MATHLETICS

G SERIES Student Book

Fractions, Decimals and Percentages

Name _____

Series G – Fractions, Decimals and Percentages

Contents

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Contents

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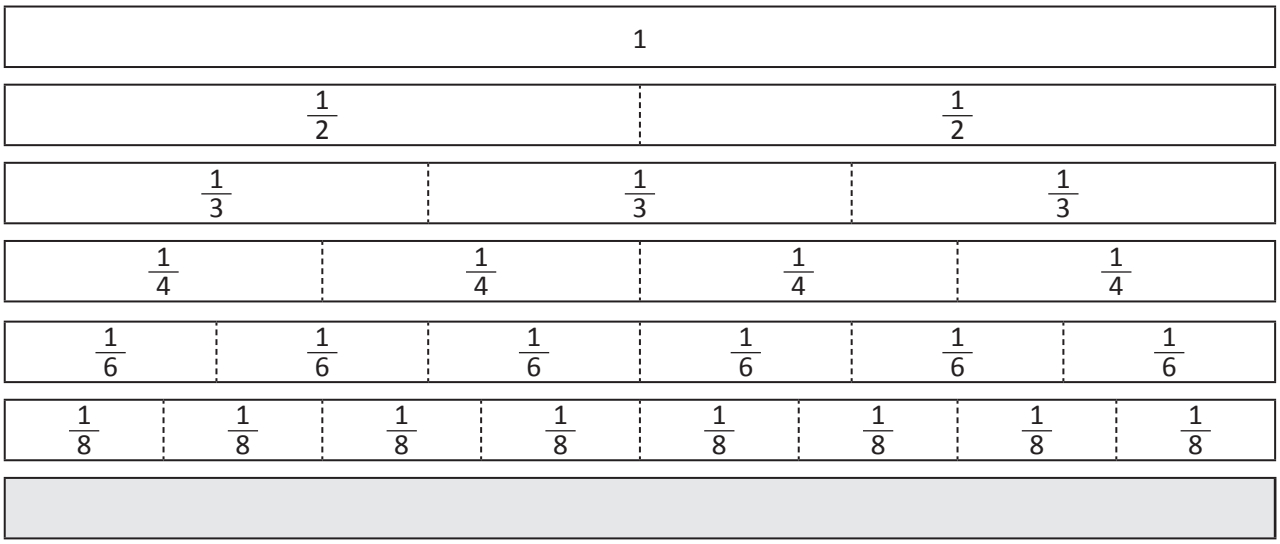
Fractions – equivalent fractions

Equivalent fractions have the same value but they have different denominators.
This means they have been divided into a different number of parts.



1 **Use the wall to find the equivalent fractions:**

a What fractions can you find that are equivalent to $\frac{2}{3}$? _____

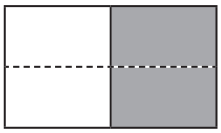
b What fractions can you find that are equivalent to $\frac{3}{4}$? _____

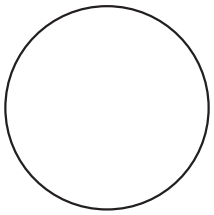
c How many eighths are equivalent to $\frac{1}{2}$? _____

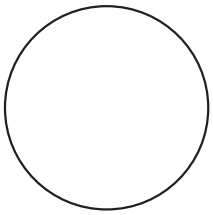
d How many quarters are equivalent to $\frac{4}{8}$? _____

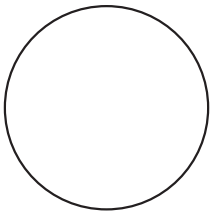
e Divide the bottom row into twelfths. Find some equivalent fractions for $\frac{4}{12}$. _____

2 **Divide and shade the shapes to show the following equivalent fractions. The first one has been done for you.**

a $\frac{1}{2} = \frac{2}{4}$ 

b $\frac{1}{4} = \frac{2}{8}$ 

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

d $\frac{1}{2} = \frac{2}{4}$ 

e $\frac{1}{4} = \frac{2}{8}$ 

Fractions – equivalent fractions

To find equivalent fractions without drawing diagrams we use the numerators and denominators to guide us.

Imagine your share of a cake is half. It is too big to pick up so you cut your half into halves. You now have 2 quarters of the cake.

You have doubled the number of parts (the denominator) and by doing this you have doubled the number of parts (the numerator).

This method can be used to find all equivalent fractions.

$\frac{1}{2} = \frac{\boxed{2}}{4}$ (× 2 above and below)

3 **Use the clues to help you make the equivalent fractions:**

a $\frac{1}{3} = \frac{\square}{12}$ (× 4)

b $\frac{1}{2} = \frac{3}{\square}$ (× 3)

c $\frac{2}{3} = \frac{\square}{9}$ (× 3)

d $\frac{3}{8} = \frac{\square}{40}$ (× 5)

e $\frac{1}{3} = \frac{\square}{9}$

f $\frac{1}{4} = \frac{\square}{8}$

g $\frac{3}{4} = \frac{15}{\square}$

h $\frac{2}{4} = \frac{\square}{2}$

4 **We can also reduce the number of parts in a whole. We divide to do this:**

a $\frac{18}{24} = \frac{3}{\square}$ (÷ 6)

b $\frac{9}{21} = \frac{3}{\square}$ (÷ 3)

c $\frac{40}{48} = \frac{5}{\square}$ (÷ 8)

d $\frac{12}{18} = \frac{\square}{3}$

e $\frac{12}{21} = \frac{4}{\square}$

f $\frac{25}{40} = \frac{\square}{8}$

5 **Answer the following:**

a Cassie's table of kids won a pizza for having the most table points at the end of term. There are 6 kids at the table. What fraction of the pizza will they each receive? $\frac{\square}{\square}$

b The pizza has been cut into 12 pieces. How many slices does each kid get? _____

What is this as a fraction? $\frac{\square}{\square}$

c Stavros reckons that because they got 2 slices they got more than they would have if the pizza had been cut into 6 pieces. Is he right? Explain your answer with words or diagrams.

Fractions – mixed numerals and improper fractions

Mixed numerals are made up of whole numbers and fractions.

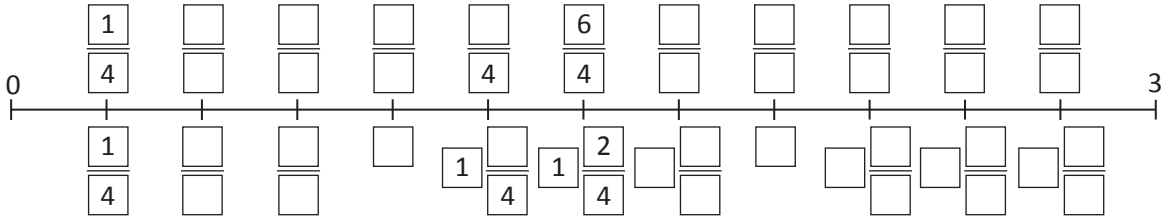
$2\frac{1}{2}$ is a mixed number.

Mixed numbers can also be expressed as improper fractions.

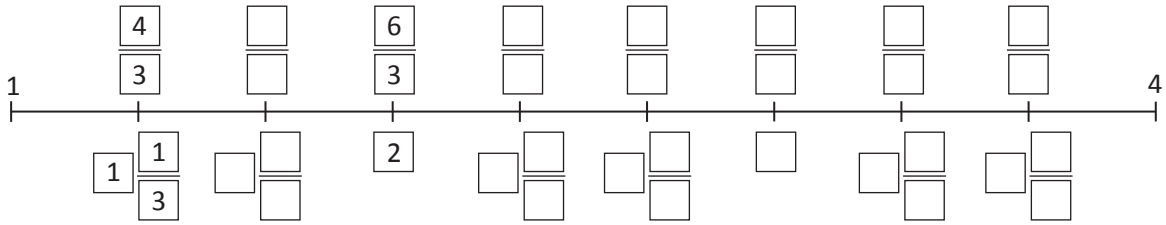
$2\frac{1}{2}$ can also be written as $\frac{5}{2}$.

1 **Complete the number lines by filling in the boxes:**

a



b



2 **Use the number lines above to help you find the mystery fractions. Score 5 points for a correct answer. Lose 3 points for a wrong answer. For some questions, more than 1 answer is correct. The first one has been done for you.**

My score

Q1 This improper fraction is equivalent to 2.

A1 $\frac{6}{3}$ or $\frac{8}{4}$

Q2 This improper fraction comes directly before $1\frac{2}{4}$.

A2 _____

Q3 This improper fraction is one third greater than $3\frac{1}{3}$.

A3 _____

Q4 This mixed numeral is the same as $\frac{10}{4}$.

A4 _____

Q5 This improper fraction is equivalent to 3.

A5 _____

Q6 This mixed numeral comes directly after $\frac{9}{3}$.

A6 _____

Q7 This improper fraction is equivalent to 4.

A7 _____

Q8 This improper fraction is equivalent to 6.

