# Schofield $\&$ Sims 




## Simplify fractions

## Key point

Equivalent fractions are fractions with the same value. If you multiply or divide the numerator and denominator of a fraction by the same number, you will get an equivalent fraction.
When using division this is called simplifying. When the numerator and denominator in a fraction cannot be divided by the same number (a common factor), the fraction is in its simplest form.


## Get started

1 Circle the fraction that is $\frac{70}{80}$ simplified.

$$
\begin{array}{lllll}
\frac{7}{10} & \frac{7}{80} & \frac{8}{7} & \frac{7}{8} & \frac{35}{80}
\end{array}
$$

2


3 Find the missing number.


4 Divide the numerator and denominator of $\frac{16}{28}$ by 4 to give it in its simplest form. $\frac{4}{7}$

5 True or false? $\frac{4}{10}$ is in its simplest form.
True $\square$ False


6 Divide both numbers of the fraction $\frac{36}{54}$ by 6 to give an equivalent fraction. Then write your answer in its simplest form. $\qquad$ $\frac{2}{3}$

7 By what number have both numbers of $\frac{21}{24}$ been divided to give it in its simplest form?
$\qquad$
3


8 Fill in the missing number.
$\frac{21}{70}$ is equivalent to $\frac{3}{10}$.

## Now try these

9 Simplify this fraction. $\frac{12}{15}=\frac{4}{5}$
10 Write $\frac{60}{240}$ in its simplest form. $\qquad$
11 Complete this pattern. $\frac{48}{84}=\frac{24}{42}=\frac{4}{7}$

12 True or false? $\frac{39}{130}$ is a fraction in its simplest form. True $\square$ False $\square$
13 Circle the fraction that is not equivalent to the others in this list. $\quad \frac{77}{88} \quad \frac{49}{56} \quad \begin{array}{llllll}\frac{7}{11} & \frac{14}{16} & \frac{70}{80}\end{array}$
14 Which of the fractions in question 13 is in its simplest form? $\qquad$ Jo says that $\frac{24}{30}$ and $\frac{20}{25}$ are equivalent. Is she correct? Yes $\qquad$ No $\qquad$ Write $\frac{40}{56}$ in its simplest form. $\frac{5}{7}$
A fraction with the denominator 27 is $\frac{2}{3}$ in its simplest form. What is its numerator? $\qquad$ 18

A grid of 48 squares has 18 coloured red.
What proportion of the grid is red? Give your answer in its simplest form. $\qquad$ $\frac{3}{8}$

## Challenge

19 Give your answers in their simplest form. In this grid 45 out of the 48 sections are gold. What proportion of the grid is: a) gold? $\qquad$ $\frac{15}{16}$
b) white? $\qquad$


20 In a room, 28 of the 32 people are male.
Write the proportion of the people who are male, in its simplest form. $\qquad$ $\frac{7}{8}$

Which of these fractions simplify to $\frac{5}{8}$ ? Circle them. $\frac{15}{24} \quad \frac{32}{40} \quad \frac{35}{48}$
22 In a field, $\frac{96}{120}$ of the animals are sheep.
Give, as a fraction in its simplest form, the proportion of the animals that are sheep. $\qquad$ $\frac{4}{5}$

23 There are 100 questions in a test. Sam answers 85 of them correctly. What proportion did he get correct:
a) as a percentage? $\qquad$ b) as a fraction in its simplest form? $\qquad$ $\frac{17}{20}$

24 What fraction in its simplest form is equal to:
a) $75 \%$ ? $\qquad$ b) $60 \%$ ? $\qquad$ c) $15 \%$ ? $\qquad$ Abl uses her knowledge that $0.45=\frac{45}{100}$ to write 0.45 as the fraction $\frac{9}{20}$ in its simplest form. Is she correct? Yes $\square$ No $\square$
26 At a football ground 2880 out of 6000 adults are men. Write this:
a) as a fraction in its simplest form.
b) as a fraction with the denominator 100 .
a) $\qquad$

c) as a percentage.
c) $48 \%$

Write the answer to $44 \div 80$ as: a) a fraction in its simplest form. $\qquad$ b) a percentage. $\qquad$ 55\%

A full tin of beans has a mass of 480 g in total. If the contents weigh 448 g , what proportion of the total mass is the tin?

Give your answer as a fraction in its simplest form. $\qquad$


## Compare and order fractions with different denominators

## Key point

When comparing or ordering fractions with different denominators, change them to equivalent fractions so they have the same denominator. Then compare the numerators.

Which is larger: $\frac{11}{12}$ or $\frac{7}{8}$ ?


## Get started

1 Use < or > to show which is larger.


2 Fill in the missing numbers.
a) $\frac{4}{7}=\frac{12}{21}$
b) $\frac{2}{3}=\frac{14}{21}$

Which is larger? $\qquad$ b

3 Given that $\frac{2}{3}=\frac{6}{9}$, which is larger: $\frac{5}{9}$ or $\frac{2}{3}$ ?


4 Change $\frac{2}{3}$ to twelfths to help you find the smaller fraction: $\frac{2}{3}$ or $\frac{7}{12}$.


5 Fill in the missing numbers. Tick the largest.

$$
\begin{array}{ccc}
\frac{2}{3}=\frac{8}{12} & \frac{3}{4}=\frac{9}{12} & \frac{3}{6}=\frac{6}{12} \\
\square & \square & \square
\end{array}
$$

6 Change both fractions to twentieths to find the smaller fraction: $\frac{2}{5}$ or $\frac{1}{4}$. $\quad \frac{1}{4}$

7 Su eats $\frac{3}{8}$ of a pizza and Jack eats $\frac{1}{2}$ of it. Who eats more? $\qquad$ Jack

8 A white cup holds $\frac{3}{10}$ of a litre and a blue cup holds $\frac{33}{100}$ of a litre. Which cup holds more? $\qquad$

## Now try these

9 Use $<$ or $>$ to show which is larger. $\frac{3}{4}<\frac{13}{16}$
10 True or false? $\frac{3}{4}$ is larger than $\frac{4}{5}$. True $\square$ False $\checkmark$
11 Which is larger: seven-tenths or sixty-nine hundredths? $\qquad$ seven-tenths

12 Write letters to show these fractions in order of size from smallest to largest.
A $\frac{3}{4}=\frac{?}{24}$
B $\frac{7}{8}=\frac{?}{24}$
C $\frac{5}{6}=\frac{?}{24}$
A
C
$B$ $\qquad$

13 Change the fractions to hundredths. Write the new fractions in order from smallest to largest.
$\frac{3}{4} \quad \frac{9}{10}$
$\frac{21}{25}$ $\qquad$
$\qquad$ $\frac{90}{100}$

14 Change the fractions to twentieths and write the original fractions in order from smallest to largest.
$\frac{7}{10} \quad \frac{3}{4}$
$\frac{3}{5} \quad \frac{1}{2}$ $\qquad$
$\qquad$ $\frac{7}{10}$ $\qquad$ To get to school, Aswin walks $\frac{7}{25} \mathrm{~km}$, Shanti walks $\frac{2}{5} \mathrm{~km}$ and Cally walks $\frac{21}{50} \mathrm{~km}$.
a) Who walks furthest? $\qquad$ Calla
b) Who walks the shortest distance?
$\qquad$
Aswan
16
Put these fractions in ascending order.
$\frac{3}{10} \quad \frac{17}{100} \quad \frac{2}{5} \quad \frac{3}{20}$ $\qquad$
$\qquad$
$\frac{3}{10}$ $\frac{2}{5}$

17 The table shows the race times for four children in seconds.
Who ran: a) the fastest time? $\qquad$ -
b) the slowest time? $\qquad$ Finn

| Ellie | Finn | Tom | Anila |
| :---: | :---: | :---: | :---: |
| $54 \frac{37}{100} \mathrm{sec}$ | $54 \frac{2}{5} \mathrm{sec}$ | $53 \frac{3}{10} \mathrm{sec}$ | $53 \frac{41}{100} \mathrm{sec}$ |

18 Use <or $>$ between these fractions. $\frac{5}{6} \square \frac{11}{12} \ll \frac{17}{18}$

## Challenge

Some lengths of ribbons are shown in inches. Write letters to show the lengths in descending order.
A $5 \frac{11}{16}$ inches
B $5 \frac{5}{8}$ inches
C $5 \frac{3}{4}$ inches
D $4 \frac{13}{16}$ inches
E $4 \frac{7}{8}$ inches
$\qquad$
$\qquad$
$\qquad$ B
E
D
20
Order these fractions from largest to smallest.
$\begin{array}{lllll}\frac{1}{2} & \frac{2}{3} & \frac{5}{9} & \frac{7}{18} & \frac{5}{6}\end{array}$ $\qquad$
$\qquad$
$\frac{5}{9}$
$\frac{1}{2} \quad \frac{7}{18}$

On a number line, which fraction with the denominator 60 lies between $\frac{2}{12}$ and $\frac{1}{5} ? \frac{11}{60}$


22 Write these numbers in order, from smallest to largest.
$1 \frac{2}{5} \quad \frac{37}{25} \quad 1 \frac{11}{50} \quad \frac{123}{100}$

$$
1 \frac{11}{50}
$$

$\frac{123}{100}$ $1 \frac{2}{5}$ $\frac{37}{25}$

23 Fill in the missing digit. $\frac{8}{10}<\frac{5}{6}<\frac{13}{15}$
24 Jake is buying a field that is $3 \frac{2}{5}$ hectares in area and a wood that is 3.35 hectares. Which is larger: the field or the wood? $\qquad$ the field


25 True or false? If a film lasts for $1 \frac{29}{30}$ hour and a chat show lasts for $1 \frac{3}{4}$ hour, the film lasts for 13 minutes longer than the chat show. True $\square$ False $\square$
Fill in the missing digit. $\frac{3}{5}<\frac{19}{30}<\frac{2}{3}$ What fraction, in its simplest form, lies exactly halfway between $\frac{1}{4}$ and $\frac{5}{12} ?$ What fraction, in its simplest form, lies exactly halfway between $\frac{5}{12}$ and $\frac{3}{7}$ ? $\qquad$

## Add and subtract any fractions and mixed numbers

## Key point

When adding or subtracting fractions, if the denominators are the same, add or subtract the numerators only. Use the same denominator. If they are not the same, change them to equivalent fractions so that the fractions all have the same denominator.


To add or subtract mixed numbers, change the fractions to equivalent fractions so they have the same denominator. The whole numbers can be treated separately, but be careful when subtracting in case the fraction in the first mixed number is smaller than the fraction in the second mixed number.
$5 \frac{1}{3}-2 \frac{3}{4}=5 \frac{4}{12}-2 \frac{9}{12}=5 \frac{4}{12}-2-\frac{9}{12}=3 \frac{4}{12}-\frac{9}{12}=2 \frac{7}{12}$

## Get started

1 Answer this subtraction.
$\frac{1}{2}-\frac{5}{12}=\frac{?}{12}-\frac{5}{12}=\frac{1}{12}$
2 Fill in the boxes to find the total.
$\frac{1}{4}+\frac{3}{10}=\frac{5}{20}+\frac{6}{20}=\frac{11}{20}$
3 Fill in the boxes to find the difference.

$$
\frac{4}{5}-\frac{1}{10}=\frac{8}{10}-\frac{1}{10}=\frac{7}{10}
$$

4 Fill in the missing numbers.

$$
\begin{gathered}
\frac{1}{6}+\frac{3}{4}+\frac{2}{3}=\frac{2}{12}+\frac{9}{12}+\frac{8}{12} \\
=\frac{19}{12}=1 \frac{7}{12}
\end{gathered}
$$

$5 \frac{5}{6}=\frac{10}{12}$ Use this fact to find $\frac{5}{6}+\frac{1}{12}$.
Mark the answer on the number line.


