

Graphs and direct proportion

Year 7 About 70 minutes Calculator allowed 47 marks



Hints online, answers free with an account:
mathswariz.uk/worksheets/ks3-year-7-graphs-and-direct-proportion/

Date _____

A Do Now

Quick questions to start.

- A1** Needed today [1 mark] **A2** Needed today [1 mark]
 $y = 3x$. Work out y when $x = 2.5$. Solve $6x = 15$.

Answer

Answer

- A3** Last lesson [1 mark] **A4** From chapter 7 [1 mark]
 5 pens cost £3.60. Work out the cost of 8 pens. Write down the gradient of the line $y = 4x - 3$.

Answer

Answer

B Example, then your turn

Year 7

Your teacher works through each example with you. Then try the one beside it.

EXAMPLE 1

Fabric is sold by the metre. 4 m of fabric cost £9.20. Find a formula for the cost, y pence, of x metres of the fabric.

Hint The formula is $y = mx$. Put the cost in pence: $x = 4$ and $y = 920$.

- B1** 2.5 kg of apples cost £4.50. [3 marks]

The cost, y pence, of x kg of apples is in direct proportion to the mass. Find a formula for y in terms of x . Use it to work out the cost of 7 kg of apples, in pounds.

Answer $y = \dots\dots$ £ $\dots\dots$

EXAMPLE 2

x US dollars are worth y pounds, and 50 US dollars are worth £40. Write a formula for y in terms of x . Use it to change 335 US dollars into pounds and £148 into US dollars.

Hint $m = 40 \div 50$. For the second change, divide by m .

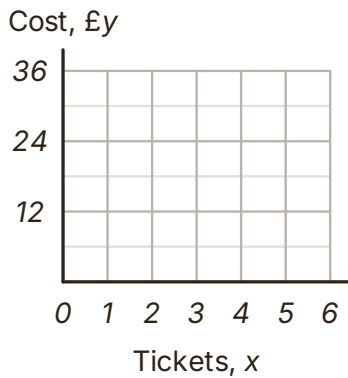
- B2** 5 kg is the same as 11 pounds [4 marks]

(lb). A mass of x kg is y lb. Write a formula for y in terms of x . Use it to change 64 kg into lb and 99 lb into kg.

Answer $y = \dots\dots$ $\dots\dots$ lb $\dots\dots$ kg

EXAMPLE 3

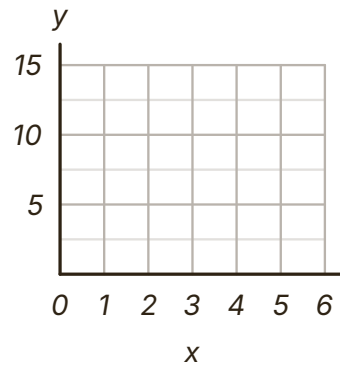
Theatre tickets cost £6 each. The cost, £ y , of x tickets is $y = 6x$. Work out y when $x = 0, 2, 4$ and 6 . Plot the points on the grid and join them.



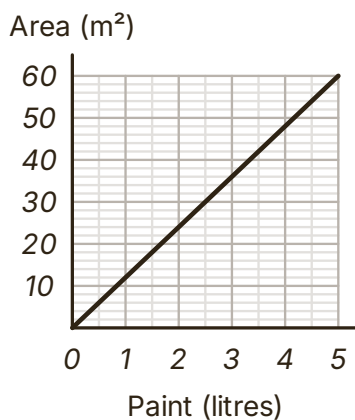
Hint Multiply each number of tickets by 6. The points should lie on a straight line through the origin.

B3 $y = 2.5x$. Work out y when $x = 0, 2, 4$ and 6 . Plot the points on the grid and join them with a straight line.

[3 marks]

**EXAMPLE 4**

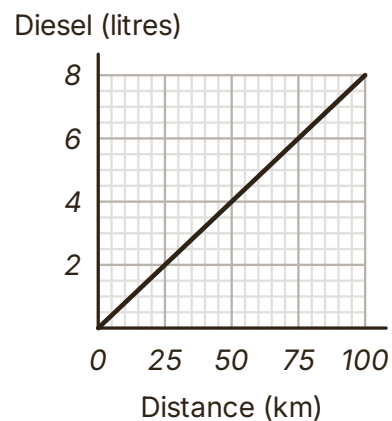
The graph shows the area a tin of paint covers. Use the graph to find the area covered by 3 litres, and the paint needed for 42 m^2 . Write a formula for the area, $y \text{ m}^2$, covered by x litres.



Hint Go up from 3 on the bottom axis to the line, then across. For the formula, read one point: 5 litres cover 60 m^2 .

B4 The graph shows the diesel a van uses. Use the graph to find the diesel used for 75 km, and the distance travelled on 2 litres. Write a formula for the diesel, y litres, used for x km.

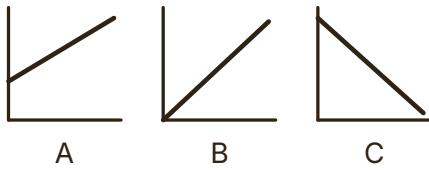
[3 marks]



Answer ... litres ... km $y = \dots$

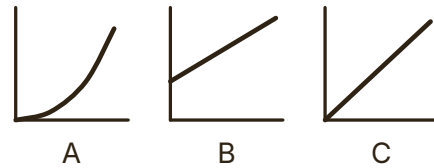
EXAMPLE 5

Which of these graphs shows that y is in direct proportion to x ? Give a reason.