A8 _____

Q9 This improper fraction is equivalent to $2\frac{2}{3}$.

A9 _____

Q10 This mixed numeral is one third less than $\frac{8}{3}$.

A10 _____

Fractions – simplifying fractions

These fractions are all equivalent to one half: $\frac{1}{2}$ $\frac{2}{4}$ $\frac{6}{12}$ $\frac{75}{150}$ $\frac{3455}{6910}$

Which is the simplest? $\frac{1}{2}$

A fraction is in its simplest form when 1 is the only number that both numbers can be divided by.
We simplify fractions to make reading and working with fractions easier.

1 **Circle the simplest fraction in each group:**

a $\frac{1}{2}$ $\frac{2}{4}$ $\frac{50}{100}$

b $\frac{33}{99}$ $\frac{3}{9}$ $\frac{1}{3}$

c $\frac{25}{100}$ $\frac{1}{4}$ $\frac{5}{20}$

d $\frac{2}{3}$ $\frac{6}{9}$ $\frac{16}{24}$

To find the simplest fraction, we divide both the numerator and the denominator by the same number. It makes sense for this to be the biggest number we can find so we don't have to keep dividing. This number is called the **Highest Common Factor (HCF)**.

Look at: $\frac{6}{18} = \frac{?}{?}$ What is the biggest number that goes into both 6 and 18?

6 is the biggest number that goes into 18 and 6.

$\frac{6 \div 6}{18 \div 6} = \frac{1}{3}$

2 **Find the highest common factor and then simplify:**

a $\frac{15}{20}$ HCF is $\square \rightarrow \frac{15 \div \square}{20 \div \square} = \frac{\square}{\square}$

b $\frac{9}{30}$ HCF is $\square \rightarrow \frac{9 \div \square}{30 \div \square} = \frac{\square}{\square}$

c $\frac{16}{24}$ HCF is $\square \rightarrow \frac{16 \div \square}{24 \div \square} = \frac{\square}{\square}$

d $\frac{12}{36}$ HCF is $\square \rightarrow \frac{12 \div \square}{36 \div \square} = \frac{\square}{\square}$

3 **Wally says he has simplified these fractions as far as he can. Is he right? If not, find the simplest fraction:**

a $\frac{16}{20} \rightarrow \frac{8}{10}$

b $\frac{50}{100} \rightarrow \frac{25}{50} \rightarrow \frac{5}{10}$

c $\frac{24}{36} \rightarrow \frac{4}{6}$

d $\frac{15}{20} \rightarrow \frac{3}{4}$

Fractions – simplifying fractions

4 **Write the following fractions in their simplest form:**

a $\frac{28}{49} = \frac{\square}{\square}$ **b** $\frac{12}{20} = \frac{\square}{\square}$ **c** $\frac{24}{42} = \frac{\square}{\square}$ **d** $\frac{13}{39} = \frac{\square}{\square}$

e $\frac{32}{36} = \frac{\square}{\square}$ **f** $\frac{9}{15} = \frac{\square}{\square}$ **g** $\frac{16}{48} = \frac{\square}{\square}$ **h** $\frac{15}{55} = \frac{\square}{\square}$

If you are not sure what the HCF is, guess, check and improve is a useful strategy. Try your choice out and then look at your new fraction.

Could it be any simpler? Is 1 the ONLY number that could go into both the numerator and the denominator?

5 **Solve the following problems. Write your answers in the simplest form:**

a Luke scored $\frac{16}{20}$ on a test. What fraction was incorrect? $\frac{\square}{\square}$

b Marika scored $\frac{12}{20}$ on the same test. What fraction did she get right? $\frac{\square}{\square}$

c 25 out of the 75 kids in Year 6 ride their bikes to school. What fraction does this represent? $\frac{\square}{\square}$

d Out of the 26 students in 6F, 14 rate Maths as their favourite subject. What fraction is this? $\frac{\square}{\square}$

e What fraction did not choose Maths as their favourite subject? $\frac{\square}{\square}$

6 **Colour and match the fractions on the bottom row with their simplest form:**

$\frac{1}{2}$	$\frac{2}{3}$	$\frac{3}{5}$	$\frac{1}{9}$	$\frac{1}{4}$	$\frac{3}{4}$
$\frac{15}{20}$	$\frac{25}{100}$	$\frac{9}{81}$	$\frac{60}{100}$	$\frac{12}{18}$	$\frac{40}{80}$

Fractions – comparing and ordering fractions

Comparing and ordering fractions with like denominators is a simple process:

When there are different denominators we need to rename the fractions so they have the same denominators. This lets us compare apples with apples.

Which is larger? $\frac{3}{4}$ or $\frac{5}{8}$

We know that $\frac{3}{4}$ is equivalent to $\frac{6}{8}$ so $\frac{3}{4}$ is larger than $\frac{5}{8}$

1 **Order these fractions:**

$1\frac{1}{2}$ $\frac{5}{4}$ $\frac{3}{4}$ $\frac{2}{4}$ $1\frac{3}{4}$ $\frac{1}{4}$ $\frac{4}{4}$

2 **Rename a fraction in each group so that you can compare them more easily. Circle the larger fraction:**

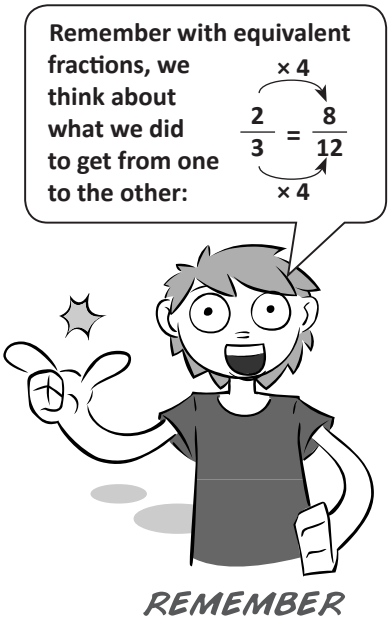
a $\frac{1}{2}$ $\frac{2}{8}$

b $\frac{4}{8}$ $\frac{3}{4}$

c $\frac{2}{6}$ $\frac{1}{2}$

d $\frac{10}{12}$ $\frac{3}{4}$

3 **Write or draw a fraction on the left that would result in the scale looking like this:**



Fractions – comparing and ordering fractions

4 **Find a partner to play this game with:**

Name a fraction between 0 and 1 and place it on the number line. Your partner then has to name and place a fraction that fits between that fraction and 1. Then you have to find one that fits between their fraction and 1 and so on. The game continues until one player cannot think of a fraction, or can't fit one in.

You can challenge a fraction placement. If you are right, your partner has to remove their fraction. If you are wrong, they get to do the 'told you so' dance.

5 **These fractions are all out of order. Cut them out and put them in order from smallest to largest. Place any equivalent fractions on top of each other. There is a space for you to rename the fractions on each of the cards if this will help. Share your thinking with a partner.**

Have they ordered them the same way?

$\frac{1}{2} = \frac{\square}{16}$	$\frac{6}{8} = \frac{\square}{16}$	$\frac{1}{4} = \frac{\square}{16}$	$\frac{12}{16} = \frac{\square}{16}$	$\frac{13}{16} = \frac{\square}{16}$	$\frac{15}{16} = \frac{\square}{16}$
$\frac{10}{8} = \frac{\square}{16}$	$\frac{5}{8} = \frac{\square}{16}$	$\frac{10}{16} = \frac{\square}{16}$	$\frac{7}{8} = \frac{\square}{16}$	$\frac{2}{8} = \frac{\square}{16}$	$\frac{5}{16} = \frac{\square}{16}$

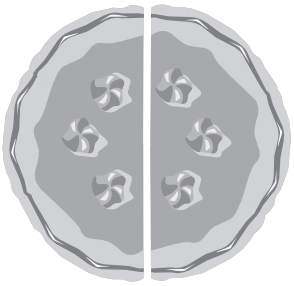
Fractions – renaming and ordering fractions

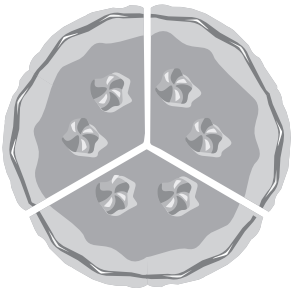
Sometimes we have to order and compare fractions with unrelated denominators such as $\frac{1}{4}$, $\frac{1}{6}$ and $\frac{1}{5}$.

To do this, we have to find one common denominator we can convert all the fractions to.