6 Write the answer as a mixed number.
$\frac{1}{3}+\frac{3}{4}=1 \frac{1}{12}$


7 Add $4 \frac{1}{2}$ to $5 \frac{1}{4}$. $9 \frac{3}{4}$

8 Fill in the missing numbers.

$$
1 \frac{3}{10}+2 \frac{5}{100}=1 \frac{30}{100}+2 \frac{5}{100}=3 \frac{35}{100}
$$

## Now try these

What is the difference between $1 \frac{1}{2}$ and $\frac{5}{8} ? \frac{7}{8}$


12 Subtract $3 \frac{3}{4}$ from $5 \frac{1}{4}$ and give your answer as a mixed number in its simplest form. $\qquad$ $1 \frac{1}{2}$ Find the total and give your answer as a mixed number. $\frac{1}{3}+\frac{3}{5}+\frac{2}{15}=1 \frac{1}{15}$
14 Count back $1 \frac{7}{10}$ from $8 \frac{3}{5}$. What number do you reach? $\qquad$
$6 \frac{9}{10}$
Find the total of $\frac{1}{6}+\frac{3}{4}+\frac{1}{3}$. Give the answer as a mixed number in its simplest form. $\qquad$ Find the sum of $\frac{3}{8}, \frac{3}{4}$ and $\frac{5}{6}$. How much less than 2 is the answer? $\frac{1}{24}$
17 Write the answer to $\frac{7}{10}+\frac{3}{5}+\frac{11}{15}$ as an improper fraction and as a mixed number. $\qquad$ What is $\frac{7}{8}-\frac{5}{24}$ in its simplest form? $\frac{2}{3}$

## Challenge

19 How many hours is the sum of $4 \frac{3}{4}$ hours and $1 \frac{1}{3}$ hour as a mixed number? $6 \frac{1}{12} \mathrm{hr}$
20 How much longer than six inches is the total length of three ribbons with these lengths?

$$
2 \frac{11}{16} \text { inches } \quad 1 \frac{5}{8} \text { inches } \quad 1 \frac{3}{4} \text { inches } \quad \frac{1}{16} \quad \text { inches }
$$



21 A runner jogs $3 \frac{2}{5} \mathrm{~km}$ slowly to warm up and then runs $6 \frac{7}{10} \mathrm{~km}$ at a faster pace.
How much more than 10km does he go in total? Give your answer as:
a) a fraction of a km. $\qquad$ km
b) a decimal. $\qquad$ 0.1 km
(22) True or false? The answer to this question is $4.6 \frac{2}{5}-4 \frac{1}{2}+2 \frac{1}{10}$ True $\qquad$ False $\square$ From a full 4-pint bottle of milk, Maria pours $\frac{7}{10}$ pints into a saucepan and then $2 \frac{3}{4}$ pints into a jug. How much milk remains in the bottle? Give your answer as:
a) a fraction in its simplest form. $\qquad$ $\overline{20}$ pt
b) a decimal. $\qquad$ 0.55 pt


| $1 \frac{2}{5}$ | $\frac{37}{25}$ | $1 \frac{11}{50}$ | $\frac{123}{100}$ |
| :--- | :--- | :--- | :--- | Look at these fractions. Find the total of the largest and smallest numbers in the box. Give your answer as:

a) a mixed number in its simplest form. $\qquad$ b) a decimal. $\qquad$ 2.7

A recipe uses $\frac{3}{5} \mathrm{~kg}$ of flour, 0.35 kg of sugar and $\frac{1}{4} \mathrm{~kg}$ of butter. What is the total mass of the ingredients:
a) in grams? $\qquad$ $g$
b) in kilograms? $\qquad$ kg Also accept $1 \frac{1}{5} \mathrm{~kg}$

How much larger is a field with an area of $27 \frac{3}{4}$ hectares than a field that is $13 \frac{19}{20}$ hectares? Give the answer in its simplest form. $13 \frac{4}{5}$ hectares

The table shows lap times of a racing car in seconds. What is the total time of all four laps?

| lap 1 | lap 2 | lap 3 | lap 4 |
| :---: | :---: | :---: | :---: |
| $16 \frac{57}{100} \mathrm{sec}$ | $14 \frac{2}{5} \mathrm{sec}$ | $19 \frac{7}{10} \mathrm{sec}$ | $12 \frac{49}{100} \mathrm{sec}$ |$\quad$| 1 |
| :---: |
| $\min$\begin{tabular}{\|c|}
\hline
\end{tabular}$\quad 3 \frac{16}{100}$ |
| sec |

Find the answer as a mixed number in its simplest form. $6 \frac{29}{39}-6 \frac{12}{13}+2 \frac{1}{3}=2 \frac{2}{13}$

## Multiply pairs of proper fractions

## Key point

To multiply fractions, multiply the numerators to give the numerator and multiply the denominators to give the denominator. Give answers in their simplest form.


Sometimes, to make multiplication easier, you can divide a numerator and a denominator by the same number (a common factor). This is called cancelling.
$\frac{7}{8} \times \frac{12}{13}=\frac{7}{2} \times \frac{12}{13}^{3}=\frac{7 \times 3}{2 \times 13}=\frac{21}{26}$ Here divide both 12 and 8 by 4.

## Get started

1 How many tenths is $\frac{2}{5} \times \frac{1}{2} ? \frac{2}{10}$

2 How many twelfths is
$\frac{3}{4} \times \frac{1}{3} ? \frac{3}{12}$


4 True or false? $\frac{7}{10} \times \frac{1}{4}=\frac{7}{40}$ True
 False $\qquad$

5 Multiply $\frac{3}{5}$ by $\frac{1}{4}$. $\frac{3}{20}$
6 Give the answer to this question
in its simplest form. $\frac{3}{5} \times \frac{1}{3}=\frac{1}{5}$
7 Mark the answer to $\frac{3}{5} \times \frac{1}{2}$ on this line.


8 Find half of $\frac{1}{4}$.
$\frac{1}{2} \times \frac{1}{4}=\frac{1}{8}$

## Now try these

9 True or false? ${ }^{1} \frac{\mathrm{~V}}{8} \times \frac{1}{\mathrm{TQ}}=\frac{1}{16}$
True $\square$ False $\square$
10 Find the missing number. $\frac{1}{6} \times \frac{3}{7}=\frac{1}{14}$
11
Write the answer to $\frac{3}{10} \times \frac{5}{6}$ in its simplest form. $\qquad$ $\frac{1}{4}$

Fill in the missing numbers. $\frac{4}{5} \times \frac{4}{5}=\frac{16}{25}$
13 What must you multiply $\frac{3}{8}$ by to get $\frac{3}{24}$ ? $\qquad$ $\frac{1}{3}$

14 Circle which is more. $\frac{3}{4} \times \frac{5}{6}$ or $\frac{2}{3} \times \frac{6}{8}$
15 True or false? These two questions have the same answer. $\frac{3}{10} \times \frac{1}{3}$ and $\frac{2}{5} \times \frac{1}{4}$ True $\square$ False $\square$
$16 \frac{15}{24}=\frac{5}{8}$ Use this fact to find the missing numbers. $\frac{3}{4} \times \frac{5}{6}=\frac{5}{8}$
17 How much smaller is $\frac{3}{8} \times \frac{2}{3}$ than $\frac{15}{16} \times \frac{4}{5}$ ? $\frac{2}{4}$ or $\frac{1}{2}$
18 What fraction when multiplied by itself gives $\frac{9}{25}$ ? $\qquad$ $\frac{3}{5}$

## Challenge

19 How many fifths is the answer to $\frac{96}{100} \times \frac{10}{12}=\frac{?}{5}$ ? $\qquad$ fifths

20 Kim draws a line that is $\frac{3}{10} \mathrm{~m}$. Amul draws a line that is $\frac{1}{6}$ of the length of Kim's line. How long is Amyl's line as a fraction of a metre? $\qquad$ $\frac{1}{20}$ m

A can of lemonade holds $\frac{33}{100}$ litre. Amy drinks one-third of a can.
What fraction of a litre does she drink? $\qquad$ $\frac{11}{100}$ l

22 A racing car uses, on average, $\frac{4}{5}$ litre of fuel to travel 16 km . How much fuel will it take to travel one-eighth of this distance ( 2 km )? Give your answer as:
a) a fraction of a litre. $\qquad$ l
b) a decimal. $\qquad$


23 Use the digits 3, 6, 8 and 9 to make a question with the answer $\frac{1}{4}$. $\frac{3}{9} \times \frac{6}{8}$ Also accept other possible answers
24 Each episode of a TV series is $\frac{11}{12}$ of an hour. After two-fifths of the episode there is an advert break.
a) What fraction of an hour comes before the advert break? $\qquad$ 30 hr
b) How many minutes is this? $\qquad$ 22 min
Milly wants to make a copy of a square photo with sides of $\frac{3}{20} m$. She reduces the size so that the lengths are $\frac{4}{5}$ of the size of the original. Give the perimeter of the new photo:

a) in centimetres. $\qquad$ cm
b) as a fraction of a metre. $\qquad$ m Also accept $\frac{12}{25}$ m Given that $0.49=\frac{49}{100}$, find the answer to $0.49 \times \frac{4}{7}$, giving your answer as:
a) a fraction in its simplest form. $\qquad$ b) a fraction with hundredths. $\qquad$
c) a decimal. $\qquad$
27
Write the answer to $\frac{24}{25} \times \frac{7}{8}$ as a decimal. $\qquad$ 0.84

| $\frac{11}{20}$ | $\frac{2}{5}$ | $\frac{1}{2}$ | $\frac{3}{4}$ | $\frac{7}{10}$ |
| :--- | :--- | :--- | :--- | :--- |

Look at the fractions. Multiply the largest fraction by the smallest fraction. Give your answer as a decimal. $\qquad$

## Divide fractions by whole numbers

## Key point

To find a unit fraction of a whole number, use division. For example, to find $\frac{1}{5}$ of a whole number you can divide by 5.
To divide a fraction by a whole number, use multiplication. For example, to divide a fraction by 5 you can multiply by $\frac{1}{5}$.

$\frac{2}{3} \div 5$ is the same as $\frac{2}{3} \times \frac{1}{5}$. The answer is $\frac{2}{15}$.


## Get started

1 What is one-half divided by 2?
$\frac{1}{2} \div 2=\frac{1}{2} \times \frac{1}{2}=\frac{1}{4}$
2 What is one-quarter divided by 2? $\frac{1}{4} \div 2=\frac{1}{4} \times \frac{1}{2}=\frac{1}{8}$


5 Divide $\frac{3}{5}$ by 2 and mark the answer on the number line.


6 Fill in the boxes to find the answer in its simplest form.
$\frac{2}{5} \div 4=\frac{2}{5} \times \frac{1}{4}=\frac{2}{20}=\frac{1}{10}$
7 Divide $\frac{1}{5}$ by 3 . $\qquad$
8 Fill in the missing number.
$\frac{1}{5} \div 3=\frac{1}{15}$

## Now try these

9 What must you divide $\frac{3}{4}$ by to get $\frac{3}{24}$ ? $\qquad$
10 Write the answer to $\frac{2}{3} \div 4$ in its simplest form. $\qquad$ $\frac{1}{6}$

11 Answer this. $\frac{2}{7} \div 5=\frac{2}{35}$
12 Fill in the missing numbers. $\frac{12}{18} \div 6=\frac{12^{2}}{18} \times \frac{1}{6}=\frac{2}{18}=\frac{1}{9}$
13 True or false? $\frac{5}{8} \div 10=\frac{1}{16} \quad$ True $\square$ False $\square$
14 Find the missing number. $\frac{3}{7} \div 6=\frac{1}{14}$

15 Write the answer to $\frac{9}{10} \div 3$ in its simplest form. $\qquad$
16 True or false? These two questions have the same answer. $\frac{3}{10} \div 3$ and $\frac{2}{5} \div 4$ True


False $\qquad$ $\frac{5}{24}$
17 If 3 people equally share $\frac{5}{8}$ of a pizza, what fraction of the whole pizza do they each get? $\qquad$ A lesson that lasts $\frac{5}{6}$ of an hour is split into 10 equal sections. Tick the two fractions that show the length of each section.

$$
\frac{50}{6} \mathrm{hr} \square \quad \frac{5}{60} \mathrm{hr} \square \quad \frac{50}{60} \mathrm{hr} \square \quad \frac{1}{12} \mathrm{hr} \square
$$



## Challenge

19 A plank that is $\frac{7}{10} \mathrm{~m}$ is cut into 14 equal lengths. What fraction of a metre is each length? $\qquad$ m How much greater is $\frac{15}{16} \div 5$ than $\frac{3}{8} \div 6$ ? $\frac{1}{8} \quad$ Also accept $\frac{2}{16}$
What fraction when divided by 4 gives $\frac{7}{32}$ ? $\frac{7}{8}$
22 Chloe has grown a sunflower that is $\frac{9}{10} \mathrm{~m}$ tall. It is six times as tall as her brother's sunflower. How tall is her brother's sunflower? Give your answer as:
a) a fraction in its simplest form. $\qquad$ $\frac{3}{20}$ m
b) a fraction in hundredths. $\qquad$ $\frac{15}{100}$ m
c) a decimal. $\qquad$ 0.15 m make a question with the answer one-quarter.
 A toy train travels at $\frac{3}{5} \mathrm{~km}$ per hour. Divide $\frac{3}{5}$ by 60 to find the distance it travels in a minute. Give your answer:
a) as a fraction of a kilometre, in its simplest form. $\qquad$ $\frac{1}{100}$ km
b) in metres. $\qquad$ m


A bottle of juice holds $\frac{4}{5}$ litre. The juice is equally shared into 10 glasses. How much juice is put in each glass? Give your answer:
a) as a fraction of a litre. $\qquad$ l b) in millilitres. $\qquad$ 80 ml

Write the answer to $\frac{24}{25} \div 8$ as a decimal. $\qquad$ 0.12 A recipe for making 24 biscuits uses $\frac{1}{4} \mathrm{~kg}$ of flour, 0.2 kg of sugar and $\frac{3}{8} \mathrm{~kg}$ of butter. How much of each ingredient is needed to make only 8 biscuits? Give the answers in their simplest form.


