



Inverse proportion

Year 7 About 70 minutes Calculator allowed 47 marks

Date _____

A Do Now

Quick questions to start.

- A1** Needed today [1 mark] **A2** Needed today [1 mark]
Work out 4.5×16 . Work out $90 \div 2.5$.

Answer Answer

- A3** Last lesson [1 mark] **A4** From chapter 12 [1 mark]
 y is in direct proportion to x .
 $y = 15$ when $x = 6$. Work out y when $x = 10$. Work out $12 \div \frac{3}{4}$.

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

A car journey is 180 km. The table shows the speed of the car and the time the journey takes. Complete the table. Show that the speed and the time are in inverse proportion.

Speed (km/h)	Time (hours)
30	?
45	?
60	?
90	?

Hint Time = distance $\div$ speed. Then multiply each speed by its time.

- B1** A tank holds 240 litres. A pump [3 marks] fills it at a steady rate, in litres a minute. Complete the table. Show that the rate and the time are in inverse proportion.

Rate	Time (min)
8	?
12	?
20	?
30	?

EXAMPLE 2

y is inversely proportional to x . When $x = 4$, $y = 9$. Write a formula connecting x and y .
Work out y when $x = 6$, and x when $y = 2.5$.

Hint Inverse proportion means $xy = k$. Find k from the pair you are given.

B2 y is inversely proportional to x . When $x = 8$, $y = 15$. Write a formula connecting x and y .
Work out y when $x = 12$, and x when $y = 48$. [4 marks]

Answer $xy = \dots$ $y = \dots$ $x = \dots$

EXAMPLE 3

6 builders take 10 days to build a wall. They all work at the same rate. How long would 4 builders take? How many builders are needed to build it in 5 days?

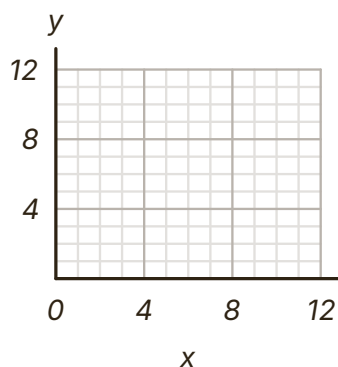
Hint Work out the total number of builder-days. Fewer builders take longer.

B3 8 pumps empty a pond in 9 hours. Each pump works at the same rate. How long would 6 pumps take? What is the smallest number of pumps that can empty the pond in 5 hours? [3 marks]

Answer ... hours ... pumps

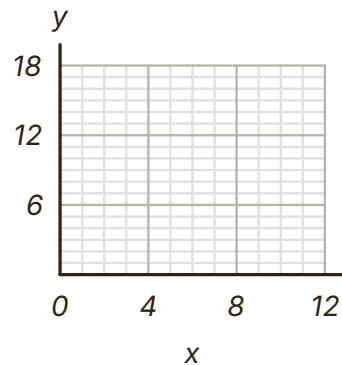
EXAMPLE 4

$xy = 24$. Work out y when $x = 2, 3, 4, 6, 8$ and 12 . Plot the points on the grid and join them with a smooth curve.



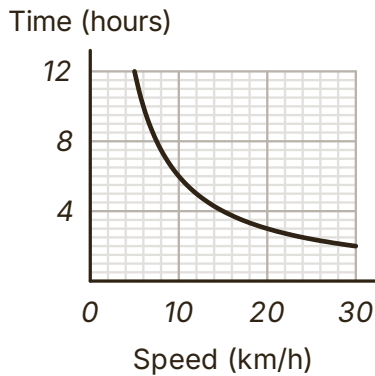
Hint $y = 24 \div x$. The points do not lie on a straight line, so draw a curve, not straight pieces.