1 **You have 2 cakes for a class party. One has been cut into halves and one into thirds. The problem is that you want each slice to be a fair fraction of the cakes.**

a Continue cutting the cakes so that each cake has the same number of fair slices:

$\frac{1}{2}$ 

$\frac{1}{3}$ 

b If you had one of these new slices, what fraction of a cake would you receive? $\frac{\square}{\square}$

That is an example of how we rename fractions. We are finding a way to re-divide the wholes so that they have the **same number of parts**. To do this efficiently we find the smallest shared multiple. This is then called the **Lowest Common Denominator (LCD)**:

$\frac{1}{2}$ The multiples of 2 are 2, 4, **6**, 8, …

$\frac{1}{3}$ The multiples of 3 are 3, **6**, 9, 12, 15, …

6 is the LCD so we convert both fractions to sixths:

$\frac{1}{2} \overset{\times 3}{=} \frac{3}{6}$ $\qquad$ $\frac{1}{3} \overset{\times 2}{=} \frac{2}{6}$

2 **Rename these fractions by first finding the shared LCD and then converting the fractions. Use the multiplication table on the right to help you find the LCD:**

a $\frac{1}{2}$ $\frac{1}{4}$ $\frac{1}{3}$ $\qquad$ $\frac{\square}{12}$ $\frac{\square}{\square}$ $\frac{\square}{\square}$

b $\frac{3}{6}$ $\frac{1}{2}$ $\frac{1}{3}$ $\qquad$ $\frac{\square}{\square}$ $\frac{\square}{\square}$ $\frac{\square}{\square}$

c $\frac{1}{3}$ $\frac{1}{4}$ $\frac{1}{6}$ $\qquad$ $\frac{\square}{\square}$ $\frac{\square}{\square}$ $\frac{\square}{\square}$

× 2	× 3	× 4	× 5	× 6
2	3	4	5	6
4	6	8	10	12
6	9	12	15	18
8	12	16	20	24
10	15	20	25	30
12	18	24	30	36
14	21	28	35	42
16	24	32	40	48
18	27	36	45	54

Fractions – renaming and ordering fractions

1 **Look at each group of fractions. Predict which you think is the largest and circle your prediction. Now, rename the fractions in the work space below so that each fraction in the group has the same denominator. Use a different colour to circle the largest fraction. Any surprises?**

a $\frac{1}{2}$ $\frac{2}{3}$ $\frac{3}{9}$ **b** $\frac{2}{5}$ $\frac{1}{2}$ $\frac{1}{3}$ **c** $\frac{3}{4}$ $\frac{2}{3}$ $\frac{4}{8}$ **d** $\frac{3}{4}$ $\frac{3}{6}$ $\frac{3}{8}$

2 **This time, rename the fractions and circle the largest. Underline the smallest.**

a $\frac{3}{8}$ $\frac{2}{4}$ $\frac{5}{6}$ **b** $\frac{4}{7}$ $\frac{1}{2}$ $\frac{11}{14}$ **c** $\frac{1}{3}$ $\frac{5}{8}$ $\frac{4}{6}$ **d** $\frac{3}{4}$ $\frac{2}{3}$ $\frac{1}{2}$

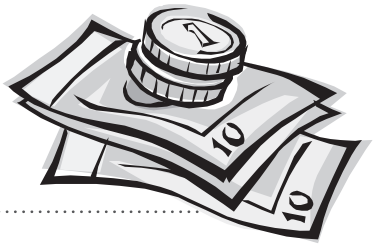
3 **For each fraction write a larger fraction below. The new fraction must have a different denominator. It can have a different numerator.**

$\frac{1}{2}$ $\frac{1}{3}$ $\frac{2}{3}$ $\frac{4}{5}$ $\frac{9}{15}$

Spend and save — solve

Getting ready

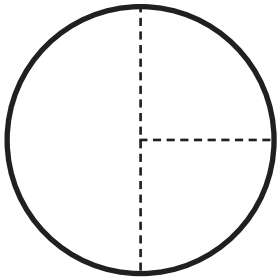
In this activity you will solve money problems. Working backwards is a useful maths strategy to use here.

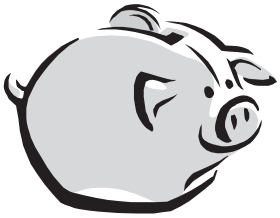


What to do

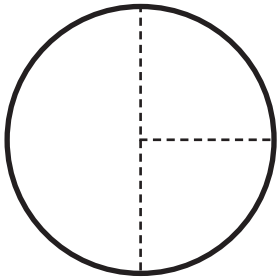
Use the fraction pies to help you solve the following problems:

Sarah's gran gave her some money for her birthday. Sarah saved $\frac{1}{2}$ of the money and spent $\frac{1}{4}$ of the money on a book. That left her with $15 in her purse. How much money did her Gran give her?

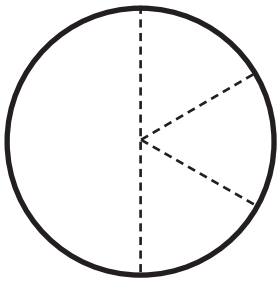




Martha opened her piggy bank and decided to spend it this way: $\frac{1}{2}$ on magazines; $\frac{1}{4}$ on snacks; $\frac{1}{4}$ on a necklace. The necklace cost $12. How much money did she have in her piggy bank?



Ali went to the show. He spent $\frac{1}{2}$ of his money on rides and $\frac{1}{3}$ of what was left on a dagwood dog, some chips and some fairy floss. That left him with $28 to spend on show bags. How much money did he have to begin with?



Trick or treat! apply

Getting ready

Sam and his mates decide to go trick or treating one Halloween. They then divvy up the loot.

Total

50 mini chocolate bars
18 gob stoppers
16 Chuppa Chups
12 Wizz Fizzes
4 all day suckers
2 Easter eggs
1 turnip

What to do

Use the chart on the right to work out the answers to the problems below:

a In the opening round, Sam gets $\frac{2}{5}$ of the mini chocolate bars and $\frac{1}{4}$ of the Chuppa Chups. How many of each does he get?

b George wanted all the gob stoppers. In a tense negotiation with Sam, he managed to score $\frac{2}{3}$ of them. How many did he get? How many did he miss out on?

c To get his share of the gobstoppers, Sam has to trade off $\frac{1}{2}$ of the Chuppa Chups he received in Question **a**. How many does he lose?

d Mara gets all the Wizz Fizzes, $\frac{1}{2}$ the all day suckers, and the remaining $\frac{3}{5}$ of the chocolate bars. In total, how many items does she get?

e Here is a fraction sentence that shows how the gob stoppers were shared: $\frac{1}{3} + \frac{2}{3} = \frac{3}{3}$ or 1 whole. Write the fraction sentence that shows how the chocolate bars were shared.

f Mara decides to give $\frac{1}{4}$ of her Wizz Fizzes to George. Write the fraction sentence to show how many she has left. Now, write the sentence using whole numbers.

Decimal fractions – tenths, hundredths and thousandths

Common fractions and decimal fractions are related as they both show parts of a whole. In common fractions, we divide a whole into parts such as halves or sixths.

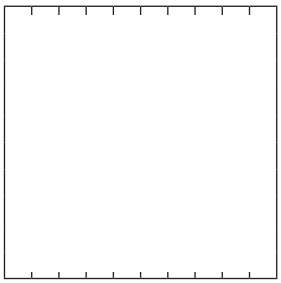
In decimal fractions, the whole is partitioned using the base 10 system – into tenths, then hundredths, then thousandths and so on.

We use a decimal point after the one to indicate the end of whole numbers: 6.42

If the number has no whole numbers, we use a zero to make sure we don't miss the decimal point: 0.42

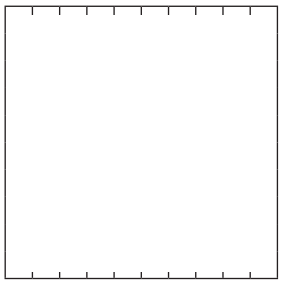
1 **Divide these wholes into tenths and shade the specified amounts. Write each as a decimal fraction:**

a



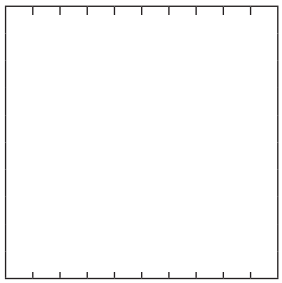
$\frac{4}{10}$ 0 •

b



$\frac{9}{10}$ •

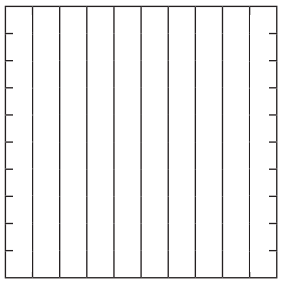
c



$\frac{10}{10}$ •

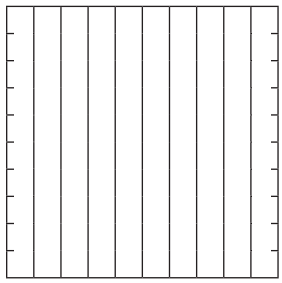
2 **Now divide these wholes into hundredths and shade the specified amounts. Write each as a decimal fraction:**

a



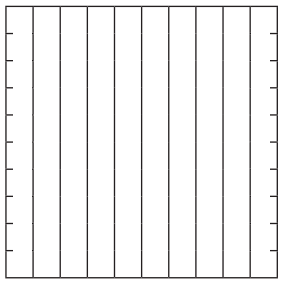
$\frac{61}{100}$ 0 •

b



$\frac{80}{100}$ 0 •

c



$\frac{55}{100}$ 0 •

3 **Express these as decimal fractions:**

a 6 tenths, 7 hundredths, 4 thousandths 0 •

b $\frac{432}{1000}$ 0 •

c 4 tenths, 9 hundredths, 3 thousandths 0 •

d $\frac{589}{1000}$ 0 •

e 0 tenths, 2 hundredths, 9 thousandths 0 •

f $\frac{7}{1000}$ 0 •

g 4 thousandths 0 •

h $\frac{1000}{1000}$ •

Decimal fractions – reading and writing decimals

When we write decimals we follow this place order:

Thousands	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths
			2 •	2	5	6

Numbers **before** the decimal point are whole numbers.

