Linear and quadratic graphs

Worked solutions

KS3 Maths topic practice

This topic online

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1 Four straight lines A, B, C and D are drawn on the grid.

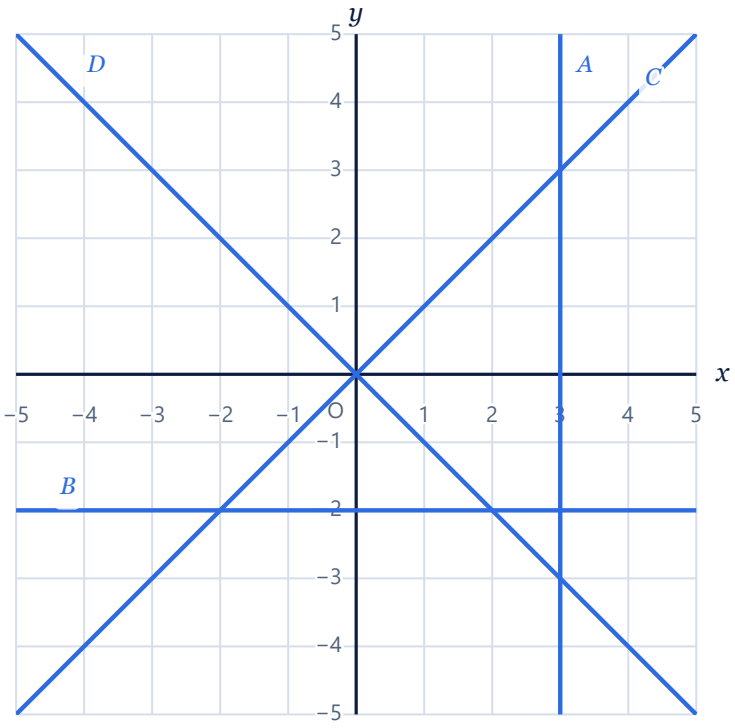
Write down the equation of

a. line A

b. line B

c. line C

d. line D



(4 marks)

a)

vertical line: every point has $x = 3$

$x = 3$

b)

horizontal line: every point has $y = -2$

$y = -2$

c)

$(1, 1), (2, 2), (3, 3)$: y is the same as x

$y = x$

d)

$(1, -1), (2, -2), (-3, 3)$: y is minus x

$y = -x$

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

a. Write down the gradient of the line.

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

(2 marks)

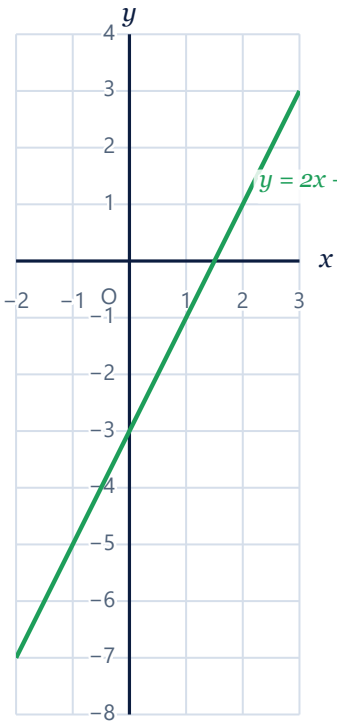
In $y = mx + c$, m is the change in y for a 1-unit increase in x, called the gradient. c is the value of y when $x = 0$, called the y-intercept

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 $(0, -2)$

3 On the grid, draw the graph of $y = 2x - 3$ for values of x from -2 to 3



(3 marks)

Make a table of values

x					

Plot the points and join them with a single straight line with a ruler

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4 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 ÷ 4 = 3

3

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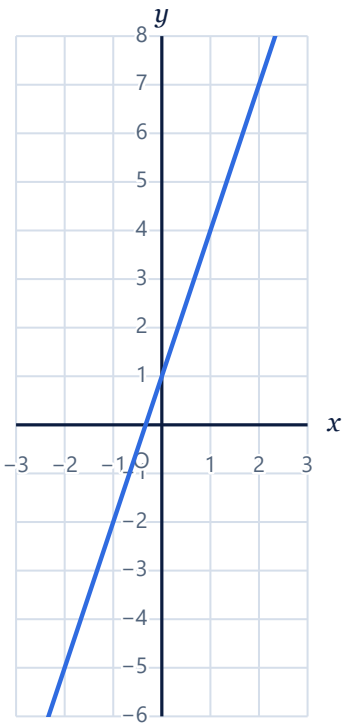
5 A straight line is drawn on the grid.

a. Write down the y intercept of the line.

b. Work out the gradient of the line.

c. Write down the equation of the line in the form $y = mx + c$



(3 marks)

a)

crosses the y-axis at (0, 1)

1

b)

use (0, 1) and (2, 7)

up 6, across 2

gradient $= \frac{6}{2} = 3$

3

c)

$m = 3$, $c = 1$

$y = 3x + 1$

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6 The straight line $y = 4x + c$ passes through the point (3, 10).

a. Find the value of c.