The distance from $A$ to $C$ is 8 times the distance from $A$ to $B$.
Find the distance from $A$ to $B$ as a decimal in kilometres. $\qquad$ km

## Relate fractions to division and find decimal equivalents

## Key point

When one number is divided by another, the answer can be written as a fraction.
For example 3 pies are shared equally between 8 people. Each pie can be split into eighths. Each person can have an eighth from each pie, so each person has $\frac{3}{8}$ altogether.

$3 \div 8=\frac{3}{8}$


$$
4 \div 5=\frac{4}{5}
$$

You can use division to write a fraction as a decimal. Some fractions will need to be simplified first.
$\frac{12}{40}=\frac{3}{10}=3 \div 10=0.3$


## Get started

These three cakes are shared equally between four children.
How much does each child get? $\qquad$ $\frac{3}{4}$ $\qquad$


Five pizzas are equally shared between eight people. What fraction of a pizza does each person get? $\frac{5}{8}$


3 Divide 4 by 7 and give your answer as a fraction. $\qquad$

4 What number is divided by 6 to give the answer $\frac{5}{6}$ ? $\qquad$
5 What is $6 \div 8$ in its simplest form?

$$
6 \div 8=\frac{3}{4}
$$

6 Give the answer to $7 \div 10$ as a fraction and as a decimal.
$7 \div 10=\frac{7}{10}=0.7$
7 Tick the statement which is equivalent to $\frac{3}{8}$.

$$
8 \div 3=2.66667 \quad 3 \div 8=0.375
$$



8 Mark the answer to $5 \div 8$ on this line.


## Now try these

9 As a fraction in simplest form, what is $45 \mathrm{~kg} \div 54$ ? $\qquad$ $\frac{5}{6}$ kg

10 Write $\frac{16}{100}$ as a decimal. $\qquad$
11 What is $7 \div 1000$ or seven-thousandths as a decimal? $\qquad$
Write the answer to $27 \div 30$ as: a) a fraction in its simplest form. $\qquad$ $\frac{9}{10}$ b) a decimal. $\qquad$ 0.9

13 Twenty-one melons are shared equally between 28 children.
What fraction of a melon does each get? $\frac{21}{28}=\frac{3}{4}$


14 A machine cuts a 32 cm length of wire into 48 equal lengths.
What is the length of each piece as a fraction in its simplest form? $\qquad$ $\frac{2}{3}$ cm

15 True or false? $25 \div 40$ and $35 \div 56$ have the same answer when written as a decimal.
True $\square$ False $\qquad$
An 8 m length of ribbon is cut into 40 equal strips. Write, as a decimal, the length of each strip.
$\qquad$
17 Divide 37 by 4 and give your answer as a decimal. $4 \longdiv { 3 7 . 0 0 }$
9.25
$\qquad$

## Challenge

19 Find and circle the fractions and decimals equivalent to $56 \div 80$.
$\begin{array}{llllll}\left(\frac{56}{80}\right. & \frac{7}{8} & 0.07 & \left(\frac{7}{10}\right. & 0.875 & 0.7\end{array}$

20
Ahmed says that $£ 3$ divided by 4 is $\frac{3}{4}$ of $£ 1$ and this is $£ 0.75$.
Is he correct? Yes $\qquad$ No $\qquad$


21 What is 33 kg divided by 10 as a mixed number and as a decimal? $\qquad$ $3 \frac{3}{10}$ kg and $\qquad$ 3.3 kg

22 Use written division to help you convert $\frac{7}{8}$ to a decimal. 0.875
As a decimal, what length in kilometres is one-eighth of 7 km ? $\qquad$ 0.875 km

24 True or false? $\frac{5}{8}=0.635$ True $\square$ False


25 Compare these two expressions. Choose $<$, > or = to write in the box. $36 \div 54$ $\square$
26 This division has been started to find the decimal equivalent of $\frac{5}{6}$.
Write the answer to four decimal places. $\qquad$ 0.8
$65^{5.5{ }^{2} 0 \quad 0}$

27 Use division to help you join each fraction to its equivalent decimal (to three decimal places).


28
Use division to find the decimal equivalent of one-eleventh, two-elevenths and three-elevenths to six decimal places.
a) $\frac{1}{11} \quad 0.090909$
b) $\frac{2}{11}$ $\qquad$ c) $\frac{3}{11}$ $\qquad$

## Check-up test 1

1 What is the simplified equivalent fraction?


2 Simplify $\frac{15}{25}$. $\frac{3}{5}$
3 Poppy says that $\frac{18}{24}$ and $\frac{15}{20}$ are equivalent.
Is she correct? Yes $\qquad$ No $\square$

4 In a field, $\frac{56}{72}$ of the animals are sheep. Give the proportion of the animals that are sheep, as a fraction in its simplest form. $\qquad$


1 mark

5 Use < or > to show which is larger.
$\frac{3}{4}>\frac{11}{16}$
6 Nea eats $\frac{3}{8}$ of a curry and Dan eats $\frac{1}{4}$ of it.
Who eats more? $\qquad$


7 Change these fractions to hundredths.
Write the new fractions in order from smallest to largest.
$\begin{array}{lll}\frac{3}{5} & \frac{8}{10} & \frac{17}{25}\end{array}$ $\qquad$ $\frac{60}{100}$ $\frac{68}{100}$ $\frac{80}{100}$  mark

8 Dinesh is buying a field that is $6 \frac{4}{5}$ hectares in area and a wood that is 6.75 hectares. Which is larger: the field or the wood? $\qquad$ the field

9 Complete the boxes to find the total.

$$
\frac{3}{4}+\frac{1}{10}=\frac{15}{20}+\frac{2}{20}=\frac{17}{20}
$$

10 What is $4 \frac{7}{9}-2 \frac{1}{3}$ as a mixed number? $2 \frac{4}{9}$
11 Count back $1 \frac{3}{10}$ from $4 \frac{2}{5}$. What number do you reach? $3 \frac{1}{10}$


1 mark


1 mark

12 From a full 3-litre carton of milk Mark pours $\frac{9}{10}$ litre into a saucepan and then $1 \frac{1}{4}$ litre into a jug. Find how much milk is still in the carton. Give your answer as:
a) a fraction in its simplest form. $\frac{17}{20} \quad l \quad$ b) a decimal. $\qquad$ 0.85 1


13 Find half of $\frac{1}{8}$. $\frac{1}{2} \times \frac{1}{8}=\frac{1}{16}$
14 Write the answer to $\frac{7}{10} \times \frac{4}{5}$ in its simplest form. $\frac{14}{25}$
15 What must you multiply $\frac{5}{8}$ by to get $\frac{5}{16}$ ? $\frac{1}{2}$

16 Write the answer to $\frac{24}{25} \times \frac{3}{4}$ as a decimal. 0.72

17 True or false? $\frac{2}{3} \div 5=\frac{4}{15} \quad$ True $\square$ False $\square$
18 Find the answer. $\frac{4}{9} \div 5=\frac{4}{45}$
19 If two people equally share $\frac{5}{8}$ of a pizza, what fraction of the whole pizza do they each get? $\qquad$ $\frac{5}{16}$


20 What fraction when divided by 3 gives $\frac{3}{21} ?$
21 Divide 5 by 8 and give your answer as a fraction. $\frac{5}{8}$

22 What is $9 \div 1000$ or nine-thousandths as a decimal? 0.009

An $8 m$ length of rope is cut into 20 equal pieces.
Write, as a decimal, the length of each piece. $\qquad$ 0.4 m


24 This division has been started to find the decimal equivalent of $\frac{4}{9}$. Write the answer to four decimal places. $\qquad$ 0.4
$9 \longdiv { 4 . . ^ { 4 } 0 \quad 0 }$

## Multiply decimals by whole numbers

## Key point

It is important to know the value of the digits in decimals and to be able to make them into fractions. The headings in the grid stand for ones, tenths, hundredths and thousandths.

| $375$ | 0 | t | h | th |
| :---: | :---: | :---: | :---: | :---: |
|  | 0 | 3 | 7 | 5 |
| $\frac{7}{100}=$ | 0 | 0 | 7 |  |
| $\frac{13}{10}=$ | 1 | 3 |  |  |
| $\frac{1848}{1000}=$ | 1 | 8 | 4 | 8 |

When multiplying a decimal by a whole number, it can be easier to convert the decimal to a fraction to multiply it. You can then convert it back to a decimal.

When multiplying a fraction by a whole number, only multiply the numerator by the whole number.
$0.21 \times 7=\frac{21}{100} \times 7=\frac{147}{100}=1.47$

## Get started

1 Write $\frac{8}{1000}$ as a decimal. 0.008
2 What decimal is equal to $\frac{17}{1000} ? 0.017$
3 What is 0.573 written as a fraction?
$\qquad$
4 How many thousandths are equal to 1.574 ?

1574 1000

6 If $\frac{7}{100}=0.07$, how many hundredths are equal to double 0.07? $\frac{14}{100}$

7 How do you write fourteen-hundredths as a decimal? $\qquad$
8 What is $0.3 \times 7$ as a decimal? $\square$ 2.1


## Now try these

$9 \quad 0.5 \mathrm{~kg} \times 5=$ $\square$ kg

10 Multiply $0.07 \times 5$ and give your answer as a decimal. $\qquad$

11 What is 0.09 multiplied by 3 ? $\qquad$

12 A scoop holds 0.07 kg of flour. How much flour is in 4 scoops? $\qquad$ 0.28 kg


13 Aziz paints a picture that is 0.9 m wide and Ali paints a picture four times as wide. How wide is Ali's picture? $\qquad$ 3.6 m

14 How much greater than $£ 2$ is $£ 0.80 \times 3$ ? $\qquad$ 40 p

15 As she walks, each of Emma's steps is 0.4 m apart. If she takes 11 steps, how far from the start has she walked? $\qquad$ 4.4 m


16 Circle the mass that, when multiplied by 6 , equals 0.24 kg .
0.4 kg
0.18 kg
0.004 kg
0.3 kg
0.04 kg

17 True or false? $0.08 \times 5=0.4$ True $\square$ False $\square$
18 How far is: a) six times the distance 0.06 km ? $\qquad$ 0.36 km
b) sixty times the distance 0.06 km ? $\quad 3.6 \mathrm{~km}$

## Challenge

19 Multiply 0.08 by 21 and give your answer as a decimal. $\frac{8}{100} \times 21=1.68$
20. How many times the amount in bucket $A$ is the amount in bucket $B$ ? $\qquad$ 5


21 Find the sum of $(0.4 \times 5)$ and $(0.04 \times 5)$. $\qquad$ 2.2
$\qquad$
22 Find the difference between $(0.08 \times 12)$ and $(0.12 \times 8)$.

23 Each bottle contains 0.3 litres of lemonade. How much lemonade is in a box of 12 bottles? $\qquad$ 3.6 1

A boat travels at 0.7 km per hour. If it stays at the same speed, how far will it travel in 24 hours?
$\qquad$ km

25 How much heavier are 21 packets of these crisps than 2 packets of these biscuits? Give your answer in kilograms. $\qquad$ kg

$0.7 \times 0.7=\frac{7}{10} \times \frac{7}{10}=\frac{49}{100}$
Oliver uses this fact to help him write the answer to $0.7^{2}$ as a decimal. What is his answer? $\qquad$

A square has sides of 0.4 m . What is: a) its perimeter? $\qquad$ 1.6 m
b) its area? $\qquad$ 0.16 $\mathrm{m}^{2}$

28 Use this fact to help you answer each of these questions.
a) $\frac{17}{100} \times 6=\frac{102}{100}$
b) $\frac{17}{1000} \times 6=\frac{102}{1000}$
c) $0.17 \times 6=1.02$
d) $0.017 \times 6=0.102$

## Multiply and divide by 10, 100 or 1000

## Key point

When multiplying by 10,100 or 1000 the digits move to the left (one, two or three places).
When dividing by 10,100 or 1000 the digits move to the right (one, two or three places).


