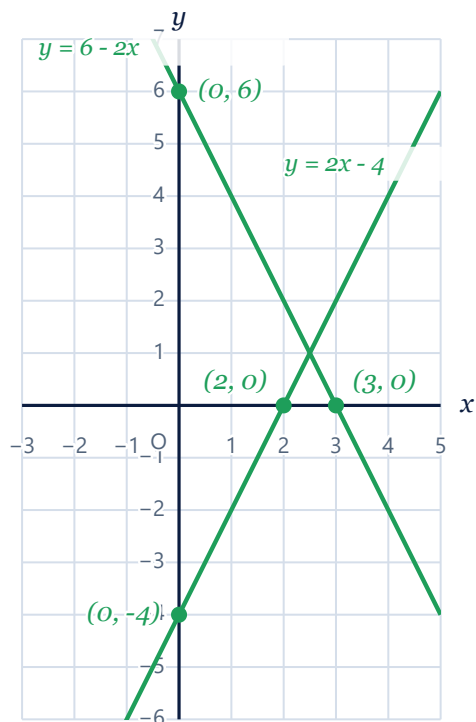
7

On the axes, sketch the graphs of

a. $y = 2x - 4$

b. $y = 6 - 2x$

Mark the coordinates of the points where each line crosses the axes.



(4 marks)

a) $x = 0$

$y = -$

$y = 0$

$$\begin{array}{rcl}
 2x - 4 & = & 0 \\
 +4 & & +4 \\
 \hline
 2x & = & 4 \\
 \div 2 & & \div 2 \\
 \hline
 x & = & 2
 \end{array}$$

gradient 2, slopes up

through (0, -4) and (2, 0)

b) $x = 0$

$y = 6$

$y = 0$

$$\begin{array}{rcl}
 6 - 2x & = & 0 \\
 +2x & & +2x \\
 \hline
 6 & = & 2x \\
 \div 2 & & \div 2 \\
 \hline
 3 & = & x
 \end{array}$$

gradient -2, slopes down

through (0, 6) and (3, 0)

8

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)

$$1 =$$

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

$$y = -2x + 7$$

9

The straight line L has equation $y = 5x - 3$

a. Write down the gradient of L.

b. Find the equation of the straight line that is parallel to L and passes through the point (2, 11).

(4 marks)

The gradient of L is the coefficient of x , which is 5

Parallel lines have equal gradients, so the new line has the

form $y = 5x + c$

Substitute (2, 11)

$$11 = 10 + c, \text{ so } c = 1$$

The equation is $y = 5x + 1$

10

Find the equation of the straight line that is perpendicular to $y = 2x - 3$ and passes through the point (4, 1).

(3 marks)

The gradient of $y = 2x - 3$ is 2, so the perpendicular gradient is $-\frac{1}{2}$, since $2 \times (-\frac{1}{2}) = -1$

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

Substitute (4, 1)

$$1 =$$

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

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

EXTENSION QUESTIONS

11

Write each equation in the form $y = mx + c$. Then write down the gradient of the line.

a. $3x + 2y = 12$

b. $4y - 8x = 20$

(4 marks)

a)

$$\begin{array}{rcl} 3x + 2y & = & 12 \\ - & & - \\ 2y & = & \\ \div 2 & & \div 2 \\ y & = & \end{array}$$

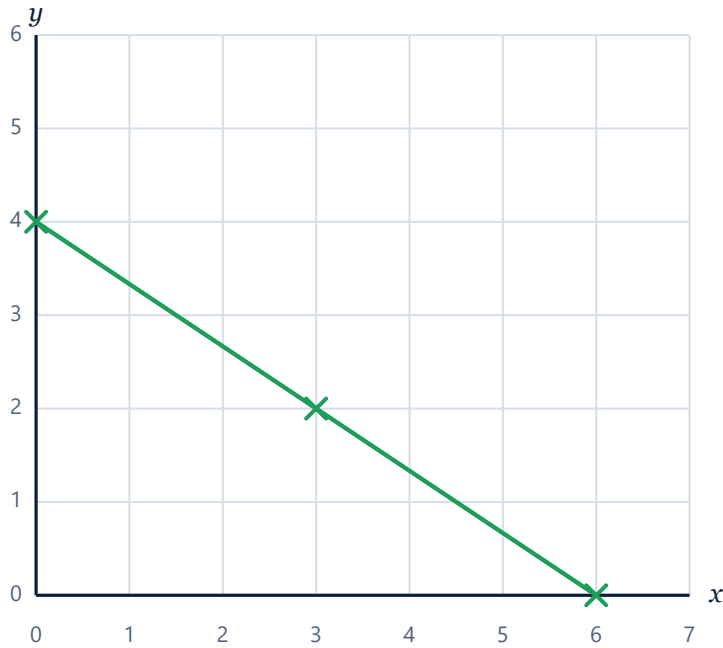
$$y = -1.5x + 6, \text{ gradient } -1.5$$

b)

$$\begin{array}{rcl} 4y - 8x & = & 20 \\ +8x & & +8x \\ 4y & = & 8x + 20 \\ \div 4 & & \div 4 \\ y & = & 2x + 5 \end{array}$$

$$y = 2x + 5, \text{ gradient } 2$$

12

On the grid, draw the graph of $2x + 3y = 12$ for values of x from 0 to 6

(3 marks)

$$x = 0$$

$$\begin{array}{rcl} 3y & = & 12 \\ \div 3 & & \div 3 \\ y & = & 4 \end{array}$$

$$y = 0$$

$$\begin{array}{rcl} 2x & = & 12 \\ \div 2 & & \div 2 \\ x & = & 6 \end{array}$$

$$\text{check } x = 3$$

$$\begin{array}{rcl} 6 + 3y & = & 12 \\ - & & - \\ & 3y & = & 6 \\ \div 3 & & \div 3 \\ & y & = & 2 \end{array}$$

plot (0, 4), (3, 2), (6, 0) and join

Line from (0, 4) to (6, 0)

13

The straight line L has equation $3x + 4y = 8$

Find the equation of the straight line that is parallel to L and passes through the point (8, 1).

(4 marks)

Rearrange $3x + 4y = 8$: $4y = -3x + 8$, so $y = -\frac{3x}{4} + 2$. Thegradient of L is $-\frac{3}{4}$

Parallel lines have equal gradients, so the new line has the

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

Substitute (8, 1)

$$1 =$$

The equation is $y = -\frac{3x}{4} + 7$

$$y = -\frac{3x}{4} + 7$$