

Algebraic methods

- Solving problems of direct proportion using algebraic methods
- Relating a linear function or equation to a graph
- Relating algebraic solutions of linear equations to graphs

Keywords

You should know

explanation 1a

explanation 1b

explanation 1c

explanation 1d

- 1** Milk costs 80p per litre in a supermarket.
Calculate the cost of these.

- a** 6 litres **b** 10 litres
c 20 litres **d** 1.5 litres



- 2** CDs are on special offer and the cost of five of them is £24.95. Work out the cost of

- a** 2 CDs **b** 12 CDs
c 36 CDs **d** 100 CDs



- 3** Copy and complete the following table for the number of kilograms of sugar (x) and the cost (y).

x	1	2	3		5	
y	0.5	1		2		3

- a** Complete this sentence.

This table represents the function $x \rightarrow \square$

- b** Write an equation for the function y in terms of x .
c Show this function on a mapping diagram and as a graph.

4 The members of the Racing Racquets Tennis Club drink orange juice at a rate of 4.6 litres per half hour.

- a** How much will they drink during a session that lasts 3 hours?
- b** At a tournament that lasts 7 hours, 8 clubs play.
Each club has the same number of players as Racing Racquets.
They drink orange juice at the same rate as the Racing Racquets Tennis Club.
How much orange juice will be drunk altogether?
- c** If only one-quarter of the members of the Racing Racquets club are present for one 3-hour practice, how much orange juice will they drink?



5 Curtain trimmings are sold by the metre.

- a** Red trimming costs £2.35 per metre.
Work out the cost of 7.5 metres of red trimming.
- b** Blue trimming costs £1.75 per metre.
How much does 12.3 metres of blue trimming cost?
- c** Petra pays £32.55 for some blue trimming. What length did she buy?

explanation 2a

explanation 2b

6 Are the variables in each table in direct proportion? Explain your answer.

a

x	1	2	3	4	5	6
y	7	14	21	28	35	42

b

x	1	4	5	8	10	15
y	2.5	10	12.5	20	25	37.5

c

x	5	10	15	20	25	30
y	0.625	1.2	1.875	2.5	3.125	3.75

7 At the airport, the rate of exchange is 2.06 Swiss francs to £1.

- a** Write an equation to show that the number of Swiss francs is directly proportional to the number of pounds.
- b** Copy and complete this table of values.

Pounds	1	2		10		60
Swiss francs	2.06		10.3		82.4	

- c** Convert 103 Swiss francs into pounds.
- d** What is the cost in pounds of a meal which comes to 52 Swiss francs?
- e** A suitcase costs £35. Find the equivalent price in Swiss francs.
- f** A millionaire has £1 million. What is this in Swiss francs?

8 Miles and kilometres are in direct proportion.

This equation shows the relationship between kilometres (k) and miles (m).

$$m = \frac{5}{8}k$$

- a** Copy and complete this table of values.

k	0	4	8	12	16	20
m	0					

- b** Plot a graph of m (on the vertical axis) against k (on the horizontal axis).
Use a scale of 1 to 20 on both axes.
Label your axes and write a title on the graph.
- c** From your graph, how many kilometres are equivalent to 4 miles?
Give your answer to the nearest kilometre.
- d** From your graph, how many miles are equivalent to 10 kilometres?
Give your answer to the nearest mile.

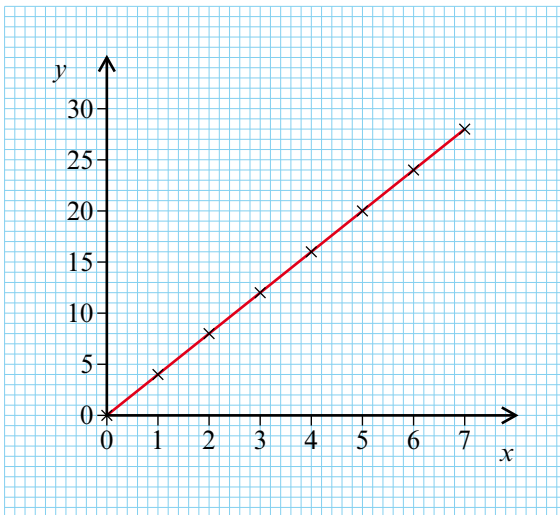
9 Which of these equations do *not* represent two variables that are in direct proportion to each other?

- a** $y = 45x$ **b** $s = 3.4t$ **c** $p = q + 3$ **d** $g = \frac{h}{5}$

explanation 3a

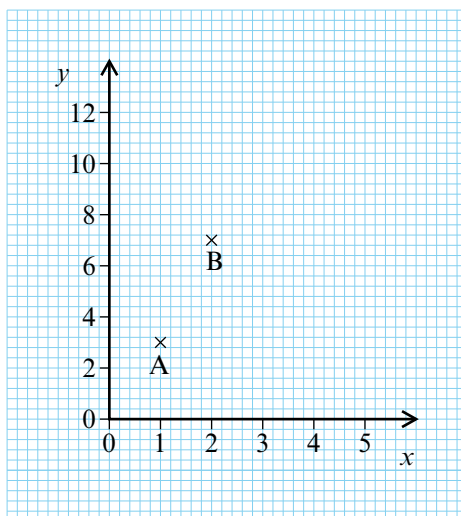
explanation 3b

10 This is the graph of a linear function.



- a** When the x -value increases by 1, what happens to the y -value?
- b** Write the linear equation for the function.

