

# Direct Proportion

If  $y$  is directly proportional to  $x$

then we can write  $y \propto x$

which means  $y = kx$  for some constant  $k$

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- 1 Dress material costs £23.40 for 4 metres.  
How much does 1 metre cost?

$$\frac{£23.40}{4} = £5.85$$

- 3 Betty is paid £34.30 for seven hours' work at a nursing home.  
How much should she receive for five hours' work?

$$\begin{array}{l} 1 \text{ hr} = \frac{£34.30}{7} = £4.90 \\ 5 \text{ hrs} = £4.90 \times 5 = £24.50 \end{array} \quad \left| \quad £34.30 \times \frac{5}{7}$$

- 5 A machine makes 490 engine parts in 35 minutes.  
How many engine parts will the machine make in one hour?

$$490 \text{ parts} \times \frac{60}{35} = 840 \text{ parts}$$

- 11 The recipe for eight small cakes includes the following:  
480 g flour, 720 g fat, 2 eggs.

Change the amounts so there will be enough to make 12 small cakes.

$$\begin{array}{lll} 480 \times \frac{12}{8} & 720 \times \frac{12}{8} & 2 \times \frac{12}{8} \\ = 720 \text{ g} & 1080 \text{ g} & 3 \text{ eggs} \end{array}$$

# Direct Proportion

## Exercise 25E

- Dress material costs £23.40 for 4 metres.  
How much does 1 metre cost?
- 14 cm<sup>3</sup> of copper weighs 126 g.  $\frac{126}{14} = 9g$   
What is the weight of 1 cm<sup>3</sup>?
- Betty is paid £34.30 for seven hours' work at a nursing home.  
How much should she receive for five hours' work?
- Six razor blades cost 42p.  $42p \times \frac{10}{6} = 70p$   
How much will ten razor blades cost?
- A machine makes 490 engine parts in 35 minutes.  
How many engine parts will the machine make in one hour?
- Four packets of tea cost £1.28.  $£1.28 \times \frac{3}{4} = 96p$   
How much will three packets cost?
- A 6 kg bag of sprouts cost £1.98.  
How much does an 8 kg bag of sprouts cost if the cost per kg is the same?
- Seven tubes of toothpaste have a total weight of 854 g.  $854g \times \frac{8}{7} = 976g$   
Work out the weight of eight tubes of toothpaste.
- Anisha buys 12 rubbers for £1.80.  
How much would it cost her to buy 15 rubbers?
- Five bottles of detergent have a capacity of 1560 cm<sup>3</sup>.  $1560cm^3 \times \frac{9}{5} = 2808cm^3$   
Work out the total capacity of nine similar bottles.
- The recipe for eight small cakes includes the following:  
480 g flour, 720 g fat, 2 eggs.  
Change the amounts so there will be enough to make 12 small cakes.

# Inverse Proportion

If  $y$  is inversely proportional to  $x$

then  $y = \frac{k}{x}$  for some constant  $k$

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- 1 Six people can harvest a field of strawberries in four days.  
How long would it take eight people to harvest the same field?

6 people take 4 days

1 person would take  
 $4 \text{ days} \times 6 = 24 \text{ days}$

8 people would take  $= \frac{24}{8} = 3 \text{ days}$

More people take less time

$$4 \text{ days} \times \frac{6}{8} \\ = 3 \text{ days}$$

- 3 A field of grass provides enough food for 25 cows for eight days.  
For how long would the same field feed 10 cows?

$$8 \text{ days} \times \frac{25}{10} \\ = 20 \text{ days}$$

Food lasts longer

- 5 Four bricklayers can build a wall 10 feet high in 10 days.  
How long would it take five bricklayers to build a similar wall?

More bricklayers means less time

$$10 \text{ days} \times \frac{4}{5} = 8 \text{ days}$$

# Inverse Proportion

## Exercise 25F

- 1 Six people can harvest a field of strawberries in four days.  
How long would it take eight people to harvest the same field?
- 2 Five pumps can empty a tank of water in four hours. If one pump has broken down, how long would the remaining four pumps take?

$$4 \text{ hrs} \times \frac{5}{4} = 5 \text{ hrs}$$

### 422 Ratio and proportion

- 3 A field of grass provides enough food for 25 cows for eight days.  
For how long would the same field feed 10 cows?
- 4 In a school 33 classrooms are required for classes of 32 pupils each.  
How many classrooms would be needed if the class size were reduced to 22 pupils?  
 $33 \times \frac{32}{22} = 48$
- 5 Four bricklayers can build a wall 10 feet high in 10 days.  
How long would it take five bricklayers to build a similar wall?
- 6 Two secretaries can type a large document between them in nine hours.  
How long would it take three secretaries to type the document?  
 $9 \text{ hrs} \times \frac{2}{3} = 6 \text{ hrs}$
- 7 Bags of sugar are packed in seven boxes, each holding 12 bags.  
If the same quantity of sugar is packed into larger boxes and only six boxes are used, how many bags are there in each box?
- 8 A quantity of food will last six pigs for 10 days.  
For how long would the same quantity last four pigs?  
 $10 \text{ days} \times \frac{6}{4} = 15 \text{ days}$
- 9 It takes nine men 30 days to complete a contracted job.  
How long would it take 20 men?
- 10 A circular flower bed has space for 160 plants, placed 18 cm apart around the outside edge.  
How many plants could you fit in round the edge if the plants were 24 cm apart?