Hint A direct proportion graph is a straight line that goes through the origin, $(0, 0)$.

B5 Which of these graphs shows that y is in direct proportion to x ? Give a reason why each of the other two does not. [3 marks]



Answer

c Practice

Year 7

C1 A 150 g pot of yoghurt contains 21 g of sugar. x g of the yoghurt contain y g of sugar. Show that $y = 0.14x$. [2 marks]

C2 $y = 1.25x$. Write a formula for x in terms of y . [2 marks]

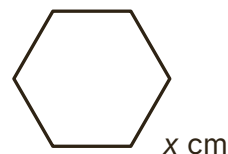
Answer $x = \dots\dots$

C3 Which of these formulas show that y is in direct proportion to x ? Write down the letters. [2 marks]

- A: $y = 4x$ B: $y = x + 4$
C: $y = 0.4x$ D: $y = 4x - 1$

Answer

C4 A regular hexagon has sides of x cm. Its perimeter is y cm. Write a formula for y in terms of x . Work out the side of a regular hexagon with a perimeter of 45 cm. [3 marks]



Answer $y = \dots\dots \dots$ cm

D1 You can use this graph to change between pounds (£) and euros (€).

- (a) Use the graph to change £40 into euros. [1 mark]

Answer €

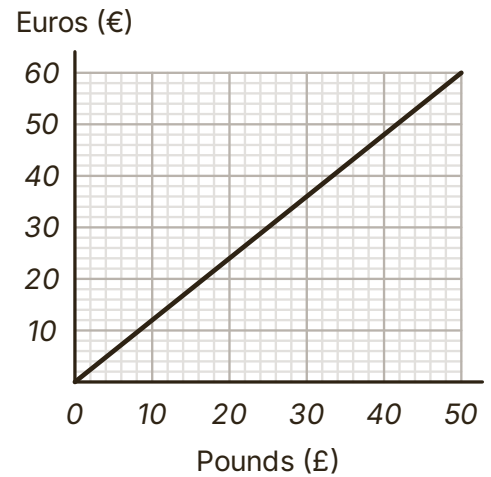
- (b) Use the graph to change €36 into pounds. [1 mark]

Answer £

- (c) Rhian changes £360 into euros. How many euros does she get? [2 marks]

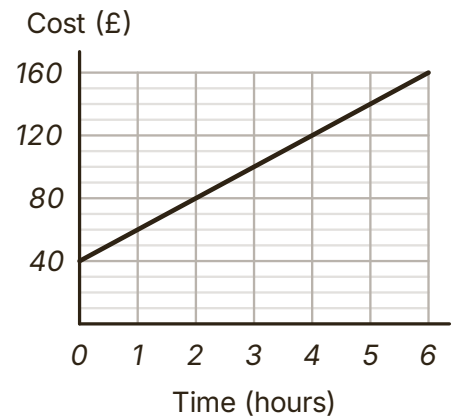
Answer €

Total for D1: 4 marks



- D2** Kai says, "The cost of hiring the hall is in direct proportion to the time, because the graph is a straight line." [2 marks]

The graph shows the cost of hiring a hall. Is Kai correct? Give a reason for your answer.



- D3** A machine fills bottles at a steady rate. In 8 minutes it fills 300 bottles. The number of bottles, y , is in direct proportion to the time, x minutes.

- (a) Write a formula for y in terms of x . [2 marks]

Answer $y = \dots\dots$

- (b) How long does the machine take to fill 1000 bottles? Give your answer in minutes and seconds. [2 marks]

Answer ... minutes ... seconds

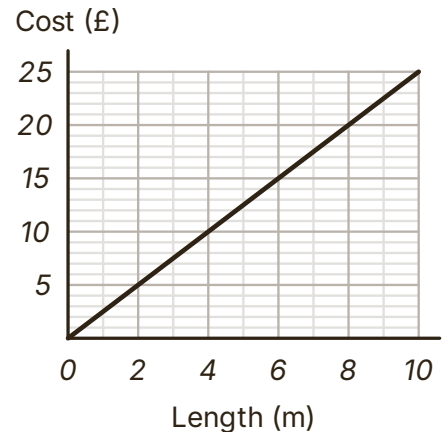
Total for D3: 4 marks

D4 Two shops sell the same rope. The graph shows the cost of rope at shop A. At shop B the cost, £ y , of x metres is $y = 2.35x$.

- (a) Use the graph to write a formula for the cost, £ y , of x metres of rope at shop A. [2 marks]

Answer $y = \dots\dots$

- (b) Jo needs 30 m of rope. Which shop is cheaper for 30 m, and by how much? You must show your working. [3 marks]



Answer shop ... by £

Total for D4: 5 marks

E Extension

Stretch

No route is given. The hints are at the end of the sheet. Use one at a time.

- E1** y is in direct proportion to x . The graph of y against x passes through the points $(6, a)$ and $(a, 24)$, where a is a positive number. Work out the value of a . [3 marks]

Answer $a = \dots\dots$

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** Write $y = mx$. Put each point into the formula.
Hint 2 $a = 6m$ and $24 = m \times a$, so $24 = m \times 6m = 6m^2$.
Hint 3 $m^2 = 4$, so $m = 2$ (the line goes up), and $a = 6 \times 2 = 12$. Check: $2 \times 12 = 24$.

How did it go?

Colour one circle on each line: not yet, nearly, yes.

I can find a formula $y = mx$ from one pair of values. ☐ ☐ ☐

I can draw and read a graph of direct proportion. ☐ ☐ ☐

I can tell a direct proportion graph: a straight line through the origin. ☐ ☐ ☐