Numbers **after** the decimal point are parts of a whole number.

The further the digit is to the left in the number, the greater its value. The further it is to the right, the smaller its value.

1 **What is the value of the digits in bold? Tick the correct column:**

	Thousands	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths
a 5.8**9**2				•			
b 13.0**5**				•			
c **7**63.22				•			
d 8**9**.021				•			
e 100.00**1**				•			
f 560.**4**5				•			
g 3**1**2.956				•			

2 **Read each number and write it as a decimal:**

a four ones and one hundred twenty two thousandths _____

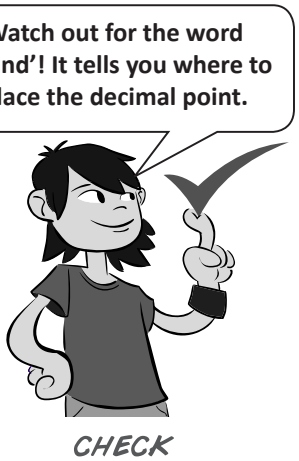
b one hundred eleven and sixty five hundredths _____

c three hundred and forty two thousandths _____

d four thousand and twelve hundredths _____

e twelve and 13 thousandths _____

f two hundred thirteen and forty-three hundredths _____



3 **These answers are all close but incorrect. Write the correct answers:**

a twenty seven tenths is written as 0.27 — No it's not, it's written as _____

b forty eight hundredths is written as 0.048 — No it's not, it's written as _____

c 9000 thousandths is written as 0.009 — No it's not, it's written as _____

d eleven and 12 hundredths is written as 11.012 — No it's not, it's written as _____

e 167 hundredths is written as 16.7 — No it's not, it's written as _____

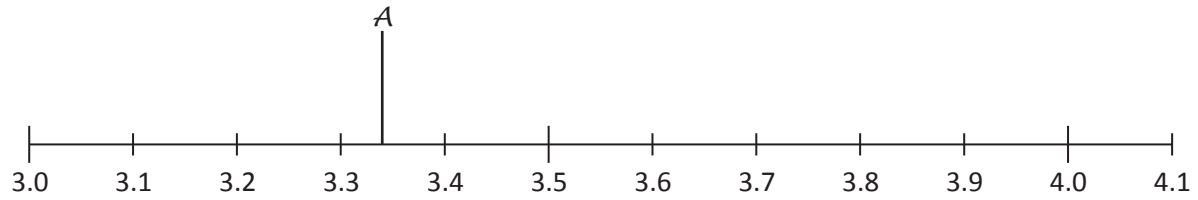
Decimal fractions – comparing and ordering decimals

We need to carefully consider the place value of digits when ordering and comparing decimals.

	Name	Distance
A	Spitter Macgee	3.34 m
B	Did You See That One Big-noter	3.1 m
C	Secret-ingredient Spitski	3.15 m
D	Dead-eye Jones	3.63 m
E	The Long Distance Shooter	4.01 m
F	Sally Straw	3.36 m
G	Technique Tezza	3.96 m
H	Lone Shooter	4.04 m
I	Double Or Nothing Danielle	4.05 m
J	Shoot Dog	3.94 m

1 **6A has a very cool teacher who decides to harness, not ban, the class' current obsession with pea shooting. After a week of intense training, a shoot-off occurs. The results for the top ten shooters are tabled on the right.**

Place the students on the number line. The first one has been done for you.



2 **Use the above information to answer the following questions:**

a Who shot the furthest on the day? _____

b Whose shot was the shortest? _____

c Which students' shots were 1 hundredth of a metre apart?

_____

d What was the difference between the shots of Shoot Dog and Spitter Macgee? _____

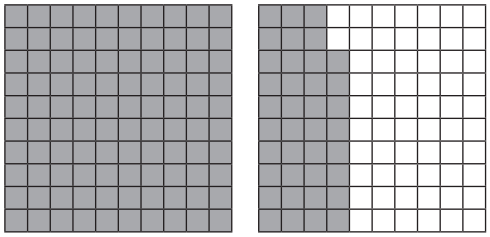
e Do you think you could beat this? Something to try at home perhaps? Even 6A's teacher eventually had enough of the pea shooting.

Decimal fractions – renaming decimals

We can express the same decimal fraction in different ways.

This shows 138 hundredths.

We can also express this as 1 whole, 3 tenths and 8 hundredths ***or*** 13 tenths and 8 hundredths ***or*** 1 whole and 38 hundredths.



1 **Rename these fractions:**

a 37 hundredths is also ☐ tenths + ☐ hundredths

b 53 hundredths is also ☐ tenths + ☐ hundredths

c 99 hundredths is also ☐ tenths + ☐ hundredths

d 6 tenths and 3 hundredths is also ☐ hundredths

e 4 tenths and 9 hundredths is also ☐ hundredths

f 4 tenths, 9 hundredths and 8 thousandths is also ☐ thousandths

g 0 tenths, 5 hundredths and 8 thousandths is also ☐ thousandths

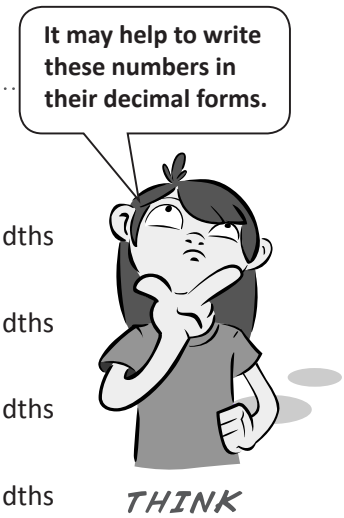
2 **Now try these. Fill in the missing information:**

a 4 ones = 40 tenths = 400 hundredths = _____ thousandths

b _____ ones = 70 tenths = _____ hundredths = _____ thousandths

c 2.5 ones = _____ tenths = 250 hundredths = _____ thousandths

d _____ ones = _____ tenths = 900 hundredths = _____ thousandths



3 **Rename these numbers as many ways as you can. Use the abbreviation: H for hundredths, T for tenths and O for ones:**

5.67	**2.52**	**9.81**
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Decimal fractions – rounding

We often round decimals to a particular place value. We do this to make the numbers easier to work with.

Look at 2.685. We can round this to the nearest whole number, tenth or hundredth.

Let's round it to the nearest tenth. To do this, we look at the number in the hundredths place. This is 8, which is closer to 10 than 1, so we round the tenth up. The rounded number is now 2.7

1 **Round these numbers to the nearest tenth:**

a 67.23 _____ **b** 48.07 _____

c 124.78 _____ **d** 90.14 _____

e 54.53 _____ **f** 7.06 _____

2 **Now round these numbers to the nearest hundredth:**

a 58.127 _____ **b** 70.345 _____

c 45.007 _____ **d** 78.134 _____

e 89.036 _____ **f** 36.231 _____

3 **Use a calculator to perform the following operations. Round the answers to the nearest tenth:**

a 132.4 ÷ 5 = _____ **b** 178 ÷ 8 = _____ **c** 125.3 ÷ 4 = _____

d 223 ÷ 4 = _____ **e** 12 ÷ 7 = _____ **f** 123.52 ÷ 4 = _____

4 **Look at the following meal options.**

a Round each price to the nearest dollar and total the estimated cost of each option below:

Choice 1		
Hamburger	$4.95	
Can of drink	$2.25	
Large chips	$1.15	
Total		

Choice 2		
Noodles with prawns	$7.95	
Green tea	$0.95	
3 Crab cakes	$2.98	
Total		

Choice 3		
Salad roll	$5.15	
Juice	$2.25	
Cookie	$1.95	
Total		

b You have $10. Circle the choices you can afford.

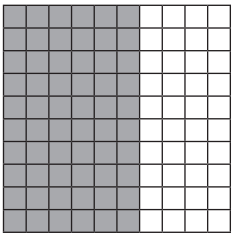
Decimal fractions – percentages

Percent comes from the Latin 'per centum' and means parts per hundred. It is expressed using the symbol %.