## Exercise 25G Mixed questions

- Express these ratios in their simplest form:  
(a)  $35 : 10$                       (b)  $6 : 18$                       (c)  $\frac{1}{4} : 5$   
(d)  $\frac{7}{8} : \frac{3}{4}$                       (e)  $3.5 : 4.25$                       (f)  $75\text{p} : \text{£}6$   
(g)  $600\text{ g} : 1.8\text{ kg}$                       (h)  $5\text{ min} : 1\frac{1}{2}\text{ hrs}$                       (i)  $5\text{ mm} : 4\text{ cm}$
- Express these ratios in the form  $1 : n$ .  
(a)  $3 : 15$                       (b)  $8 : 6$                       (c)  $\frac{1}{2}\text{ s} : 1\text{ min}$   
(d)  $1.25\text{ km} : 150\text{ m}$
- Express these ratios in the form  $n : 1$ .  
(a)  $15 : 10$                       (b)  $3\text{ h} : \frac{1}{2}\text{ h}$                       (c)  $100\text{ g} : 1\text{ kg}$
- Find  $x$  for each of these pairs of equivalent ratios:  
(a)  $2 : 10$      $x : 35$                       (b)  $4 : x$      $20 : 45$
- Divide:  
(a)  $30.78$  metres in the ratio  $4 : 5$   
(b)  $\text{£}18.40$  in the ratio  $2 : 3 : 5$ .
- One bottle of wine holds  $0.75$  litres. Another holds  $1.2$  litres. Work out the ratio (in its simplest form) of the capacities of the bottles.
- The ratio of boys to girls in a youth club is  $4 : 5$ . There are  $28$  boys.  
How many girls are there in the youth club?

- 8 In the past year a garage sold 468 cars. They were either estate cars or saloon cars. The ratio of estate cars to saloon cars sold was 2 : 7.  
Find how many estate cars the garage sold.
- 9 In 24 hours the Earth turns about its axis through an angle of  $360^\circ$ .  
What angle has it turned through in 15 hours?
- 10 A florist has a delivery of the same number of single roses every week day. When he has nine single roses to a bunch he can make exactly 60 bunches. One day he decides to put 12 single roses in each bunch.  
How many bunches will there be?
- 11 12 bags of oats will be enough for three donkeys for eight days.  
How long will 10 bags last four donkeys if they are given the same amount each per day?
- 12 Here are the ingredients for making 18 rock cakes.  
9 ounces of flour  
6 ounces of sugar  
6 ounces of margarine  
8 ounces of mixed dried fruit  
2 large eggs  
Mark wants to make 12 rock cakes.  
(a) (i) How much sugar does he need?  
(ii) How much dried fruit does he need? Give your answer correct to the nearest ounce.  
Mark only has 9 ounces of margarine. He has plenty of all the other ingredients.  
(b) What is the greatest number of rock cakes he can make?

[E]

- 13 Mortar is made by mixing five parts by weight of sand with one part by weight of cement.  
How much sand is needed to make 8400 kg of mortar?



[E]

- 14 The heights of two buildings are in the ratio 5 : 8. The bigger building is 56 feet high.  
Calculate the height of the lower building.



[E]

## Exercise 25G

- 1 (a) 7:2 (b) 1:3 (c) 1:20 (d) 7:6 (e) 14:17  
(f) 1:8 (g) 1:3 (h) 1:18 (i) 1:8
- 2 (a) 1:5 (b) 1:0.75 (c) 1:120 (d) 1:0.12
- 3 (a) 1.5:1 (b) 6:1 (c) 0.1:1
- 4 (a) 7 (b) 9
- 5 (a) 13.68 m, 17.1 m (b) £3.68, £5.52, £9.20
- 6 5:8 7 35 8 104
- 9 225° 10 45 11 5 days
- 12 (a) (i) 4 ounces (ii) 5 ounces (b) 27 cakes
- 13 7000 kg 14 35 feet

Q11

- 11 12 bags of oats will be enough for three donkeys for eight days. How long will 10 bags last four donkeys if they are given the same amount each per day?

| Bags | Donkeys | Days |
|------|---------|------|
| 12   | 3       | 8    |
| 12   | 1       | 24   |
| 1    | 1       | 2    |
| 10   | 1       | 20   |
| 10   | 4       | 5    |