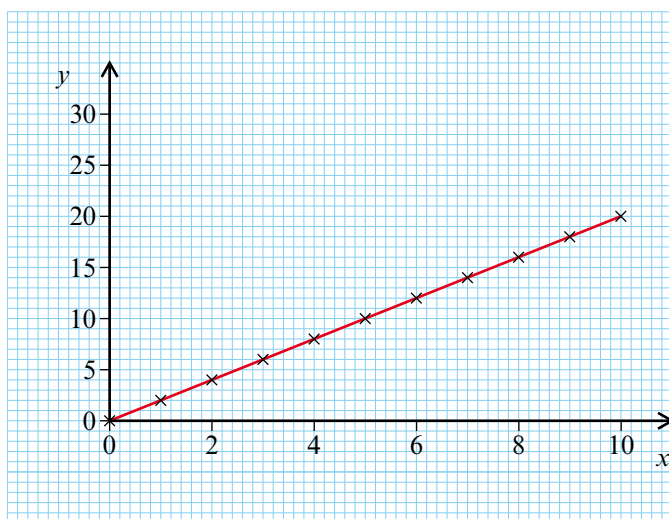
11 The points A and B belong to a linear function.



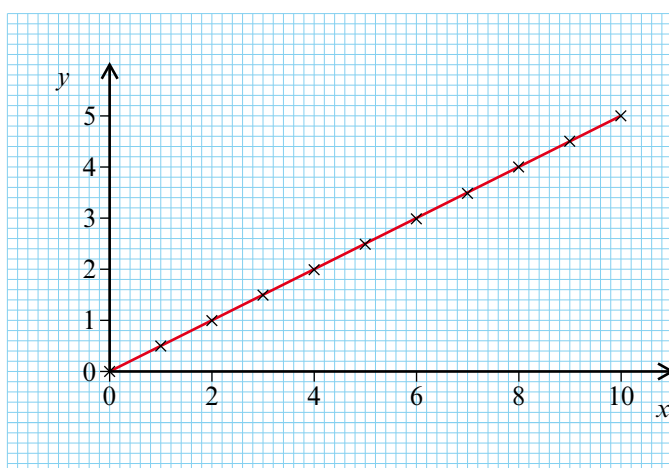
Find the values of m and n so that $(3, m)$ and $(n, 19)$ belong to the same function.

12 For each graph, write a linear equation for the function.

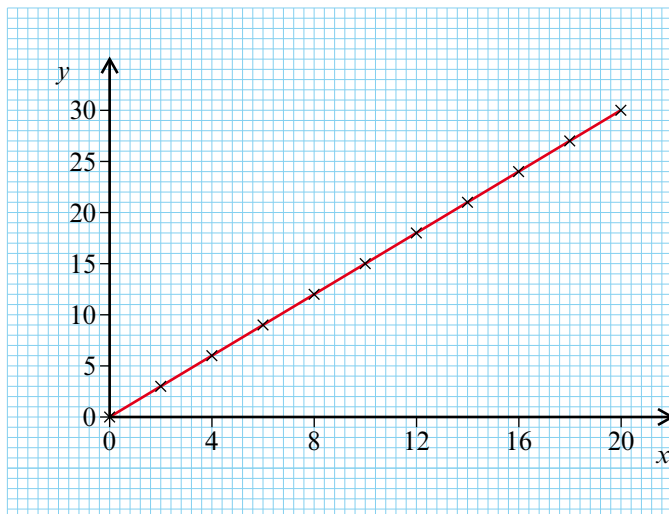
a



b



c



explanation 4

13 x and y are two variables.

y is directly proportional to x , and $y = 20$ when $x = 4$.

- a** Write y as a function of x .
- b** Calculate y when $x = 9$.
- c** Calculate y when $x = 3.4$.
- d** Calculate x when $y = 30$.
- e** Calculate x when $y = 12$.

14 p and q are two variables.

p is directly proportional to q , and $p = 5$ when $q = 10$.

- a** Write p as a function of q .
- b** Calculate p when $q = 16$.
- c** Calculate p when $q = 12.8$.
- d** Calculate q when $p = 14$.
- e** Calculate q when $p = 7.5$.

15 x and y are two variables.

y is directly proportional to x , and $y = 27$ when $x = 2.7$.

- a** Write y as a function of x .
- b** Calculate y when $x = 1.4$.
- c** Calculate x when $y = 25$.

Draw x - and y -axes using values of x from 0 to 3 and values of y from 0 to 30.
Draw a line through $(0, 0)$ and $(2.7, 27)$.

- d** What is the equation of the line you have drawn?
- e** Use your line to check your answers to parts **b** and **c**.