Here, 60% has been shaded. This is the same as 60 hundredths.

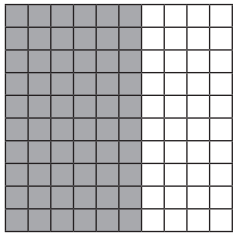
$\frac{60}{100} = 0.60 = 60\%$

We commonly use percentages in sales – *25% off everything TODAY ONLY*; on tests – *I got 85%*; and when we are gathering and reporting on data – *78% of people surveyed love chocolate*.



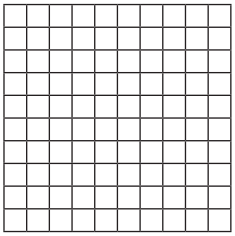
1 **Fill in the missing values:**

a



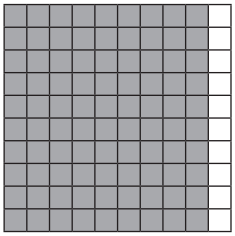
$\frac{60}{100}$	0.	%

b



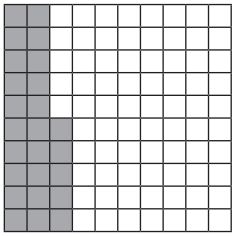
$\frac{30}{100}$	0.3	%

c



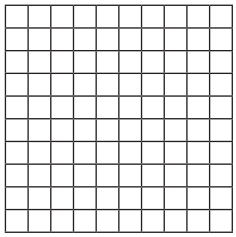
—	0.	90%

d



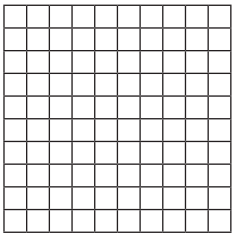
—	0.25	%

e



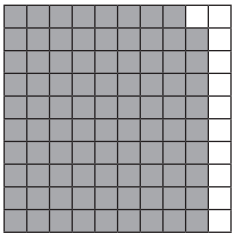
$\frac{45}{100}$	0.	%

f



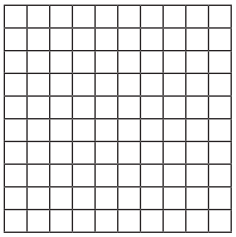
—	0.75	%

g



—	0.	%

h

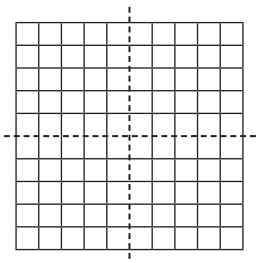


—	0.5	%

It is useful to know some common percentages such as 25%, 50%, 75% or 100%.

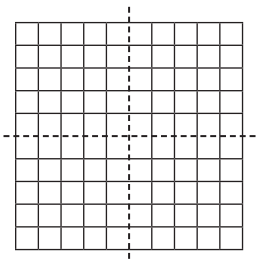
2 **Shade the grids to show the following percentages:**

a



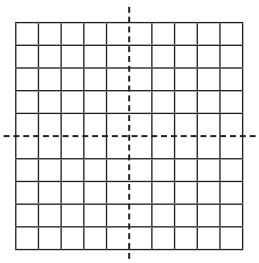
$\frac{1}{4}$	0.	%

b



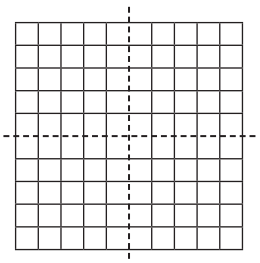
$\frac{1}{2}$	0.	%

c



$\frac{3}{4}$	0.	%

d



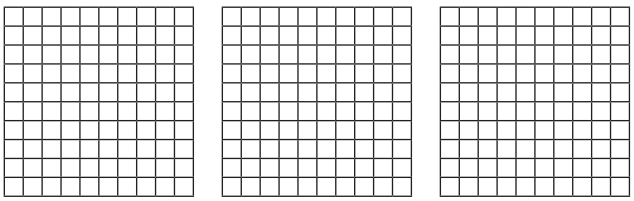
$\frac{4}{4}$		%

Decimal fractions – percentages

Not all percentage values are whole numbers between 1 and 100. We can have such things as 300% growth or percentages that contain decimals such as 3.5%.

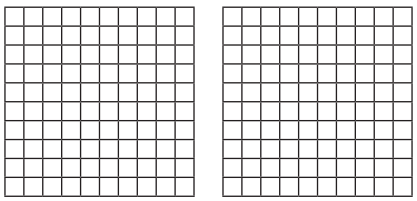
3 **Shade the grids to show the following percentages:**

a



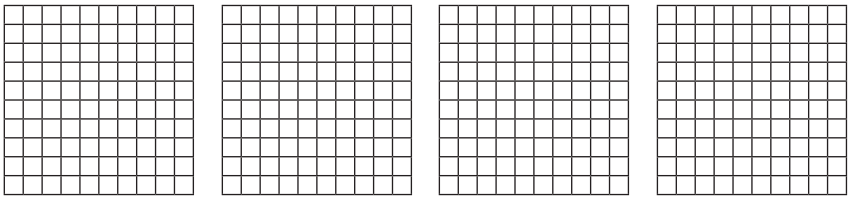
250%

b



130%

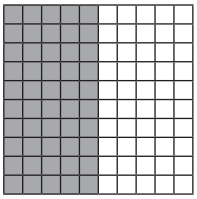
c



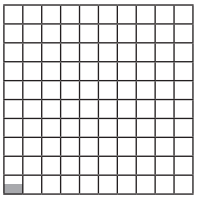
375%

4 **How would you show half a percent? Circle the option you think is correct. Discuss your choice with a partner. Do they agree?**

Option A

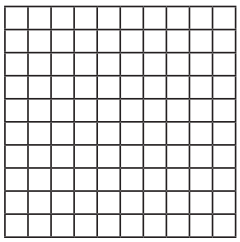


Option B

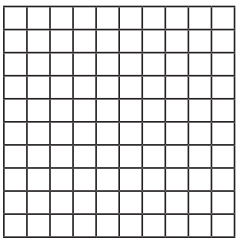


5 **100 people were surveyed. They were asked to nominate their preferred way of eating vegetables. Shade the grids to show the survey results:**

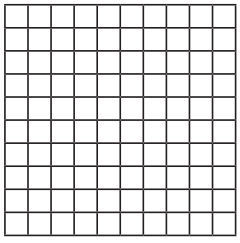
a 7% preferred their veggies boiled till they were all soggy and watery.



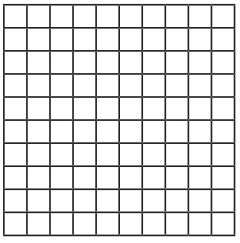
b 43% preferred their veggies stir fried.



c 19.5% preferred their veggies raw.



d 30.5% did not care how they were prepared because they weren't going to eat them anyway.



Ask around … apply

Getting ready

In this activity you are going to design a survey and then ask 100 people your questions. You will then find a way to communicate your results.

Work in a small group.

What to do

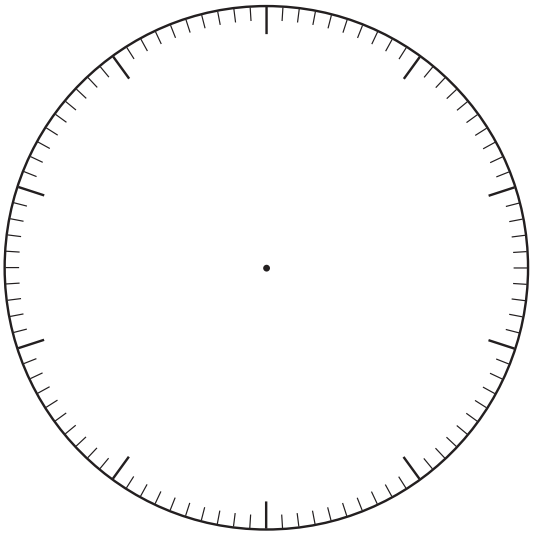
As a group, think about what information you are going to gather. Some things to consider might be:

- What kind of answers are you after?
- Will you provide options? How many? What if someone gives an answer you haven't included in your list? What if you get 100 different answers?
- Who is your target audience and when will you ask them? If you are surveying kids about their favourite ice cream flavours, asking at lunch times would be a good time. If you want adult responses, when is the best time to be able to talk to 100 adults?
- How will you record the answers?

Plan your survey and run it by your teacher. If it all looks good, conduct it.

What to do next

Use a pie graph to represent your information. You may use this model below or create your own using a spreadsheet program.



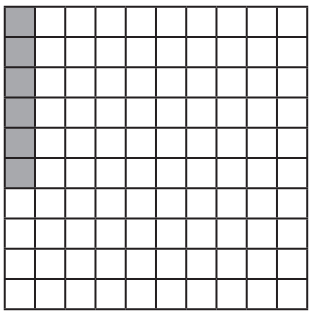
Percentage problems — solve

Getting ready

We have been using 100 grids to represent percentage, with each square representing 1%.

