



Direct proportion

- Solving problems of direct proportion numerically
- Representing direct proportion relationships as equations and graphically
- Solving problems involving direct proportion

Keywords

You should know

explanation 1

- Five litres of fuel cost £4.90. Calculate the cost of these amounts.
a 6 litres **b** 10 litres **c** 20 litres **d** 1.5 litres
- CDs are on special offer and Bethany bought three for £14.85.
Work out the cost of these numbers of CDs.
a 2 CDs **b** 12 CDs **c** 36 CDs **d** 100 CDs
- 5 miles is approximately equal to 8 km.
a Roughly how many kilometres are equal to these distances?
i 18 miles **ii** 32 miles
b Roughly how many miles are equal to these distances?
i 80 km **ii** 400 km **iii** 55 km
- A 5-litre tin of paint covers a wall surface of 45 m^2 .
a How many litres of paint are needed to cover a wall surface of
i 65 m^2 **ii** 120 m^2
b If one litre of paint costs £4.45, what is the cost of painting a room with total wall area of 81 m^2 ?
- Six pizzas cost £14.40.
a Calculate the cost of these numbers of pizzas.
i 3 pizzas **ii** 7 pizzas **iii** 20 pizzas
b How many pizzas can be bought with £10? How much change will there be?

- 6** Tina's quarterly electricity bill is £73.08. This includes £56.70 for using 450 units of electricity and the standing charge of 17.8p per day.

Calculate the bills for the following units of electricity.

(Assume the same rate per unit and daily standing charge.)

- a** 220 units for 32 days
- b** 1200 units for 60 days
- c** 2300 units for 91 days

explanation 2a

explanation 2b

- 7** The exchange rate for Thai baht to British pounds is £1 = 55 Thai baht.

- a** Using p for pounds and b for Thai baht, complete this proportional relationship algebraically.

$$b = \underline{\hspace{2cm}}$$

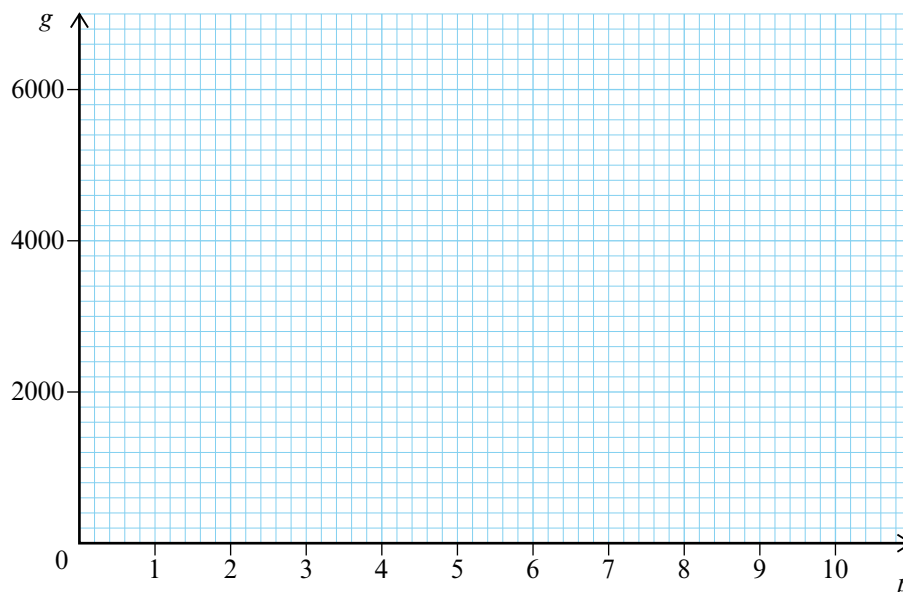
- b** Draw the graph representing this proportional relationship.
First copy and complete the table and then plot the points on a graph.

p	0	2	4	6
b				

- c** Write the gradient (steepness) of your line in part **b** and explain what this gradient represents.
- d** Toby buys a handmade suit in Thailand for 4800 baht.
What is this cost in pounds?



- 8** A mass of one pound is approximately equal to 450 grams.
- a** Write this as an algebraic relationship using p for pounds and g for grams.
- b** Copy the axes and draw the graph of this proportional relationship.



- c** Write the gradient of your line in part **b** and explain what this gradient represents.
- d** Use your graph to find the number of pounds in 50 kg.
- 9** Are the variables in each table in direct proportion? Explain your answers. For those that are in direct proportion, write the rule as an equation.

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

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

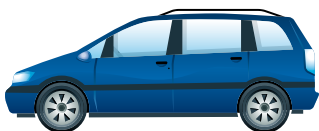
a $y = 45x$

b $s = \frac{t+3}{4}$

c $p = 3q^2$

d $g = 0.01h$

- 11** A car moving at constant speed uses 20 litres of fuel to travel 180 miles.



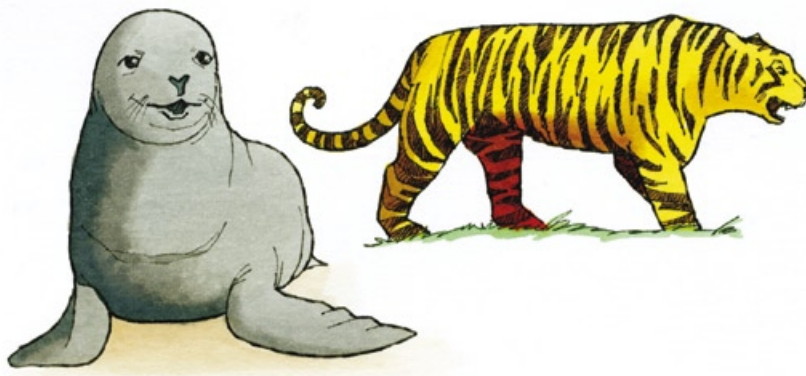
The fuel used is directly proportional to the distance travelled.