$=$| Th | $\mathbf{H}$ | $\mathbf{T}$ | $\mathbf{0}$ | $\mathbf{t}$ | $\mathbf{h}$ | th |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
|  | 9 | 3 | 2 |  |  |  |
|  |  | 4 | 4 |  |  |  |

$$
932 \div 10=93.2
$$

## Get started

1 How many places to the right do the digits move when dividing by 100 ? $\qquad$ 2

2

| T | 0 | t | h | th |
| :--- | :--- | :--- | :--- | :--- |
|  | 8 |  |  |  |

Divide the number above by 100 , using the grid to help. 0.08

3

| T | $\mathbf{0}$ | $\mathbf{t}$ | h | th |
| :---: | :---: | :---: | :---: | :---: |
|  | 0 | 0 | 5 |  |

Multiply the number above by 100, using the grid to help. $\qquad$ 5 $\qquad$

4 How many places to the left do the digits move when multiplying by 1000 ?
$\qquad$
5 What is $0.004 \times 1000$ ? $\qquad$
6 What is 6 divided by 1000 , as a decimal? 0.006
$73.2 \times 10=32$
8 True or false? $1.2 \div 100=0.12$
True $\square$ False $\triangle$

## Now try these

Complete the table.

|  | $\times \mathbf{1 0}$ | $\times \mathbf{1 0 0}$ | $\times \mathbf{1 0 0 0}$ | $\div \mathbf{1 0}$ | $\div \mathbf{1 0 0}$ | $\div \mathbf{1 0 0 0}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 5.1 | 51 | 510 | 5100 | 0.51 | 0.051 | 0.0051 |

10
What is 0.42 multiplied by 1000 ? 420

Divide 170 by 1000 . $\qquad$
12
What number when divided by 100 gives 0.04 ? $\qquad$ $0.26 \times 1000=260$

Ten people must all pay equal amounts for a camera costing $£ 197$. How much should they each pay? $f$ $\qquad$ 19.70


16 A 13 m line is split into 100 equal parts. Give the length of each part:
a) in metres. $\qquad$ m
b) in centimetres. $\qquad$ 13 cm
c) in millimetres. $\qquad$ 130 mm

17 What is one-thousandth of 21 plus one-hundredth of 21 plus one-tenth of 21? $\qquad$ 2.331

18 True or false? One thousand lots of 0.013 kg is 13 kg . True $\square$ False $\square$

## Challenge

Mark the answer to 145 divided by 1000 on the line.


A warehouse has 1000 of one of these tins of paint. If the total amount of paint in the 1000 tins is 210 litres, tick the tin the warehouse has.


21 True or false? Dividing by 1000 gives the same answer as multiplying by $\frac{1}{1000}$. True $\square$ False $\square$ What is $70.5 \times \frac{1}{100}$ as a decimal? 0.705

23 The arrow is pointing to the answer to the question $? \div 1000$. What is the missing number in the question?
 2330

A hose lets out 0.66 litres of water every second. Lucy wants to fill her 66-litre pond.
How many seconds will it take to fill it? $\qquad$ 100 sec

25 A box containing 1000 staples weighs 222 grams.


The box when empty weighs 12 grams.
How much does each staple weigh? $\qquad$ $g$

Add the product of 10 and 4.2 to the product of 1000 and 0.42 . $\qquad$ 462

Circle the two numbers where one number is 1000 times that of the other.
0.067
$6.7 \quad \frac{67}{1000}$
$670 \frac{67}{100}$
28 Charlie chooses a number to divide by 1000. His answer as a mixed number is $8 \frac{7}{100}$.
a) What is his answer as a decimal? $\qquad$ b) What was his chosen number? $\qquad$ 8070

## Round decimals to a given number of decimal places

## Key point

| $\mathbf{H}$ | $\mathbf{T}$ | $\mathbf{O}$ | $\mathbf{0}$ | h | th | tth |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 4 | 2 | 5 | 4 | 8 | 2 | 9 |

When rounding, look at the digit in the column to the right of the one you are rounding to. If rounding to the nearest tenth (to one decimal place), look at the hundredths digit. If rounding to the nearest hundredth (to two decimal places), look at the thousandths digit, and so on. If the digit is 5 or more, round up.
425.4829 rounded to the nearest whole number is 425 .
425.4829 rounded to the nearest tenth (one decimal place) is 425.5 .
425.4829 rounded to the nearest hundredth (two decimal places) is 425.48.
425.4829 rounded to the nearest thousandth (three decimal places) is 425.483 .

## Get started

1 Mark the decimal 3.27 on this line.


2
Does 3.27 round to 3.2 or 3.3 , when rounding to the nearest tenth? $\quad 3.3$

3 Circle the tenths digit in this number.
25 .(4) 3
4 Is the tenths digit of 25.493 five or higher?
Yes $\square$ No $\square$

True or false? 25.493 when rounded to the nearest whole number is 25 .
True


False $\square$
Is the thousandths digit of the decimal 303.728 five or higher?

Yes $\triangle$ No $\square$
7 What is 303.728 rounded to the nearest hundredth (two decimal places)? 303.73

8 To how many decimal places has 6.4769 been rounded to give the answer 6.5? $\qquad$

## Now try these

True or false? 57.7394 is 57.73 to two decimal places. True $\square$ False
 Fill in the missing numbers.

| decimal | to the nearest <br> whole number | to the nearest <br> tenth | to the nearest <br> hundredth | to the nearest <br> thousandth |
| :---: | :---: | :---: | :---: | :---: |
| 5.7493 | 6 | 5.7 | 5.75 | 5.749 |

A calculator shows the number 0.142857 on the display. Jamie writes this number to the nearest tenth (to one decimal place). What is his answer? $\qquad$ 0.1

12 Fill in the missing numbers.

| decimal | to the nearest <br> whole number | to the nearest <br> tenth | to the nearest <br> hundredth | to the nearest <br> thousandth |
| :---: | :---: | :---: | :---: | :---: |
| 0.0736 | 0 | 0.1 | 0.07 | 0.074 |

Write this number to two decimal places. $\qquad$

Find the sum of 53.741 kg and 101.044 kg . Give the answer to one decimal place. $\qquad$ 154.8 kg

15 Circle the two decimals that are 4.42 when rounded to two decimal places.


16
Answer these questions, giving your answers to two decimal places.
a) $14.858-2.202=12.66$
b) $47.3 \div 100=0.47$

When rounding to the nearest hundredth of a kilogram, what does 9.196 kg round to? $\quad 9.20 \mathrm{~kg}$
18 What is the smallest decimal with two decimal places that is 12.8 when rounded to the nearest tenth? 12.75

## Challenge

19 Find the total of the amounts in this receipt and give the answer to the nearest pound.
f $\qquad$

20 A lottery winner wins $£ 7.1057$ million.
a) Is this closer to $£ 7.10$ million or $£ 7.11$ million? $£$ $\qquad$ million
b) What is the winning amount to three decimal places? $£ 7.106$ million

21 What is the total amount in the three buckets to:
a) one decimal place? $\qquad$ 8.4 1
b) two decimal places? $\qquad$ 8.38


22 Round each of these masses to one-tenth of a kilogram and use your estimates to give an approximate total.
$0.405 \mathrm{~kg}+0.371 \mathrm{~kg}+0.285 \mathrm{~kg}+0.051 \mathrm{~kg}=1.2 \mathrm{~kg}$
23 One mile is equal to 1609.344 metres. How many metres is 2 miles?
Give your answer to the nearest metre. $\qquad$ 3219 m
$363 \div 16=22.6875$ Use this fact to help you write the answer to $£ 3630 \div 16$ to two decimal places. $\qquad$
25 The number of inches equal to half a metre is 19.685039370079 to 12 decimal places.
Round this number to: a) one decimal place. $\qquad$ inches
b) two decimal places. $\qquad$ inches c) five decimal places. $\qquad$ 19.68504 inches

Use written division to convert $\frac{1}{3}$ to a decimal and give your answer to two decimal places. $\qquad$ 0.33 True or false? The fraction $\frac{1}{6}$ as a decimal is 0.166 when rounded to three decimal places. True $\square$ False $\triangle$

28 Divide the numerator by the denominator for each of these fractions and give each answer as a decimal to three decimal places.
a) $\frac{5}{6} \quad 0.833$
b) $\frac{7}{9} \quad 0.778$
c) $\frac{6}{11} \quad 0.545$
d) $\frac{2}{11} \quad 0.182$

## Solve problems involving fractions and decimals

## Key point

There are several ways to find a fraction of a quantity.
$\frac{5}{8}$ of 40 or $\frac{5}{8} \times 40$
Method 1: Divide by the denominator (to find one part) and multiply by the numerator (to find several parts).
Divide by 8 to find $\frac{1}{8}$ and multiply by 5 to find $\frac{5}{8} . \quad 40 \div 8 \times 5=25$
Method 2: Use equivalent fractions.

The missing number is the answer, 25.


Method 3: Multiply the numerator by the whole number and simplify.
Multiply 5 by 40 to get the fraction $\frac{200}{8}$, then simplify to get 25 .
$\frac{5}{8} \times 40=\frac{200}{8}=\frac{100}{4}=\frac{25}{1}=25$
If you need to multiply a decimal by a whole number, it can be easier to convert the decimal to a fraction first. You can then use one of the three methods above.
$0.35 \times 160=\frac{35}{100} \times 160=\frac{7}{2 Q_{1}} \times 16 Q^{8}=7 \times 8=56$
In the same way, it can sometimes be easier to convert fractions to decimals before multiplying.

## Get started

1 Find $\frac{4}{7}$ of 77 cm . 44 cm


2 What length is four-fifths of this line?


3 Find $\frac{2}{3}$ of 33 p. $\qquad$ p
$4 \frac{3}{8} \times £ 40=£ 15$

5 Use the fact that $\frac{3}{8}=\frac{60}{160}$ to find $\frac{3}{8}$ of $£ 160$. £ 60

6 If $\frac{5}{6}=\frac{60}{72}$, what is $\frac{5}{6}$ of 72 kg ? $60 \quad \mathrm{~kg}$
7 Use the equivalent fractions to find $\frac{2}{3}$ of 27 .

$$
\frac{2}{3}=\frac{18}{27} \text { so } \frac{2}{3} \text { of } 27 \text { is } 18
$$

8 Fill in the missing number. $\frac{4}{5} \times 2=\frac{8}{5}$

## Now try these

9 Give the answer as a mixed number. $\frac{4}{5} \times 2=1 \frac{3}{5}$


10 How many minutes are in $\frac{7}{12}$ of an hour? $\frac{7}{12}=\frac{?}{60}=$ $\square$
$11 \quad 0.55=\frac{11}{20} \quad$ Fill in the boxes. $0.55 \times 15=\frac{11}{20} \times 15^{3}=\frac{33}{4}=8 \frac{1}{4}$
12 Write the answer to $0.55 \times 15$ as a decimal, using your answer to question 11 . $\qquad$ 8.25

13 True or false? $0.45 \times \mathrm{f} 200=£ 90 \quad$ True $\square$ False $\square$
14 A full turn is $360^{\circ}$. How many degrees in $\frac{5}{6}$ of a full turn? $\qquad$ $300^{\circ}$
15 Find the difference between $\frac{7}{8}$ of 72 litres and $\frac{7}{9}$ of 72 litres. $\qquad$ -

16 Write 0.92 as a fraction with hundredths.
Then write it in its simplest form.
Use this fraction to help you answer $0.92 \times £ 75$.

$$
\frac{92}{100}=\frac{23}{25} \quad 0.92 \times £ 75=£ 69
$$

17 Gita draws a line that is $\frac{7}{12}$ the length of line $A$. How long is Gita's line? $\qquad$ cm 18 How many times the amount in $B$ is the amount in $A$ ? 10

## Line A 84 cm <br> | Line A |
| :--- |
| 84 cm |



## Challenge

19 What is the difference between $\frac{3}{8}$ of 400 and $0.375 \times 400 ?$
20 When drawing a pie chart Ravi colours $\frac{3}{5}$ of the chart in gold. What angle does he use for this section? 216 .