What to do

These grids are set up a little differently. Work with a partner to figure out what each square represents and then answer the questions.



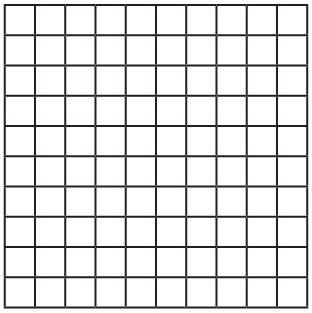
Problem 1

These 6 squares have a value of 36.

a What is the value of 1 square? _____

b What is the value of the entire grid? _____

c If 50% of the grid is shaded, what value is shaded? _____



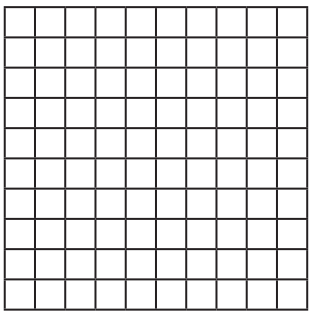
Problem 2

There are 140 convenience stores in Smallville.

a 40% of these stock your favourite Slurpee flavour. Use the grid to represent this information.

b How many stores sell your favourite flavour? _____

300 people



Problem 3

a If this grid represents 300 people, what does each square represent? _____

b How many people are represented by ten squares? _____

c 60 of the 300 people like watching sports. Represent this on the grid in red.

d 225 people prefer playing sport to watching it. Represent this in green.

Fractions of an amount – finding fractions

What process do we use to find fractions of amounts?

When we find $\frac{1}{4}$ of 20, we are sharing 20 into 4 groups. We use **division** to find fractions.

1 **Warm up with this puzzle. Use division to find the answer to each clue. The solved puzzle will tell you the name of a very important day of the year.**

☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
2	11	25	4	9	3	8	5	75	10	9	8	50

L = $\frac{1}{4}$ of 16 **Y** = $\frac{1}{2}$ of 100 **A** = $\frac{1}{12}$ of 96

D = $\frac{1}{7}$ of 63 **O** = $\frac{1}{2}$ of 22 **S** = $\frac{1}{100}$ of 1 000

H = $\frac{1}{4}$ of 300 **T** = $\frac{1}{11}$ of 55 **M** = $\frac{1}{3}$ of 9

W = $\frac{1}{2}$ of 4 **R** = $\frac{1}{4}$ of 100

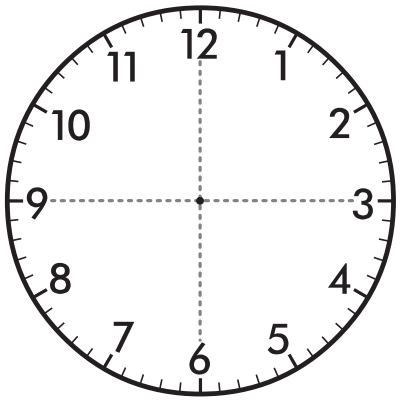
2 **We use fractions of time regularly in our lives. Use the clock to work out:**

a What fraction of an hour is 15 minutes? ☐/☐

b What fraction of an hour is 30 minutes? ☐/☐

c What fraction of an hour is 45 minutes? ☐/☐

d What fraction of an hour is 20 minutes? ☐/☐



e If Lucas practises guitar from 4:20 to 4:35 each day, what fraction of an hour does this represent? ☐/☐

f Patrick practises soccer for 1 hr 15 min. How would you express that as an improper fraction? ☐/☐

g Find 3 time spans that represent $\frac{1}{3}$ of an hour.

_____ to _____ _____ to _____ _____ to _____

Fractions of an amount – finding fractions

Once we know how to find one part of a group, we can use this to find other fractional amounts:

To find $\frac{2}{3}$ of 9, we first find $\frac{1}{3}$ of 9 ⟶ 9 ÷ 3 = 3 $\quad \frac{1}{3}$ of 9 = 3

$\frac{2}{3}$ of 9 is 2 times this ⟶ 2 × 3 = 6 $\quad \frac{2}{3}$ of 9 = 6

3 **Find the following fractional amounts:**

a $\frac{2}{4}$ of 12 = ☐ **b** $\frac{5}{6}$ of 30 = ☐ **c** $\frac{3}{4}$ of 24 = ☐

d $\frac{3}{8}$ of 96 = ☐ **e** $\frac{9}{10}$ of 20 = ☐ **f** $\frac{3}{5}$ of 350 = ☐

4 **The Walsh kids fight like cats and dogs over computer time and their dad has had enough. He has drawn up a schedule and says that if they don't stick to it, he will hide the keyboard till Christmas and cut off the internet. Help the kids work out their daily allocation and save them from a fate worse than death:**

a How many minutes does each kid get each day?

Dylan ☐

Nina ☐

Natasha ☐

Dylan gets twice as much time as Nina as he has more homework. $\frac{1}{2}$ of his time is to be spent on study, the other half is free time.

Natasha gets $\frac{1}{4}$ of an hour more than Nina but 30 minutes less than Dylan. She must spend $\frac{2}{8}$ of her time practising her French.

Nina gets $\frac{3}{4}$ of an hour each day. $\frac{1}{3}$ of this is to be spent on Mathletics, the rest is free time.

b How many minutes must Dylan spend on study?

_____

c How many minutes will Nina spend on Mathletics?

_____

d Express the time allocations as fractions of an hour:

Dylan

Nina

Natasha

This one is a puzzle. Read all the clues carefully – one of them is your starting point.

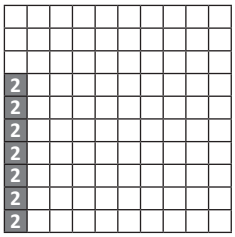
Once you have solved that all important first clue, the rest will follow.

Fractions of an amount – percentage

We often have to find percentages in real life such as '40% off – today only!'

40% of 100 is $\frac{40}{100}$ or 40. A $100 item would be reduced by $40.

That's easy if everything costs $100 but how do we find percentages of numbers other than 100? There are a number of ways to do this – here are some of them.



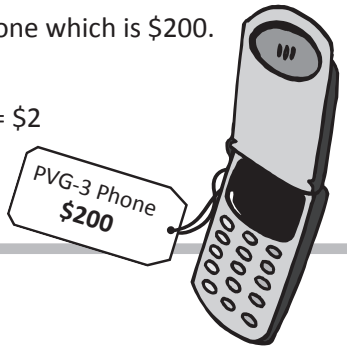
Look at this 100 grid. It represents the total cost of this phone which is $200.

Each of the 100 squares represents 1% of this.

To find the value of a single square we divide: $200 ÷ 100 = $2

Each square or percent represents $2.

How do we then find 7% of $200? 7 × $2 = $14.



1 **Use the 100 grid to calculate:**

a 5% of $200 is _____

b 20% of $200 is _____

c 10% of $200 is _____

d 22% of $200 is _____

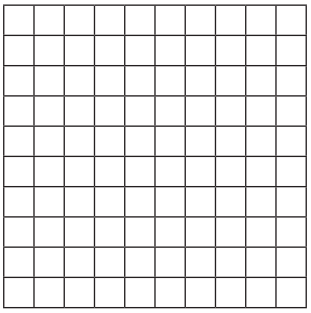
e 15% of $200 is _____

f 50% of $200 is _____

g If the store advertises a sale of 15% off the cost of the phone, what is the saving in dollars? _____

2 **Use the 100 grid to calculate the following. 1 square represents _____ people:**

300 people



a 8% of 300 people is _____

b 50% of 300 people is _____

c 25% of 300 people is _____

d 40% of 300 people is _____

e 12% of 300 people is _____

f 80% of 300 people is _____

g If 65% of the 300 people surveyed liked chocolate, how many people liked chocolate? _____

3 **Patterns can also help us understand percentages. Use patterns to calculate. The first row has been done for you.**

10% of 40 is	4	5% of 40 is	2	20% of 40 is	8
10% of 50 is	_____	5% of 50 is	_____	20% of 50 is	_____
10% of 60 is	_____	5% of 60 is	_____	20% of 60 is	_____
10% of 100 is	_____	5% of 100 is	_____	20% of 100 is	_____
10% of 500 is	_____	5% of 500 is	_____	20% of 500 is	_____
10% of 1000 is	_____	5% of 1000 is	_____	20% of 1000 is	_____
10% of 3000 is	_____	5% of 3000 is	_____	20% of 3000 is	_____

Fractions of an amount – percentage

We can use fractions to help us calculate percentages.

How can we calculate 25% of 80?

We know that 25% is the same as $\frac{1}{4}$. To find $\frac{1}{4}$ of 80 we divide by 4.

80 ÷ 4 = 20 25% of 80 is 20.