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

(3 marks)

a) Substitute $x = 3$ and $y = 10$: $10 = 4(3) + c$

$10 = 12 + c$, so $c = -2$

b) The y-intercept is c, so the line crosses the y-axis at (0, -2)

7 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 $y = -2x + 7$

$\boxed{y = -2x + 7}$

8 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

$\boxed{y = 3x + 4}$

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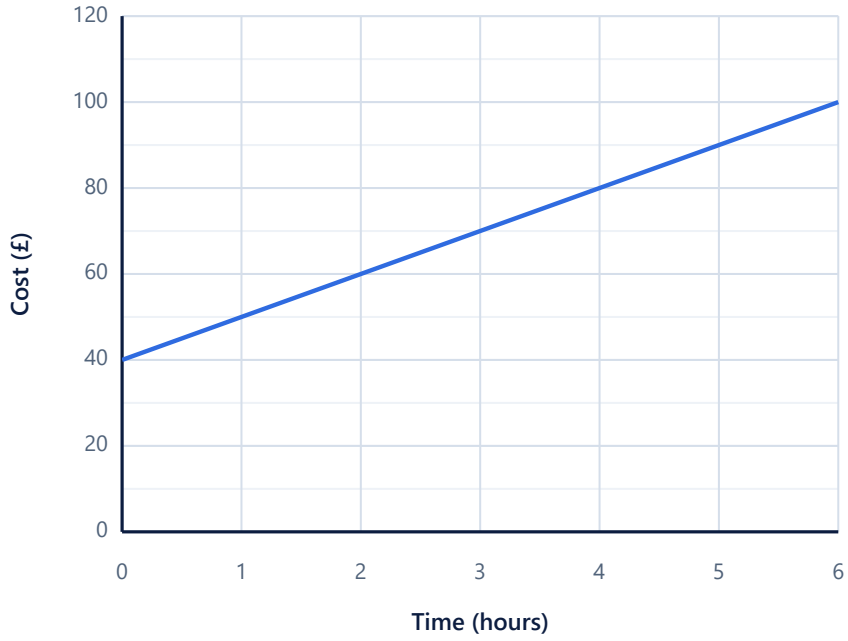
9 The graph shows the cost of hiring a bouncy castle for a party.

a. Write down the y intercept of the graph. What does it tell you about the cost?

b. Work out the gradient of the line. What does it tell you about the cost?

c. Amara hires the bouncy castle for 4 hours. Work out the cost.



(4 marks)

a)

Line meets the cost axis at 40

40: a fixed charge of £40

b)

use (0, 40) and (6, 100)

$$\text{gradient} = \frac{100 - 40}{6}$$

$$= \frac{60}{6} = 10$$

10: £10 for each hour

c)

$$\text{cost} = 40 + 10 \times 4$$

$$= 40 + 40$$

£80

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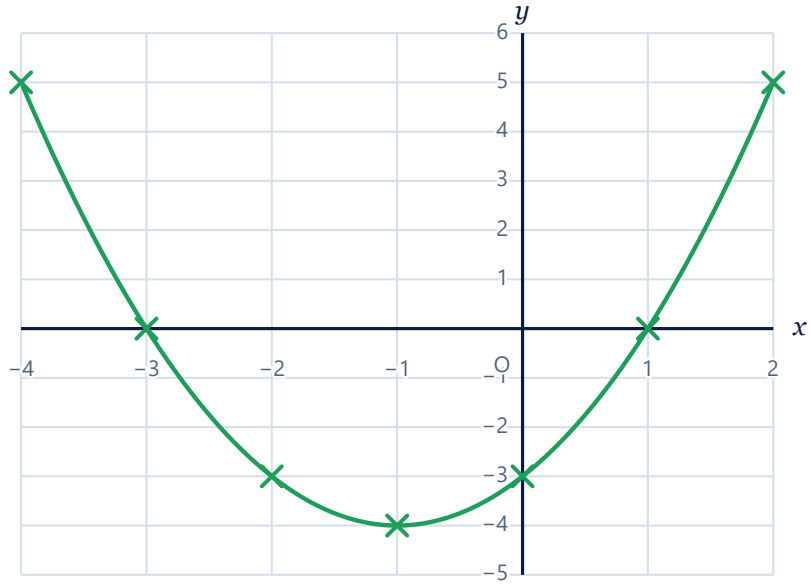
10

a. Complete the table of values for $y = x^2 + 2x - 3$

x	−4	−3	−2	−1	0	1	2
y	5		−3		−3		5

b. On the grid, draw the graph of $y = x^2 + 2x - 3$ for values of x from −4 to 2