21 Harry's stride measures 0.6 m . What is the length of 11 of his strides? Give your answer as:
a) a mixed number. $\qquad$ m
b) a decimal. $\qquad$ 6.6 m
22. A bottle of juice holds $\frac{2}{3}$ litre. How much less than 8 litres do 11 bottles hold as a fraction? $\qquad$ $\frac{2}{3}$ 1

23 How much is $\frac{2}{3}$ litre as a decimal rounded to three decimal places? $\qquad$ 0.6671

24 Nine people shared some pineapples. Each person ate 0.75 of a pineapple. What is the smallest number of pineapples that they could have shared? $\qquad$ 7
 Maya is $\frac{11}{12}$ of the height of her brother. Her brother is 132 cm tall. How much taller is her brother than Maya? _11 cm

A rectangle has a length of 13.75 cm and a width that is $5 \frac{1}{2} \mathrm{~cm}$ less than its length.
What is the perimeter of the rectangle in: a) centimetres? $\qquad$ 44 cm
b) metres? $\qquad$ 0.44 m
$\qquad$ m

56 cm
Each episode of a TV series is $\frac{17}{20}$ hour. When watching the episodes back-to-back without a break, how long would it take to watch: a) two episodes? $\qquad$ 102 min b) six episodes? $\qquad$ 5 hr $\qquad$ 6 min

## Solve percentage problems including comparison

## Key point

The percentage symbol, \%, stands for per cent, which means out of every 100.


So $27 \%$ means 27 out of $100, \frac{27}{100}$ or 27 hundredths.
Any fraction can be written as a percentage. If you can, multiply both the numerator and denominator by a number which will give the denominator 100 .
$\frac{1}{4}=\frac{25}{100}=25 \% \quad \frac{17}{50}=\frac{34}{100}=34 \%$
If the denominator of the fraction is not a factor of 100 , for example $\frac{3}{8}$, divide the numerator by the denominator to find the decimal. Then multiply it by 100 to give the percentage.
$3 \div 8=0.375 \quad 0.375 \times 100=37.5 \quad$ so $\frac{3}{8}=37.5 \%$

## Get started

1 True or false? $57 \%$ means $\frac{57}{100}$. True $\qquad$ False $\square$
2 Write $81 \%$ as a fraction with the denominator 100 .


3 What percentage is equal to $\frac{9}{100}$ ? $\quad 9 \quad \%$
4 Given that one-half is $\frac{50}{100}$, what is one-half as a percentage?
$\qquad$ \%

5 Fill in the missing numbers.
$\frac{7}{10}=\frac{70}{100}=70$

6 Circle the percentage of this grid that is gold.


7 Write $40 \%$ as a fraction with the denominator 100 and then in its simplest form.
$40 \%=\frac{40}{100}=\frac{2}{5}$
8 Colour $40 \%$ of this shape.


## Now try these

9 Circle which is greater: $\frac{1}{10} 8 \%$
10 Given that $\frac{1}{20}=\frac{5}{100}$, what is $\frac{1}{20}$ as a percentage? $\qquad$ \%
What percentage is $\frac{3}{20}$ ? 15 \%
12 Find $\frac{1}{25}$ as a percentage. $\frac{1}{25}=\frac{4}{100}=4$
13 Tick which is greater: $\frac{1}{25}$ or $3 \%$. $\frac{1}{25} \quad 3 \% \square$

14
Write > or < to show which is greater. $\square$ 60\%

15 Rashid scored 11 out of 20 in a test. What is his score as a percentage? $55 \%$
16 Write $\frac{7}{25}$ as: a) a fraction with hundredths. $\frac{28}{100} \quad$ b) a percentage. $\quad 28 \%$
17 Maryam scored 7 out of 10 in a test and Adam scored 69 out of 100.
Who has the better percentage? $\qquad$
18 In a music exam, Daniel scored 17 out of 25.
What is his score as a percentage? $\qquad$ 68\%


## Challenge

19 Put these in ascending order.
$\frac{3}{10} \quad 4 \% \quad \frac{2}{5} \quad 35 \% \quad 4 \% \quad \frac{3}{10} \quad 35 \%-\frac{2}{5}$

20 A vase holds $20 \%$ of one litre. What percentage of a litre does $\frac{1}{4}$ of the vase hold? $\qquad$ 5\%

21 There are 100 children in a school and $55 \%$ of them are girls. What fraction of the children in the school are boys? Give the answer in its simplest form. $\frac{9}{20}$

22 As a percentage of a whole, by how much greater is $\frac{24}{25}$ than $\frac{19}{20}$ ? $\qquad$
23 This table shows the number of questions correctly answered in several tests. Write each score as a percentage.

| correctly answered | number of <br> questions in total | percentage <br> score |
| :---: | :---: | :---: |
| 7 | 10 | $70 \%$ |
| 3 | 5 | $60 \%$ |
| 4 | 25 | $16 \%$ |
| 130 | 200 | $65 \%$ |

24 In an athletics stadium 2480 of the 4000 people are male. What percentage of the people there are:
a) male? $\qquad$ b) female? $\qquad$ $38 \%$

25 There are 20 questions in a quiz. Li gets 17 correct, Mia gets $\frac{4}{5}$ of the total number of questions correct and Ben scores $75 \%$. a) Who scores the most? $\qquad$ Li
b) Who scores the least? $\qquad$ Ben
c) How many more questions does Li get correct than Ben? $\qquad$ 2 -

Divide 5 by 8 to help you give $\frac{5}{8}$ as: a) a decimal. $\qquad$ b) a percentage. $\qquad$
Write $\frac{1}{3}$ as: a) a decimal to three decimal places. $\qquad$ 0.333
b) a percentage to one decimal place. $33.3 \%$

28 Write whether each statement is true or false.
a) $\frac{8}{9}$ is approximately $89 \%$ (to the nearest whole number). $\qquad$ true
b) $\frac{2}{3}$ is approximately $60 \%$ (to the nearest whole number). $\qquad$ false
c) $\frac{5}{6}$ is approximately $83 \%$ (to the nearest whole number). $\qquad$

## Convert between fractions, decimals and percentages

## Key point

Proportions of a whole can be described as fractions, as decimals and as percentages. Sometimes it is easier to work with fractions while at other times it is easier to work with percentages or decimals.


## Get started

1 Use the fact that $25 \%$ is one-quarter to help you find $25 \%$ of 400 ml . 100 m

2 How many lots of 0.1 m are in one whole metre? $\qquad$ -

Jacob scored 7 out of 10 in a test.
What is this score as a percentage? $\qquad$ 70 \%

4 What percentage of a whole turn are three right angles?
$\qquad$ \%

What is one-fifth as a percentage? $\qquad$ 20 \%

6 Write 0.6 as a fraction and as a percentage.
$0.6=\frac{6}{10}=60 \quad \% \quad$ Also accept $\frac{3}{5}$
7 Complete the table.

| fraction | percentage | decimal |
| :---: | :---: | :---: |
| $\frac{83}{100}$ | $83 \%$ | 0.83 |
| $\frac{20}{100}$ | $20 \%$ | 0.20 or 0.2 |

8 What fraction of a kilogram is the total mass of these two bags? $\frac{1}{2}$ kg


## Now try these

9 Fill in the boxes to find the missing percentage. $\frac{22}{25}=\frac{88}{100}=88 \%$
10 What is the score $\frac{41}{50}$ as a percentage? $\quad 82 \%$
11 Write what $£ 150$ is as a proportion of $£ 200$ as a percentage. 75\%

12 Six minutes is equal to one-tenth of an hour. What percentage of an hour is 48 minutes? $\qquad$


13 Simplify $\frac{8}{100}$ to help you give $8 \%$ as a fraction in its simplest form. $\qquad$

Adele scored 243 out of 300 in an exam. Write this as a fraction with the denominator of 100 and then as a percentage. a) fraction $\frac{81}{100} \quad$ b) percentage $\quad 81 \%$

17 Sadiq has $£ 175$ and has to pay $32 \%$ of it in tax. Fill in the gaps to find how much tax he has to pay.
$32 \%$ of $£ 175=\frac{32}{100} \times £ 175=\frac{8}{25} \times £ 175=£ \frac{56}{}$
Find the difference in kilograms between $2 \%$ of 3200 kg and $\frac{3}{100}$ of 2100 kg . $\qquad$ 1 kg

## Challenge

19 Complete the table.

| fraction in its simplest form | percentage | decimal |
| :---: | :---: | :---: |
| $\frac{13}{20}$ | $65 \%$ | 0.65 |
| $\frac{2}{25}$ | $8 \%$ | 0.08 |

A can of cola holds 0.33 litres and a bottle of cola holds $58 \%$ of a litre. Find the difference between the amount in each and write the answer as a fraction of a litre in its simplest form. $\qquad$ how far from the start has he walked? Give your answer as:

a) a decimal. $\qquad$ m
b) a mixed number in its simplest form. $\qquad$ $3 \frac{3}{4}$ m

22 A phone that cost $£ 75$ is reduced by $£ 15$ in a sale.
By what percentage of the original price is it reduced? $\qquad$ $20 \%$

Find the total mass of these two tins and write the answer as a: $0.45 \mathrm{~kg} \quad 0.4 \mathrm{~kg}$
a) percentage of a kilogram.
85\%
b) fraction of a kilogram in its simplest form. $\qquad$ kg

Juanita has $£ 56$. She gets $8 \%$ in interest. How much interest does she get? $£$ $\qquad$ 4.48

25 Ruby takes out $20 \%$ of the money in her savings account. She takes out $£ 34$.
a) How much money does she have in total? $£$ $\qquad$ 170
b) How much is left in the savings account now? $£ 136$

A nurse is giving some medicine to a child. The child's dose is $60 \%$ of the adult's dose. If the adult's dose is 0.2 litre, what is the child's dose in millilitres? $\qquad$ 120 ml


27 There are 25 questions in a test. Noah gets 16 correct, Dylan gets 0.6 of the total number of questions correct and Ella scores 68\%. a) How many per cent more than Noah does Ella score? $\qquad$ 4\% b) How many more questions does Ella get correct than Dylan? $\qquad$ 2 Two-thirds of a litre of juice is put into a bottle that holds 2 litres. How full is the bottle? Give your answer as a percentage of 2 litres, to the nearest whole number. $\qquad$ $33 \%$

## Check-up test 2

1 Write $\frac{6}{1000}$ as a decimal. 0.006

2 Multiply 0.07 by 3. 0.21

3 How much less than $£ 3$ is $£ 0.90 \times 3$ ? $\qquad$ p

4 A boat travels at 0.9 km per hour. If it stays at the same speed, how far will it travel in 24 hours? $\qquad$ km


5 A square has sides of 0.6 m . What is:
a) its perimeter? $\qquad$ 2.4 m
b) its area? $\qquad$ $\mathrm{m}^{2}$


6 What number when divided by 100 gives 0.09 ? $\qquad$ 9

7 Ten people must equally pay for something costing $£ 231$.
How much should they each pay? f $\qquad$ 23.10

8 Josh chooses a number to divide by 1000 . His answer as a mixed number is $4 \frac{3}{100}$.
a) What is his answer as a decimal? 4.03
b) What was his chosen number? 4030

9 Does 4.73 round to 4.7 or 4.8 when rounding to the nearest tenth? $\qquad$ 4.7

10 A calculator shows the number 0.32582 on its display. Luca writes this number to the nearest tenth (to one decimal place).