$\frac{1}{2}$ = 50%

$\frac{1}{4}$ = 25%

$\frac{1}{3}$ = 33$\frac{1}{3}$%

$\frac{1}{5}$ = 20%

$\frac{1}{10}$ = 10%

$\frac{3}{4}$ = 75%

REMEMBER

4 **Use your knowledge of fractions to calculate the percentages:**

a 25% of 120 is ☐

$\frac{1}{4}$ of 120 = _____

120 ÷ 4 = _____

b 50% of 250 is ☐

$\frac{1}{2}$ of 250 = _____

250 ÷ 2 = _____

c 20% of 50 is ☐

$\frac{1}{5}$ of 50 = _____

50 ÷ 5 = _____

d 25% of 16 is ☐

e 33$\frac{1}{3}$% of 66 is ☐

f 75% of 80 is ☐

Calculators are also handy for working out percentages. This is how we calculate 40% of 50:

We enter 

Our answer appears 

5 **Use a calculator to find these percentages:**

a 20% of 300 mL = ☐

b 35% of 280 mL = ☐

c 15% of 800 kg = ☐

d 6% of 70 km = ☐

e 25% of 150 mL = ☐

f 9% of $700 = ☐

g 15% of 400 = ☐

h 18% of 300 mL = ☐

i 90% of 1000 = ☐

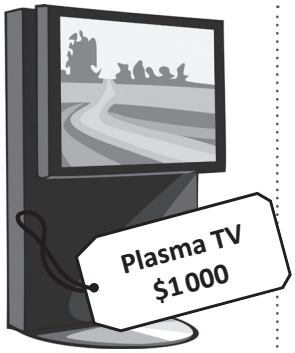
6 **The answer is 75. Use a calculator to work out the percentages and tick all the squares that match the answer:**

What is 25% of 300?	What is 75% of 100?	What is 10% of 750?	What is 15% of 55?
What is 45% of 180?	What is 35% of 300?	What is 50% of 150?	What is 20% of 375?

Fractions of an amount – finding discounts

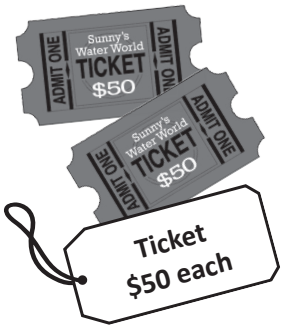
We have to calculate discounts quite often in real life. Stores have many special offers and canny consumers can quickly calculate the savings to help them make decisions about their purchases.

1 **How much would you save if the following discounts were offered? Choose a method to calculate:**



10% off _____
25% off _____
50% off _____
60% off _____

10% off _____
25% off _____
50% off _____
60% off _____



10% off _____
25% off _____
50% off _____
60% off _____

10% off _____
25% off _____
50% off _____
60% off _____

2 **You are helping your grandpa with his holiday shopping at Savers. Everything in the store marked ★ is 5% off, everything marked ★★ is 15% off and everything marked ★★★ is 20% off. Help your grandpa calculate both the savings and the new costs:**

★★ $20

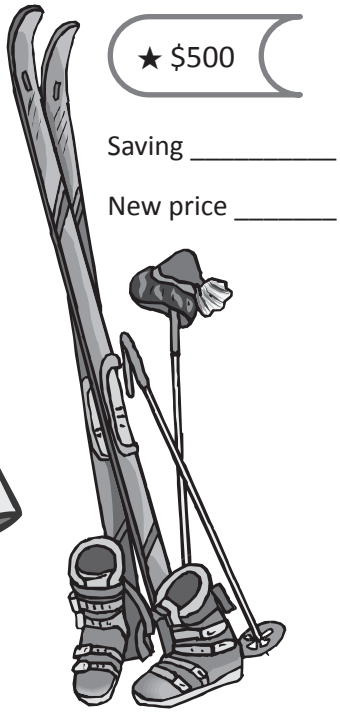
Saving _____

New price _____

★ $85

Saving _____

New price _____



★ $500

Saving _____

New price _____

★★★ $15

Saving _____

New price _____

★★ $40

Saving _____

New price _____

Shopping spree

apply

Getting ready

Get ready to shop! Work in a small group for this activity. You'll all need a copy of this page. Calculators may not be used.

C copy

You are each going to fill your own mall with things you like, then another group member will decide what kind of discounts you can have on each item.

Then you'll each race around your own mall calculating the new prices.

You may keep any items you calculate correct prices for. You have to put back any mistakes!

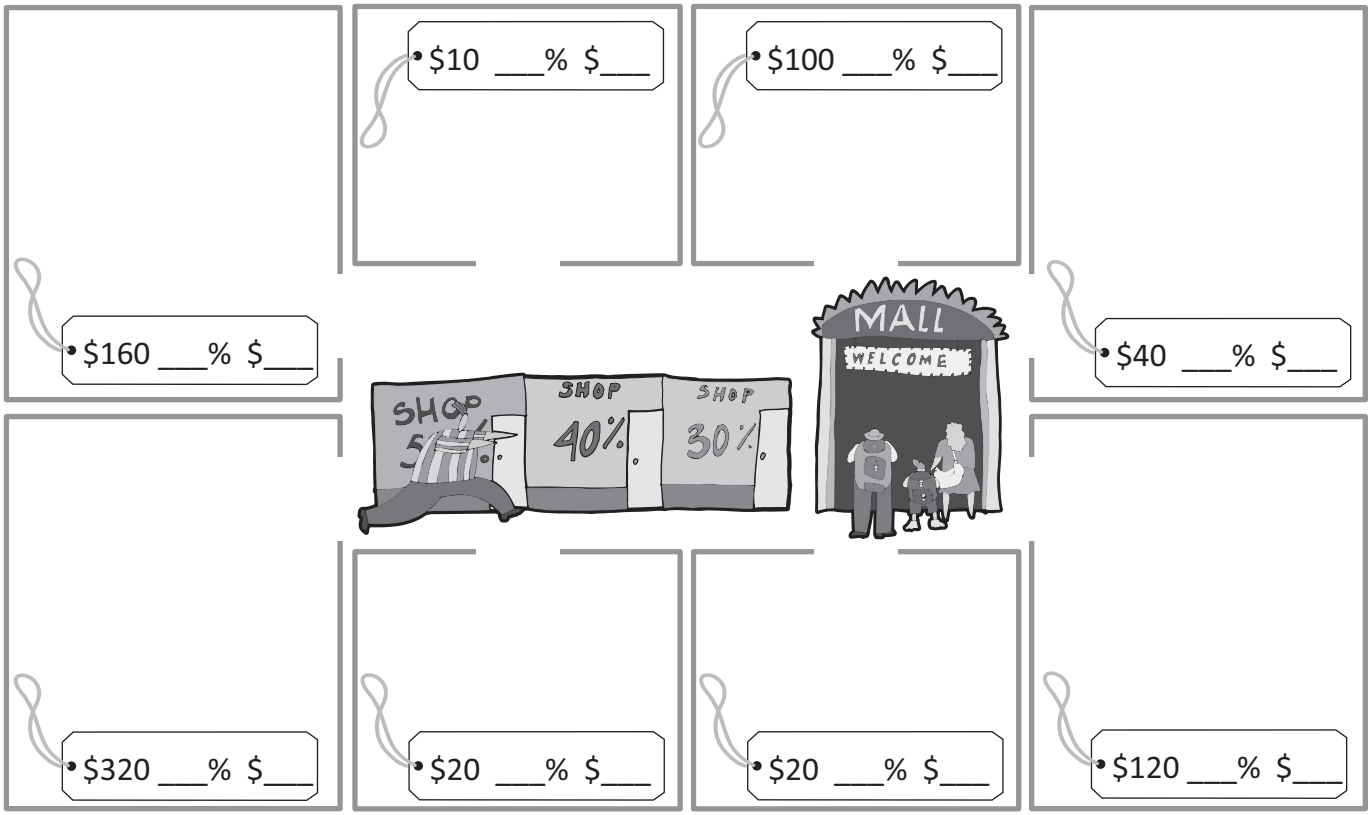
What to do

In each shop is a price tag. Next to each tag, draw something you think you'd like that would probably cost around this amount.

Now switch your paper with someone else in the group. Choose a discount of 5%, 10%, 20%, 25% or 50% to put next to the price. You must apply each discount at least once.

When everyone in your group is done, switch your pages back. On 'go', start calculating. Who finishes first? The game continues until everyone finishes their calculations.

Use a calculator to check everyone's maths. Who kept all their purchases? Excellent shopping.



Discount dilemmas — solve

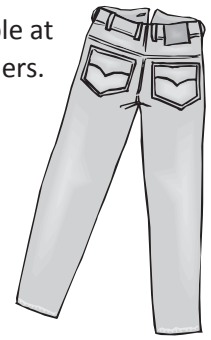
Getting ready

Solve these shopping dilemmas. You can work with a partner or by yourself.

Show your mathematical reasoning for each problem.

What to do

DILEMMA 1 You have been eyeing off a new pair of jeans available at your local jeans shop and also online. They are $100 at both suppliers.