(4 marks)

a)

square first, then the rest

$x = -3$: $(-3)^2 + 2 \times (-3) - 3 = 9 - 6 - 3 = 0$

$x = -1$: $(-1)^2 + 2 \times (-1) - 3 = 1 - 2 - 3 = -4$

$x = 1$: $1^2 + 2 \times 1 - 3 = 1 + 2 - 3 = 0$

0, −4, 0

b)

plot the 7 points from the table

join with a smooth curve, not a ruler

U-shaped curve, lowest point (−1, −4)

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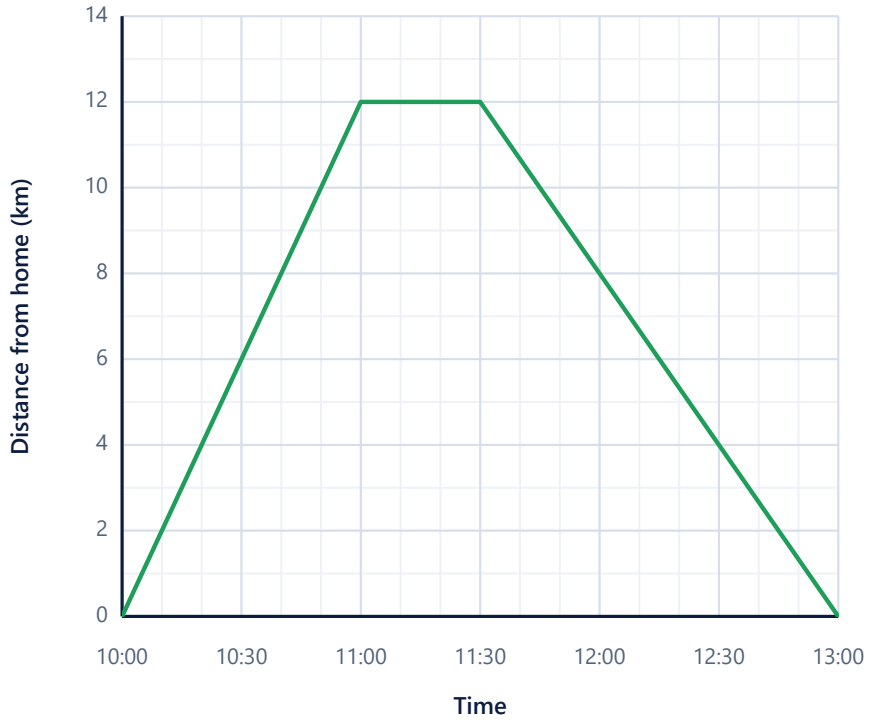
11 Kofi leaves home at 10:00 and cycles to the lake at a steady speed.
He arrives at the lake at 11:00. The lake is 12 km from his home.
He stays at the lake for 30 minutes.
He then cycles straight home at a steady speed and arrives home at 13:00.

a. On the grid, draw a distance-time graph for Kofi's journey.

b. Work out Kofi's speed on the way home, in kilometres per hour.



(4 marks)

a)

10:00 at 0 km to 11:00 at 12 km

flat line at 12 km from 11:00 to 11:30

11:30 at 12 km down to 13:00 at 0 km

graph drawn as above

b)

11:30 to 13:00 = 1.5 hours

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

$$= \frac{12}{1.5}$$

$$= 8$$

8 km/h

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12 A straight line passes through the points A (−1, 7) and B (3, −1).

a. Work out the gradient of the line.

b. Find the equation of the line. Give your answer in the form $y = mx + c$

c. Does the point (6, −7) lie on the line? You must show how you get your answer.

(4 marks)

a)

gradient = {−7/3 − (−1)}

= {−/4}

= −

[−]

b)

y = −2x + c, put in (3, −1)

−

−

+6 5 c +6

[y = −2x + 5]

c)

y =

y =

[Yes, it gives y = −7]