B4 $xy = 36$. Work out y when $x = 2, 3, 4, 6, 9$ and 12 . Plot the points on the grid and join them with a smooth curve. [3 marks]

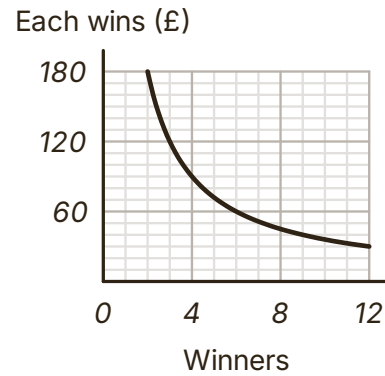


EXAMPLE 5

Ben rides 60 km. The graph shows the time, y hours, at a speed of x km/h. Find the time at 12 km/h and the speed for 2.5 hours. Write a formula connecting x and y . Find the time at 40 km/h.



Hint Go up from 12 to the curve, then across. For the formula, multiply the two numbers at any point on the curve.

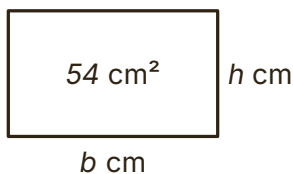
B5 A prize of £360 is shared equally by n winners. Each gets £ c . Use the graph to find c when there are 6 winners, and n when each gets £40. Write a formula connecting n and c . [3 marks]

Answer £ ... winners $nc = \dots$

c Practice

Year 7

- C1** A rectangle has an area of 54 cm². Its base is b cm and its height is h cm. Write a formula connecting b and h . Work out h when $b = 7.2$. [3 marks]



Not drawn accurately

- C2** Is y inversely proportional to x ? Give a reason. [2 marks]

x	y
2	20
4	10
5	8
8	6

Answer $bh = \dots$ $h = \dots$

- C3**
 $xy = 50$. Find the value of x when x and y are equal. Give your answer to 2 decimal places.

[2 marks]
- C4**
£600 is shared equally between n people. Each person gets £ p . How many people share the money when each gets £37.50?

[2 marks]

Answer
 $x = \dots\dots$

Answer
... people

D
Exam-style questions

GCSE Foundation

- D1**
5 people take 12 hours to pick the apples in an orchard. They all work at the same rate.
- (a)**
How long would 8 people take? Give your answer in hours and minutes.
- [2 marks]

Answer
... hours
... minutes

- (b)**
The farmer wants the apples picked in 4 hours. How many people does she need?
- [2 marks]

Answer
... people

Total for D1: 4 marks

- D2**

Mia says, "When $y = 20 - x$, y is inversely proportional to x , because y goes down as x goes up."

[2 marks]
- Is Mia correct? Give a reason for your answer.

- D3**
A coach for a school trip costs £780. The cost is shared equally between the pupils who go.
- (a)**
Complete the table.
- [2 marks]
- (b)**
Write a formula connecting the number of pupils, n , and the amount each pays, £ c .
- [1 mark]

Pupils	£ each
20	?
30	?
40	?
52	?

Answer
 $nc = \dots$

- (c) Each pupil can pay at most £18. What is the smallest number of pupils that must go? [2 marks]

Answer ... pupils

Total for D3: 5 marks

D4 A coach journey takes 3 hours at an average speed of 64 km/h.

- (a) How long would the journey take at an average speed of 48 km/h? [2 marks]

Answer ... hours

- (b) The coach must do the journey in 2 hours 30 minutes. What average speed must it travel at? [2 marks]

Answer ... km/h

Total for D4: 4 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 inversely proportional to x . When x goes up by 2, y goes down from 15 to 10. Find the value of k in the formula $xy = k$. [3 marks]

Answer $k = \dots\dots$

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** Call the first value of x just x . The second value is $x + 2$.
Hint 2 Both pairs give the same product: $15x = 10(x + 2)$.
Hint 3 $15x = 10x + 20$, so $5x = 20$ and $x = 4$. Then $k = 4 \times 15 = 60$. Check: $6 \times 10 = 60$.

How did it go?

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

- I can tell inverse proportion: the product xy stays the same. ☐ ☐ ☐
- I can find a formula $xy = k$ and use it both ways round. ☐ ☐ ☐
- I can draw and read a graph of inverse proportion. ☐ ☐ ☐