What is his answer? $\qquad$ .3


11 When rounding to the nearest hundredth of a kilogram, what does 6.496 kg round to? $\qquad$ 6.50 kg

12 One mile is equal to 1609.344 metres. How many metres is 3 miles?
Give your answer to the nearest metre. $\qquad$ 4828 m


1 mark


1 mark


1 mark

1 mark


1 mark


1 mark


1 mark
(13) $\frac{5}{6} \times £ 30=£ 25$


1 mark


1 mark


1 mark


1 mark


1 mark


1 mark

## Solve problems involving calculating percentages

## Key point

Use fractions to help you find percentages of numbers and quantities.
$1 \%=\frac{1}{100}$ so to find $1 \%$ divide by 100 . $1 \%$ of $£ 800=£ 800 \div 100=£ 8$
$25 \%=\frac{25}{100}=\frac{1}{4}$ so to find $25 \%$ divide by $4 . \quad 25 \%$ of $£ 800=£ 800 \div 4=£ 200$
Use the percentages you know to work out more difficult percentages using multiplication, addition or subtraction.
$3 \%$ of $£ 800=1 \% \times 3=£ 8 \times 3=£ 24 \quad 26 \%$ of $£ 800=25 \%+1 \%=£ 200+£ 8=£ 208$

## Get started

1
Find $50 \%$ of $£ 32$. $£$ $\qquad$ 16

2 True or false? $25 \%$ of 12 is 4 . True
 False $\triangle$


3 What is $10 \%$ of 520 ml ? $\qquad$ 52 ml

4 Given that $75 \%=\frac{3}{4}$, find $75 \%$ of 20 kg . 15 kg


5 If $10 \%$ of 1200 is 120 , what is $20 \%$ of 1200 ?
$\qquad$
6 Find $10 \%$ of 90 and use your answer to give $30 \%$ of 90 . $\qquad$ 27

7 Laura spent $30 \%$ of $£ 8000$ on a new scooter.
How much did she spend? £ 2400


8 True or false? 70\% of 400 is 280.
True $\qquad$ False


## Now try these

9 A ballerina does a full turn of $360^{\circ}$.
How many degrees are in $30 \%$ of a full turn? 108 .
10 Write in words the answer to 'one per cent of two thousand'. $\qquad$ twenty


11 Complete the boxes to find $11 \%$ of 300 m .
$10 \%$ of $300 \mathrm{~m}=30 \mathrm{~m} \quad 1 \%$ of $300 \mathrm{~m}=3 \mathrm{~m} \quad$ so $11 \%$ of $300 \mathrm{~m}=33 \mathrm{~m}$
12 True or false? $7 \%$ of $£ 500=£ 35 . \quad$ True $\square$ False $\square$
13 If $25 \%$ of 1400 is 350 and $10 \%$ of 1400 is 140 , what is $35 \%$ of 1400 ? $\qquad$ 490

14 Given that $1 \%$ of $700=7$ use subtraction to find $99 \%$ of 700.693


Find $5 \%$ of: a) 300 ml . $\qquad$ ml
b) 80 cm . $\qquad$ cm

Amir draws a line that is $15 \%$ of the length of line A.
Line A How long is Amir's line? $\qquad$ mm

60 mm

True or false? 50\% of a number is ten times as large as 5\% of the same number. True $\square$ False $\square$ Find $50 \%$ of 140 and $5 \%$ of 140 and use your answers to find $45 \%$ of 140. $\qquad$
18

## Challenge

When drawing a pie chart Gemma colours 55\% of the chart in gold. What angle does she use for this section? $\qquad$ 198 -

$86 \%=50 \%+25 \%+10 \%+1 \%$ Use this fact to help you find $86 \%$ of 3200. $\qquad$ 2752

## 21 <br> $15 \%$ of $£ 2600 \quad 11 \%$ of $£ 3400 \quad 55 \%$ of $£ 700$

What is the value of: a) the largest of the above amounts? $£ 390$
b) the smallest of the amounts? $f$ $\qquad$ 374 c) the total of the amounts? $£$ $\qquad$ 1149

How many minutes is $80 \%$ of one hour? $\qquad$ 48 $\min$

True or false? 47\% of one hour is 28 minutes and 12 seconds. True $\checkmark$ False $\square$
24 A piece of metal is 120 cm in length. A machine in a factory makes a hole $61 \%$ of the way along its length. How far from the furthest end is the hole, in centimetres (to one decimal place)? $\quad 73.2 \mathrm{~cm}$

The width of a rectangle is 80 mm . Its length is $20 \%$ greater than its width. Find the perimeter of the rectangle in centimetres. $\qquad$ 35.2 cm

80 mm


26
Emily draws a line that is $110 \%$ of the length of line B . Line B How long is Emily's line? $\qquad$ 55 mm 50 mm

27 A doctor is giving some medicine to a child. The child's dose is $72 \%$ of the adult's dose. If the adult's dose is 110 ml , what is the child's dose? $\qquad$ 79.2 ml

Kofi earns $£ 32000$ per year. He pays $21 \%$ of the money in tax and $5 \%$ into his pension. How much money does he have after paying those? $f$ $\qquad$ 23680


## Understand ratio and use a:b notation

## Key point

A fraction compares a part with the whole.


Ratio compares parts of the whole with each other.


2 questions correct and 5 questions wrong is the ratio 2:5.
Ratio is used to describe relationships between parts, for example, 'for every 2 questions correct, there are 5 wrong' or 'for every 3 girls in the room there are 4 boys'. These are written as 2:5 and 3:4.

## Get started

1 Given that $\frac{2}{5}$ of this shape is gold, what is the ratio of gold parts to white parts? gold: white 2:3


2 On this necklace $\frac{5}{8}$ of the beads are gold. What is the ratio of gold to white beads? gold: white

3 If 1 out of 5 of the children in a room are girls, what is the ratio of girls to boys? girls: boys 1:4

4 Write the ratio of gold stars to white stars.


5 What fraction of the stars in question 4 are gold? $\qquad$
6 What is the ratio of gold parts to white parts in this square?


## Give the ratio of gold to white sweets.



What fraction of the above sweets are white? $\qquad$

## Now try these

9 Colour this grid so that the ratio of coloured to white squares is 4:5.
 True or false? If one-quarter of these bottles are full and the rest are empty, the ratio of full bottles to empty bottles is 1:4. True $\square$ False $\square$


11 For every gold section of this pattern there are two white sections. Circle which shows the ratio of gold to white sections.
1:3
2:1

```
    1:2
```

A wall has blue and green tiles. For every 4 blue tiles there is 1 green tile. blue : green Write this as a ratio.

An ice cream shop sells 3 scoops of vanilla ice cream for every scoop of caramel ice cream. Write this as a ratio of vanilla to caramel scoops. $\qquad$ 3:1

14 A shop has a 'buy two, get one free' offer. Write the ratio of paid for items to free items. $\qquad$ 2:1

A class of children get into seven equal groups. Three of the groups are all girls.
The rest of the groups are all boys. What is the ratio of girls to boys? $\qquad$ 3:4

Half the people in a room are adults and half are children. Write the ratio of adults to children. $\qquad$ 1:1

17
There are ten fish in a fish tank. Three are angel fish and seven are guppies.
a) What is the ratio of angel fish to guppies?
b) What fraction of the fish are angel fish? $\qquad$


The ratio of pens to pencils in a pencil case is 5:6. What fraction of the items are:
a) pens? $\frac{5}{11}$
b) pencils? $\qquad$

## Challenge

One-third of a team's matches were won. The rest were lost. What was their 'win : lose' ratio? $\qquad$ $1: 2$

20 In a hockey match 7 out of the 12 shots at the goal were on target.
What was the ratio of shots on target to shots not on target? $\qquad$ $7: 5$


The instructions for a drink say to use squash to water in the ratio 1:6.
What fraction of the mixed drink is water? $\qquad$
A factory makes different coloured sweets. $\frac{1}{8}$ of the sweets are blue. For every 2 blue sweets there are 3 red sweets. Write the ratio of: a) blue to not blue sweets. $\qquad$ b) red to blue sweets. $\qquad$ 3:2

For every $£ 2$ Ali saves his dad gives him $£ 3$ more.
What fraction of the money altogether comes from his dad? $\qquad$ $\frac{3}{5}$

24 Circle the two fractions that could be used to describe the ratio 1:9. $\frac{3}{9} \quad \frac{1}{10} \quad \frac{5}{9} \quad \frac{9}{10}$


Circle the two fractions that could be used to describe the ratio 4:5.
$\frac{5}{8}$
$\frac{4}{5}$
$\frac{5}{9}$
$\frac{4}{9}$
$\frac{5}{4}$


If $30 \%$ of a group of children are girls, what is the ratio of girls to boys? $\qquad$ 3:7

In bowl A the ratio of green olives to black olives is $20: 10$. In bowl B the ratio is $2: 1$. For each bowl, write the fraction of black olives in its simplest form.
a) bowl A $\qquad$ $\frac{1}{3}$
b) bowl B $\qquad$ $\frac{1}{3}$

Oscar makes scones using the ratio 3:2:1 of flour to butter to sugar. What fraction of the mixture is:
a) flour?
$\frac{3}{6}$ or $\frac{1}{2}$
b) butter? $\qquad$ c) sugar? $\qquad$

## Recognise numbers in the same ratio

## Key point

Like equivalent fractions, equivalent ratios can be found by multiplying or dividing both numbers by the same number. In the same way that the fraction $\frac{5}{10}$ can be simplified to $\frac{1}{2}$ by dividing both the numerator and denominator by the common factor 5 , both numbers in the ratio 5:10 can be divided by 5 to give the equivalent ratio $1: 2.5: 10$ is said to be in the same ratio as 1:2.

## Get started

For every 2 milk chocolates in a box there is 1 dark chocolate. Multiply both numbers in the ratio by 5 .


True or false? 2:1 is in the same ratio as 10:5. True
 False $\square$

For every 2 sheep in a sheep: goats field there are 8 goats. Divide both numbers by 2 .

$$
\div 2\left(\begin{array}{c}
2: 8 \\
1: 4
\end{array} \div 2\right.
$$

4
True or false? 2:8 is in the same ratio as 1:2.
True $\qquad$ False


5 Is the ratio 2:1 in the same ratio as $8: 4$ ?
Yes


No



Two of these are in the same ratio. Circle them both.


In this pattern there are 6 gold parts and 9 white parts. For every 2 gold parts, how many white parts are there? gold: white

$$
6: 9
$$

$$
2: 3
$$



## Now try these

9 Complete the sequence of ratios in the same ratio as 1:2.
1:2, 2:4, 3:6, 4:8, 5:10, $\qquad$ 6:12 , $\qquad$ 7:14 Colour this grid so that for every 1 white square there are 2 squares coloured.


The ratio of knives to forks is $1: 1$. How many knives are there if there are 27 forks? $\qquad$ 27 In a football match 6 shots at the goal were on target and 18 were not. on target: not on target For every shot on target, how many were not on target?

A shop has a 'buy two, get one free' offer. How many free items will you get if you buy 6 items?

$$
\begin{gathered}
\text { buy: free } \\
2: 1 \\
\hline 6: 3
\end{gathered}
$$

In a box, 4 out of the 24 chocolates are milk chocolates.
milk : not milk
For every milk chocolate, how many are not milk chocolate?

4:20
1:5

Fill in the missing numbers to show a sequence of ratios in the same ratio (as 3:4). $3: 4,6: 8,9: 12,12: 16,15: 20,18: 24,21: 28$

16 In a factory the ratio of full bottles to empty bottles is 1:3.
If there are 100 full bottles, how many empty bottles must there be? $\qquad$


Which ratios are in the same ratio as 3:2? Circle four.
6:2
9:3
30:20
$6: 4$
$9: 6$
4:6

A recipe says 'for every 3 tomatoes use 5 mushrooms'. Tick each statement that is true. I could use 10 tomatoes and 6 mushrooms.
 I could use 10 mushrooms and 6 tomatoes. I could use 33 tomatoes and 55 mushrooms.


## Challenge

Write the next three ratios in this sequence.
5:3, 10:6, 15:9, 20:12, $\qquad$ 25:15 , 30:18 , 35:21

20 A wall has plain and patterned tiles. For every 4 plain tiles there is 1 patterned tile. If there are 20 plain tiles, how many must be patterned? $\qquad$ 5


Which ratios are in the same ratio as 2:5?
10:15
25:10
14:35
16:40
6:4 8:10
$6: 15$

A chef prepares 16 risottos and 20 lasagnes. Is the risotto to lasagne ratio 4:5?
Yes $\triangle$ No $\square$
Write the ratio $25: 15$ in its simplest form by dividing both numbers by their largest common factor.
$\qquad$

24
To make a drink, the instructions say to use lemon squash to water in the ratio 1:6. How much water would you use for 50 ml of squash? $\qquad$ 300 ml

A cricket team won 24 matches and lost 30 matches in a season.
 For every 4 matches won, how many were lost? $\qquad$ 5

There are 27 girls and 36 boys in the school hall. For every 3 girls, how many boys are there? $\qquad$ 4

A team's 'win : lose' ratio is 5:2. If the team has lost 18 games, how many has it won? $\qquad$ 45

There are 32 green olives and 28 black olives in a bowl. What is the ratio of green to black olives in its simplest form? $\qquad$ 8:7

## Solve ratio problems involving two quantities

## Key point

Most ratio problems involve numbers in the same ratio. To keep the numbers in the same ratio, always multiply or divide both numbers by the same number. To find a missing number, look at what one number has been multiplied or divided by and do the same to the other number.