- a** Using l for litres and d for distance, write the proportional relationship algebraically.
 - b** Without drawing the graph, state the gradient of the line represented by this relationship and what this gradient represents.
 - c** Given that fuel costs £1.08 per litre, what would be the cost of making a journey of 520 miles in this car?
- 12** Use the relationships to answer the questions.

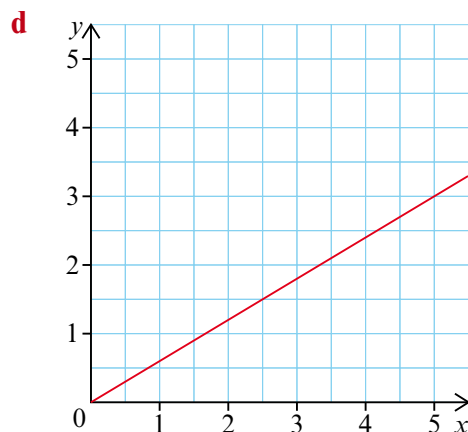
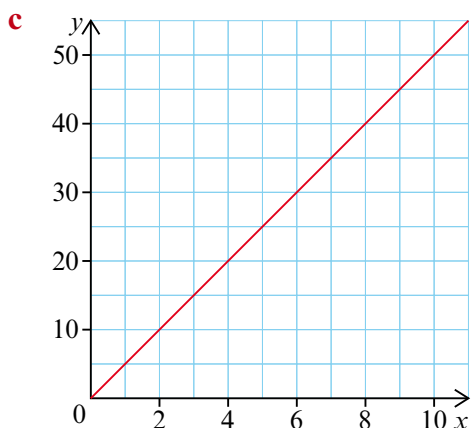
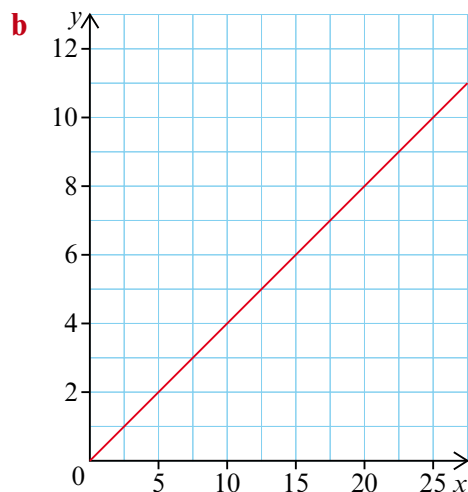
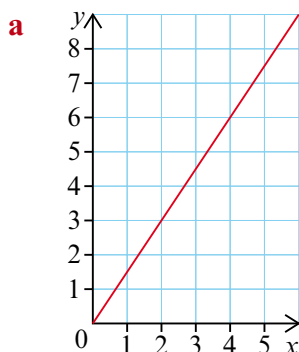
$y = 2.2x$, where x is the weight in kilograms (kg) and y is the weight in pounds (lb)

$y = 14s$ where s is the weight in stones

- a** Calculate the weight of a man in kilograms who weighs 220 lb.
- b** Calculate the weight of a child in pounds who weighs 40 kg.
- c** Calculate the weight in kilograms of a tiger that weighs 35 stones and 7 pounds.
- d** Calculate the weight in stones and pounds of a seal that weighs 180 kg.



- 13** For each of these graphs, find the gradient and write a linear equation for the function.



explanation 3a

explanation 3b

- 14** The members of the Racing Racquets Tennis Club drink orange juice at a rate of 4.6 litres per half hour.
- How much will they consume in a 3-hour practice?
 - How much will be consumed if 8 clubs, each with the same number of players, meet for a 7-hour tournament and consume orange juice at the same rate as the Racing Racquets Tennis Club?
 - If only a quarter of the members of the Racing Racquets club are present for one 3-hour practice, how much orange juice will they consume?

- 15** In a scale model of a boat, the mast is 20 cm high. This represents 12 m on the actual boat.
- a** Write the ratio of the height of the actual mast to the height of the model mast (in centimetres). Now give this ratio in its simplest form.
 - b** Use a suitable method to find the width of the boat if the model is 4 cm wide.
 - c** How long is a rope on the model if it is 10.2 m long on the actual boat?
 - d** If a railing on the boat is 2.5 cm thick, how thick should this be on the model? Give your answer in millimetres to 3 d.p.

- 16** Texts for a mobile phone cost 7.2p per text message.
- a** Write this proportional relationship algebraically using C for cost in pounds and t for the number of texts.
 - b** How much would these numbers of texts cost?
 - i** 50 texts **ii** 300 texts
 - c** How many texts were sent if these were the costs?
 - i** £4.32 **ii** £18.00

Monthly text bundles can be bought for a mobile phone where up to 500 messages can be bought for £15.

- d** What is the minimum number of texts that would make the monthly bundle better value for money than 7.2p per text?
- 17** A mobile phone company uses the following formula to calculate the monthly call costs for its 'pay monthly' customers.
- $C = 0.25t + 4.60$ where C is the monthly cost in pounds and t is the time in minutes spent talking on the telephone.
- a** Calculate the monthly costs for these numbers of minutes used.
 - i** 100 minutes **ii** 220 minutes **iii** 0 minutes
 - b** How much is each minute of talk time?
 - c** How does this relationship differ from other proportion problems in this chapter?