> 20 has been divided by 5 to get 4 , so 25 must be divided by 5 to find the missing number.


1 has been multiplied by 3 , so 4 must be multiplied by 3 to find the missing number.

## Get started

For every 2 brownies in brownies : flapjacks a box there is 1 flapjack. How many flapjacks are there if there are 10 brownies?

2
For every 2 sheep in a field there are 8 goats. How many goats are there for every 1 sheep?

A shape has 6 gold parts and 15 white parts. For every 2 gold parts, how many white parts are there?
 girls to every 3 boys. If

$$
\begin{gathered}
\text { gold : white } \\
6: 15 \\
\hline 2: 5 \\
\hline
\end{gathered}
$$

In a classroom there are 2 there are 20 girls, how many boys are there? $\qquad$ 30

$$
2: 3
$$

 If there are 15 girls, how many boys are there?
$\qquad$

6
Alfie has 3 apps for every 2 George has. If Alfie has 21 apps, how many does George have?
$\qquad$
14

A chef makes soup using 3 peppers for every 4 courgettes. She uses 15 peppers. How many courgettes does she use?
$\qquad$
True or false? There are 10 hens and 35 chicks in a farmyard. The ratio of hens to chicks is 2:7.


## Now try these

9 Colour this grid so that for every 3 white squares there are 2 squares coloured.
10 In a netball match, 4 shots at the goal were on target and 14 were not. For every 2 shots on target, how many were not on target? on target: not on target

$$
\begin{array}{|c|}
\hline 4: 14 \\
\hline 2: 7 \\
\hline
\end{array}
$$



A company gave money to two workers in the ratio $2: 3$. The worker who got more was given $£ 60$. How much was the other worker given? $£$ $\qquad$ 40

In a factory the ratio of full bottles to empty bottles is 1:3.
If there are 1500 full bottles, how many empty bottles must there be? $\qquad$ 4500

The ratio of squash to water is $2: 7$. How much water would you use for 30 ml of squash? $\qquad$ 105 ml

The length and width of a computer screen are in the ratio 7:5. If its length is 42 cm , what is its width? $\qquad$ cm

A wall has both plain and patterned tiles.
For every 7 plain tiles there are 4 patterned tiles. If there are 84 plain tiles, how many are patterned? $\qquad$ 48


16 To make pink paint you can mix 2 parts of red paint with 7 parts of white paint.
a) How much white paint would you use with 220 ml of red paint? $\qquad$ 770 ml
b) How much mixed paint would be made in total? $\qquad$ 990 ml

17 The length of a photograph is 6 cm and its width is 4 cm . Soraya copies and enlarges the photograph so that its width is now 20 cm . What is its new length? $\qquad$ 30 cm

A team's 'win : lose' ratio is $4: 3$. If the team has lost 18 games so far, how many has it won? $\qquad$ 24

## Challenge

Some cats and dogs are in a room. There are 9 pets altogether. How many cats and how many dogs are there, if there are twice as many cats as dogs?
a) cats $\qquad$ 6
b) dogs $\qquad$ 3

20 The distance from town $A$ to town $B$ is 4 times as far as from town $B$ to town $C$. It is 52 km from town $A$ to town $B$.

a) What is the distance from town $B$ to town $C$ ? $\qquad$ 13 km
b) What is the total distance from town $A$ to town $C$ ? $\qquad$ 65 km

There are 42 girls and 48 boys in the school gym. How many boys are there for every 7 girls? $\qquad$ 8

22 For a school trip the ratio of adults to children must be 2:9. How many adults are needed to take 36 children on a trip? $\qquad$ 8

Some trees are being planted. For every 7 pine trees there are 8 fir trees.
a) How many fir trees are planted if 56 pine trees are planted? $\qquad$ 64
b) How many pine trees are planted if 56 fir trees are planted? 49


24 There are 6 nuts to every 5 raisins in a bag. How many nuts are there if there are 60 raisins? $\qquad$ 72

The ratio of breadcrumbs to flour in a recipe is 3:4.
How many grams of breadcrumbs should you use for 420 g flour? $\qquad$ 315 9

There are 72 children and 48 adults. How many children are there for every 2 adults? $\qquad$ 3

On a slope of 1:5, you travel 5 metres horizontally for every metre the road rises. How much does the road rise for a horizontal distance of 45 m ? $\qquad$ 9


On a slope of $1: 5$, what is the horizontal distance for a rise of 25 m ? $\qquad$ 125 m

## Solve ratio problems involving similar shapes

## Key point

Two shapes are similar if they have the same angles as each other and their sides are in the same ratio. One similar shape is an enlargement of the other.


The sides of the second shape are 3 times the lengths of the sides of the first shape. The shape has been enlarged by the scale factor 3 .

## Get started

1
Line $B$ is 4 times the length of line $A$.
What is the length of line $B$ ? $\qquad$ cm
$\frac{\text { Line A }}{5 \mathrm{~cm}}$
Line B
?cm

2 Each side of rectangle $X$ is three times those of rectangle $Y$. What length is side $A$ ?


3 True or false? These two squares are similar. True
 False $\square$


4 By what scale factor have the sides of the smaller square above been multiplied to get the sides of the larger square? $\qquad$ 2

5 Write the length and width of a similar rectangle whose sides are 10 times this one.
a) length $\qquad$ cm
b) width $\qquad$ 20 cm


A picture is enlarged by the scale factor 3 . What is the picture's new length?
$\qquad$ cm


These two shapes are similar. Find length B.
$\qquad$ cm


8 By what scale factor has the smaller shape above been enlarged? $\qquad$ 2

## Now try these

9
True or false? When a shape is photocopied and enlarged, it produces a similar shape. The new shape has the same angles, but its sides are longer. True
 False $\square$

10 This rectangle is enlarged by a scale factor of 7 . Write the length and width of the enlarged shape. a) length $\qquad$ 77 cm
b) width $\qquad$ 42 cm

A triangle has sides of $3 \mathrm{~cm}, 4 \mathrm{~cm}$ and 5 cm . It is enlarged by a scale factor of 5 .
Circle the length of the longest side of the enlarged triangle.
$1 \mathrm{~cm} \quad 15 \mathrm{~cm} \quad 10 \mathrm{~cm} \quad 25 \mathrm{~cm} \quad 20 \mathrm{~cm}$
The perimeter of a triangle with sides of $3 \mathrm{~cm}, 4 \mathrm{~cm}$ and 5 cm is 12 cm .
What is the perimeter of a similar triangle made by enlarging it by a scale factor of 5 ? $\qquad$ 60 cm

The length to width measurements of a rectangle are in the ratio 7:2. If its length is 14 cm , what is its width? $\qquad$ cm

These triangles are similar. Find length $A$. $\qquad$ 36 cm


Two similar rectangles both have a 'length to width' ratio of 5:3. One has sides of 5 cm and 3 cm .
The other rectangle has a length of 15 cm . What is its width? $\qquad$ cm

A square with sides of 3 cm is enlarged by a scale factor of 4 . What is the perimeter of the enlarged square: a) in centimetres? $\qquad$ cm
b) in millimetres? $\qquad$ mm

True or false? A rectangle with sides of 5 cm and 2 cm has an area of $10 \mathrm{~cm}^{2}$.
When enlarged by the scale factor 2 the area of the new shape will be $20 \mathrm{~cm}^{2}$.
True $\square$ False $\Omega$


A photo is 7 cm long and 4 cm wide. When copied and enlarged it is 20 cm wide.
What is its new length? $\qquad$ 35 cm

## Challenge

These shapes are similar. Find lengths $A$ and $B$.
$A=$ $\qquad$ cm $B=$ $\qquad$ 5 cm


On a slope of 1:5, you travel 5 metres horizontally for every metre the road rises. How much does the road rise for a horizontal distance of 65 m ? $\qquad$ 13 m



Two similar rectangles have a 'length to width' ratio of 3:2. Tick the two lengths and widths that could be these rectangles.
$\mathrm{l}=6 \mathrm{~cm}, \mathrm{w}=2 \mathrm{~cm} \square$

$$
\mathrm{l}=12 \mathrm{~cm}, \mathrm{w}=8 \mathrm{~cm} \Omega
$$

$$
\mathrm{l}=21 \mathrm{~cm}, \mathrm{w}=14 \mathrm{~cm}
$$

$\square$

$$
\mathrm{l}=15 \mathrm{~cm}, \mathrm{w}=12 \mathrm{~cm}
$$

$\square$
An 8 cm line is enlarged by a scale factor of $1 \frac{1}{2}$. What is the length of the enlarged line? $\qquad$ 12 cm True or false? When the sides of a shape are multiplied by the scale factor $\frac{1}{2}$ the resulting shape is smaller than the original. True $\square$ False $\square$

Are these shapes similar or not similar? $\qquad$ not similar


True or false? All squares are similar. They all have four right angles and every square is an enlargement or reduction of another square. True $\square$ False $\qquad$
A square with an area of $16 \mathrm{~cm}^{2}$ is enlarged by the scale factor 2 .
Write: a) the length of the enlarged shape. $\qquad$ cm b) its area. $\qquad$ $\mathrm{cm}^{2}$

A square photo with an area of $25 \mathrm{~cm}^{2}$ is enlarged by the scale factor 2 . How many times the area of the original photo is the area of the enlarged photo? $\qquad$ 4

Three similar triangles have sides that are in the ratio of 1:2:3. The sides of the largest triangle are 5 times those of the smallest triangle. The smallest triangle is enlarged by a scale factor of 2 to make the middle triangle. The longest side of the middle triangle is 12 cm .

What is: a) the longest side of the largest triangle? $\qquad$ 30 cm
b) its perimeter? $\qquad$ cm

## Solve problems involving unequal sharing and grouping

## Key point

When dividing amounts into a given ratio, it can help to know how many parts there are altogether in the ratio. For example, a ratio of $4: 1$ has 5 parts and a ratio of $2: 7$ has 9 parts. Divide the amount by the total number of parts to find out what one part is worth. Multiply one part to find what several parts are worth.

Divide $£ 55$ in the ratio $4: 1 . \quad 4: 1 \rightarrow 5$ parts
$£ 44: £ 11=£ 55$

First divide $£ 55$ by $5=£ 11$.
Then multiply the ratio numbers by $£ 11$. Check they add up to the right total.

## Get started

James has $£ 15$ in pound coins in 3 equal piles. How many coins are in each pile? $\qquad$
2 For every $£ 1$ James gives his son, he gives $£ 2$ to his daughter. How much do his son and daughter get if he shares $£ 15$ in this way?
a) $\operatorname{son} f$ $\qquad$ 5
b) daughter $f$ $\qquad$ 10

Hannah has 16 cherries in four equal piles. How many cherries are in each pile? $\qquad$ 4 Hannah shares the 16 cherries. For every 1 she eats herself she gives 3 to her friend.
a) How many does Hannah eat? $\qquad$ 4
b) How many does her friend get? $\qquad$

For every $£ 3$ Sam gives her son, she gives $£ 2$ to her daughter. She sorts $£ 50$ into five piles to help her. How much do her son and
 daughter each get?
$\qquad$
a) $\operatorname{son} f$ 30 b) daughter $£$ $\qquad$ 20

How much do they each get if Sam shares £20 in the same way?
a) $\operatorname{son} f$ $\qquad$ b) daughter $£$ $\qquad$ 8

True or false? Freddie gives $£ 700$ to two workers in the ratio of $3: 4$. One gets $£ 300$ and the other gets $£ 400$. True $\square$ False $\qquad$
830 children in a room get into groups. Each group has 5 girls and 1 boy. How many girls are there altogether? $\qquad$

## Now try these

9
The ratio of nuts to raisins in a bag is $4: 3$. What is the total number of parts in the ratio?
4:3 $\rightarrow$ ? parts $\qquad$
10 If the ratio of nuts to raisins in a bag is $4: 3$ and there are 70 altogether, how many of each are there?
a) nuts $\qquad$ b) raisins $\qquad$

11 In a zoo there are 2 lions to every 3 tigers. If there are 25 of these animals in total, how many lions and how many tigers are there? Fill in the boxes to help you find the answer.
a) lions $\qquad$ 10
b) tigers $\qquad$ 15
lions: tigers
$2: 3 \rightarrow 5$ parts
$10: 15 \rightarrow 25$

For every $£ 3$ Ezra saves, he gives $£ 5$ to charity. If he shares $£ 80$ in this way, how much does:
a) he save? $£$ $\qquad$ 30
b) he give to charity? $f$ $\qquad$ 50 3: 5


In a hockey match there were 21 shots at the goal. The ratio of those on target to those not on target was 2:5. How many were:
a) on target? $\qquad$ 6
b) not on target? $\qquad$ 15

14 In a field there are sheep and dogs. There are 9 sheep for every dog.
How many sheep and how many dogs are there if there are 40 animals in the field?
a) sheep 36
b) dogs $\qquad$ 4


15 A company gave money to two workers in the ratio $2: 3$. The total amount given was $£ 45$.
How much did each worker get?
a) $f$ $\qquad$ b) f $\qquad$
$\qquad$

16 A drink has been made using orange and lemon in the ratio of 2:7. If the total amount of drink is 180 ml , how much:
a) orange was used? $\qquad$ ml
b) lemon was used? $\qquad$ 140 ml


A football team's 'win : lose' ratio is 5:3. If the team has played 48 games and not drawn any of them, how many has it: a) won? $\qquad$ b) lost? $\qquad$ 18

Divide $£ 72$ in the ratio of $5: 3 . \mathrm{f} 45: £ 27$

## Challenge

A line that is 35 cm in length is divided in the ratio 6:1. What is the length of the longer part? $\qquad$ 30 cm

The ratio of apples to pears in a crate is 2:9. If there are no other
fruits in the crate and there are 66 pieces of fruit, how many pears are there? $\qquad$ 54

21 It is 60km from town $A$ to town $C$, passing through town $B \quad A$ on the way. If the distance from $A$ to $B$ is four times as far as from $B$ to $C$, what is the distance from $A$ to $B$ ? $\qquad$ km
A B
B
C

60km

Share 108 g in the ratio $2: 1.72 \mathrm{~g}: 36 \mathrm{~g}$
For a school trip the ratio of adults to children is 2:5.
If 84 people go on a trip, how many of them are children? $\qquad$


To make a new forest, 900 trees are planted. For every 7 oak trees there are 8 birch trees.
a) How many oak trees are planted? $\qquad$ b) How many birch trees are planted? 480

There are $360^{\circ}$ in a full turn. Divide a full turn into two angles in the ratio of 8:1.

$$
320^{\circ}: 40^{\circ}
$$

If a right-angle is divided in the ratio $3: 2$, what is the size of the smaller angle? $\qquad$ 36。

27 Divide $£ 300$ in the ratio $1: 2: 3$. $£ 50: £ 100: £ 150$
A field with an area of $20000 \mathrm{~m}^{2}$ is split into three areas in the ratio of 4:3:3.
What is the area of the largest part? $\qquad$ 8000 $\mathrm{m}^{2}$

## Check-up test 3

1 What is $10 \%$ of 360 ml ?
$\qquad$


2 What is one per cent of three thousand? Write the answer in words. $\qquad$ thirty -

3 True or false? $9 \%$ of $£ 500$ is $£ 45 . \quad$ True $\square$ False $\square$
4 How many minutes is $60 \%$ of one hour? 36 min
5 Given that $\frac{3}{5}$ of this shape is gold, what is the ratio of gold parts to white parts? gold: white


6 A scarf has orange and blue squares. For every 5 orange squares there is 1 blue square. Write this as a ratio.
orange : blue
$\square$
5:1

7 A rugby team wins one-quarter of its matches. It loses the rest.
What is their 'win : lose' ratio? $\qquad$ 1:3

8
If $10 \%$ of a group of children are girls, what is the ratio of girls to boys? $\qquad$ $1: 9$

9 True or false? 4:8 is in the same ratio as 1:2.
True $\qquad$ False $\qquad$
10 Colour this grid so that for every 1 white square 3 squares are coloured.


11
In a box, 6 out of the 24 biscuits are chocolate. For every chocolate biscuit, how many are not chocolate?
chocolate: not chocolate

$$
\begin{aligned}
& 6: 18 \\
& 1: 3 \\
& \hline
\end{aligned}
$$

12 There are 28 geese and 21 ducks on the river. For every 4 geese, how many ducks are there? $\qquad$ 3


1 mark


1 mark


1 mark


1 mark

14 Two employees are paid in the ratio 3:4. The employee who gets more is given $£ 48$. How much is the other employee given? $£$ $\qquad$ 36

The length and width of a television are in the ratio 6:4.
If its length is 36 cm , what is its width? $\qquad$ 24 cm

16 There are 4 nuts to every 7 raisins in a bag. How many nuts are there if there are 77 raisins? $\qquad$ 44

A photo is enlarged by the scale factor 4. What is the photo's new length? $\qquad$ 20 cm


The perimeter of a triangle with sides of $4 \mathrm{~cm}, 5 \mathrm{~cm}$ and 6 cm is 15 cm . What is the perimeter of a similar triangle that is enlarged by a scale factor of 4?
$\qquad$ cm

19 Two similar rectangles both have a 'length to width' ratio of 7:4. One has sides of 7 cm and 4 cm . The other rectangle has a length of 21 cm .

What is its width? $\qquad$ 12 cm

20 True or false? All rectangles are similar. They all have four right angles and every rectangle is an enlargement or reduction of another rectangle.
True $\square$ False $\checkmark$

The ratio of oranges to lemons in a bag is 5:2.
What is the total number of parts in the ratio? $5: 2 \rightarrow$ ? parts $\qquad$ 7

In a basketball match there were 28 shots at the basket. The ratio of those on target to those not on target was 4:3.
How many were: $\qquad$ 16
b) not on target? $\qquad$
23 In a pet shop there are hamsters and gerbils. There are 7 hamsters for every gerbil. How many hamsters and how many gerbils are there if there are 48 animals in the shop?
a) $\qquad$ hamsters
b) $\qquad$ gerbils

Divide $£ 600$ in the ratio 3:2:1.
£ 300 : $£ 200: £ 100$


## Final test

## Section 1

$$
1 \text { Simplify this fraction. } \frac{18}{24} \rightarrow \frac{3}{4}
$$

2 Change these fractions to thirtieths. $\frac{7}{10}=\frac{21}{30} \quad \frac{3}{5}=\frac{18}{30} \quad \frac{13}{15}=\frac{26}{30}$
3 Write the fraction $\frac{40}{96}$ in its simplest form. $\frac{5}{12}$ $\qquad$


## Section 2

4 Use < or > to show which is larger. $\frac{6}{8} \square>\frac{22}{32}$


1 mark
5 Write these fractions in order, smallest first.
$\frac{7}{10}$
$\frac{2}{5} \quad \frac{39}{100}$ $\qquad$ $\frac{2}{5}$ $\qquad$ $\frac{7}{10}$

A
B
$3 \frac{3}{4}$ inches $\quad 2 \frac{13}{16}$ inches
C
$3 \frac{11}{16}$ inches

D
$3 \frac{5}{8}$ inches
E
$3 \frac{7}{8}$ inches B

1 mark

## Section 3

7 What is the difference between $1 \frac{1}{2}$ and $\frac{5}{8} ?$


8 How many hours is the sum of $4 \frac{3}{4}$ hours and $1 \frac{2}{3}$ hours?
Give your answer as a mixed number. $6 \frac{5}{12}^{3} \mathrm{hr}$
$\qquad$
9 Write the answer in its simplest form, as an improper fraction and as a mixed number.

$$
\frac{7}{10}+\frac{4}{5}-\frac{5}{15}=\frac{7}{6}=1 \frac{1}{6}
$$



## Section 4

10 What is the answer? $\frac{2}{5} \times \frac{2}{3}=\frac{4}{15}$


11 Give the answer to this question in its simplest form. $\frac{3}{5} \times \frac{1}{6}=\frac{1}{10}$

1 mark


1 mark


1 mark

## Section 5

$13 \quad \frac{3}{4} \div 5=\frac{3}{4} \times \frac{1}{5}=\frac{3}{20}$
14 Write the answer in its simplest form. $\frac{7}{10} \div 3=\frac{7}{30}$
15 A plank of wood that is $\frac{9}{10} \mathrm{~m}$ long is cut into 18 equal lengths. What fraction of a metre is each length? $\qquad$ $\frac{1}{20}$ m


## Section 6

16 Write the answer in its simplest form. $9 \div 12=\frac{3}{4}$


17 Use written division to help you convert $\frac{5}{8}$ to a decimal. $8 \longdiv { 5 . 0 \quad 0 \quad 0 }$ 0.625

18 What length in kilometres is one-eighth of 7 km as a decimal? 0.875 km


1 mark

## Section 8

Multiply 0.08 by 3 . $\qquad$ 0.24

23 Circle the mass that when multiplied by 6 equals 0.36 kg .


24
Find the sum of $(0.4 \times 5)$ and $(0.04 \times 5)$. $\qquad$ 2.2
please turn over

## Section 9

25 Write the answer to $745 \div 2$ as a decimal. 372.5
Divide 77 by 4 and give your answer as a decimal. $\qquad$ $4 \longdiv { 7 \quad 7 . 0 \quad 0 }$ 1 mark


1 mark
27 Use written division to find the answer to $575 \div 4$ as a decimal. 143.75

## Section 10

A calculator shows the number 0.172857 on its display. Irfan writes this number to the nearest tenth (to one decimal place).

What is his answer? $\qquad$ 0.2

Divide 534.674 km by 100 and give the answer to three decimal places. $\qquad$ 5.347 km

30 Round each of these masses to one-tenth of a kilogram. Then use your estimates to give an approximate total.
$0.401 \mathrm{~kg}+0.382 \mathrm{~kg}+0.288 \mathrm{~kg}+0.075 \mathrm{~kg}=1.2 \mathrm{~kg}$


1 mark

## Section 11

31
Matthew scores 69 out of 100 in a test. Khalid scores $71 \%$.
Who has the higher score? $\qquad$ Khalid

What is the score $\frac{43}{50}$ as a percentage? $\qquad$ \%

33 A can of cola holds 0.34 litres and a bottle holds $59 \%$ of a litre.
Find the difference between the amount of cola in each.
Write the answer as a fraction of a litre in its simplest form. $\qquad$ $\frac{1}{4}$ 1



1 mark

## Section 12

34
Which ratio is in the same ratio as 3:1? Circle it. $\square \square \square$


In a box, 4 out of the 20 chocolates are milk chocolates. For every milk chocolate, how many are not milk chocolate?
milk : not milk 4:16
$1: 4$


36 A wall has plain and patterned tiles. For every 4 plain tiles there is 1 patterned tile. If there are 100 plain tiles, how many patterned tiles will there be?

$\qquad$ 1 mark

## Section 13

Find 5\% of 480km. $\qquad$ 24 km

Zoe draws a line that is $15 \%$ of the length of line A. Line A

How long is Zoe's line? $\qquad$ mm

This table shows the number of questions correctly answered in several tests.
Write each score as a percentage.

| correctly answered | number of <br> questions in total | percentage score |
| :---: | :---: | :---: |
| 7 | 10 | $70 \%$ |
| 4 | 5 | $80 \%$ |
| 8 | 25 | $32 \%$ |
| 13 | 50 | $26 \%$ |
| 150 | 200 | $75 \%$ |



41 These triangles are similar. What is the length of the unmarked side?
$\qquad$ cm


1 mark
Rectangle $B$ is an enlargement of rectangle $A$ multiplied by the scale factor 5 . What is the length of rectangle $B$ ?
$\qquad$ cm

1 mark

## Section 14



42 Two similar rectangles both have a 'length to width' ratio of 7:3. One has sides of 7 cm and 3 cm . The other rectangle has a length of 21 cm .

What is its width? $\qquad$ 9 cm

## Section 15

Rakesh has $£ 18$. For every $£ 1$ he gives his son, he gives $£ 2$ to his daughter. How much do his son and daughter each get if he shares $£ 18$ in this way?

a) $\operatorname{son} f$ $\qquad$ b) daughter $f$ $\qquad$ 12

Two workers earn their wages in the ratio 3:2. The total amount given was $£ 45$.
How much did each worker get?
a) $£$ $\qquad$ b) $£$ $\qquad$

Share 108 g in the ratio 7:5. $63 \mathrm{~g}: 45 \mathrm{~g}$