In the sales, your jeans shop offers a discount of 20%, followed by a further reduction of 40% on the marked sale price. The online supplier offers a straight 60% discount.

Are these discounts the same? If not, which is the better deal?

DILEMMA 2 Would you rather become 50% poorer and then 50% richer *or* become 50% richer and then 50% poorer?

DILEMMA 3 The new game you want costs $175 at one store and $180 at another. The first store then offers a discount of 5% while the second offers a discount of 10%.

Which deal gives you the cheapest price?

Calculating – adding and subtracting common fractions

How do we add or subtract fractions? Look at this example:

We had a movie marathon on the weekend. On Saturday, we watched movies for $7\frac{1}{4}$ hours and on Sunday we watched for $5\frac{1}{4}$ hours. How many hours did we spend watching movies in total?

$$7\frac{1}{4} + 5\frac{1}{4} =$$

First we add the whole numbers: $7 + 5 = 12$. Then we add the fractions: $\frac{1}{4} + \frac{1}{4} = \frac{1}{2}$

Then we add the two answers together: $12 + \frac{1}{2} = 12\frac{1}{2}$

We use the same process to subtract fractions.

1 **Solve these problems:**

a $\frac{1}{3} + 2\frac{1}{3} =$ ☐☐

b $2\frac{3}{4} - 1\frac{2}{4} =$ ☐☐

c $1\frac{2}{5} + 3\frac{1}{5} =$ ☐☐

d $\frac{1}{5} + 6\frac{2}{5} =$ ☐☐

e $1\frac{3}{12} - \frac{1}{12} =$ ☐☐

f $7\frac{4}{12} - 3\frac{2}{12} =$ ☐☐

2 **Express these as fraction sentences. Solve them:**

a Sarah and Rachel go to a trash and treasure sale. Sarah buys $3\frac{1}{4}$ boxes of trash and Rachel buys $2\frac{1}{4}$ boxes of treasure. How much do they buy in total?

b You have $2\frac{3}{4}$ boxes of chocolates and you eat $1\frac{1}{4}$ boxes. How many boxes do you have left?

c Before World Maths Day, Akhil practices Live Mathletics for $4\frac{1}{3}$ hours on Monday and $2\frac{1}{3}$ hours on Tuesday. How many hours of practice has he put in altogether?

d Aman really gets into a sport for a while then drops it and moves on to his latest craze. As a consequence, he has five and a half cupboards of old sports equipment. His mother makes him take some of it to the local charity shop. This leaves him with 2 full cupboards. How much has he taken to the shop?

3 **What numbers could go in the boxes?**

a ☐☐ + 1☐☐ = $5\frac{3}{4}$

b ☐☐ − ☐☐ = $3\frac{1}{6}$

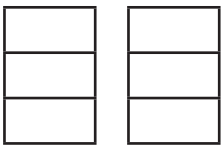
Calculating – adding and subtracting common fractions

Look at this problem: $7\frac{2}{4} + 3 + \frac{3}{4}$

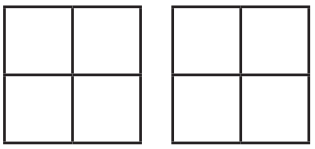
Our answer is $10\frac{5}{4}$ which is a little confusing.

$\frac{5}{4}$ is the same as $1\frac{1}{4}$. So let's add the 1 to our answer of 10. Our answer is now $11\frac{1}{4}$.

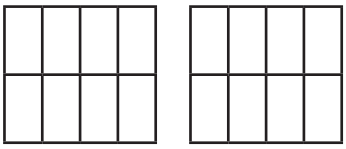
4 **Solve these problems, converting any improper fractions in your answer to mixed numerals. You can use the models to help you with the renaming:**

a 

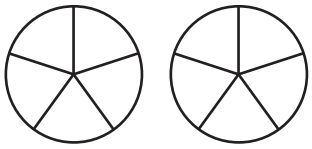
$\frac{2}{3} + 2\frac{2}{3}$ = ☐☐ which is equivalent to ☐☐

b 

$3\frac{2}{4} + 1\frac{3}{4}$ = ☐☐ which is equivalent to ☐☐

c 

$7\frac{6}{8} + \frac{5}{8}$ = ☐☐ which is equivalent to ☐☐

d 

$3\frac{3}{5} + 16\frac{3}{5}$ = ☐☐ which is equivalent to ☐☐

Sometimes we also come across more complicated subtraction problems.

Look at $1\frac{1}{4} - \frac{3}{4}$. We can't take away $\frac{3}{4}$ from $\frac{1}{4}$ so we will need to rename.

$1\frac{1}{4}$ is the same as $\frac{5}{4}$. $\frac{5}{4} - \frac{3}{4} = \frac{2}{4}$

5 **Use renaming to solve these problems. Convert your answers to mixed numbers. You can draw models if that helps:**

a $1\frac{2}{5} - \frac{4}{5}$ =

☐☐ − ☐☐ = ☐☐

b $2\frac{2}{4} - \frac{3}{4}$ =

☐☐ − ☐☐ = ☐☐

= ☐☐

c $3\frac{2}{5} - \frac{4}{5}$ =

☐☐ − ☐☐ = ☐☐

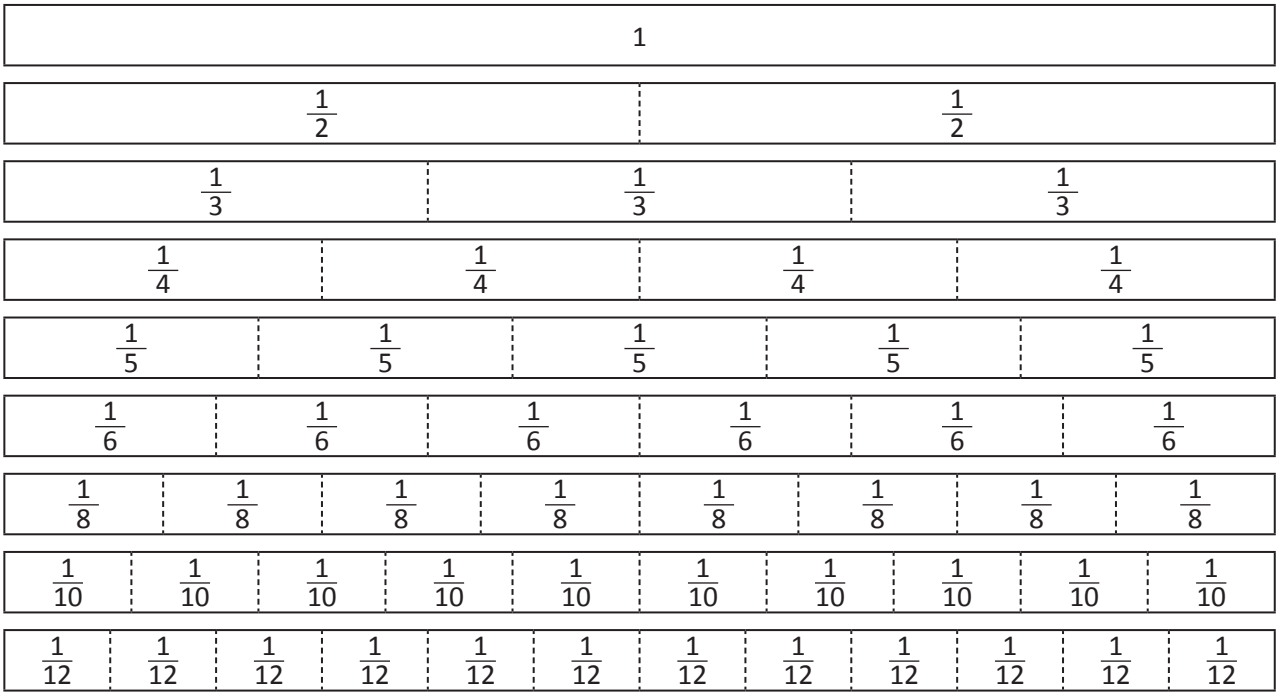
= ☐☐

Calculating – adding and subtracting common fractions

Sometimes we need to add and subtract fractions that have different but related denominators.

Look at $\frac{3}{4} + \frac{1}{8}$ How do we do this? One way is to use fraction strips to find equivalent fractions.

We can see that $\frac{3}{4}$ is the same as $\frac{6}{8}$ $\frac{6}{8} + \frac{1}{8} = \frac{7}{8}$



6 **Use the fraction strips above to help you add or subtract the like fractions. Rewrite the fractions in bold:**

a $\frac{1}{4} + \mathbf{\frac{1}{2}}$ $\frac{\square}{\square} + \frac{\square}{\square} = \frac{\square}{\square}$

b $\mathbf{\frac{2}{5}} + \frac{6}{10}$ $\frac{\square}{\square} + \frac{\square}{\square} = \frac{\square}{\square}$

c $\mathbf{\frac{4}{5}} - \frac{2}{10}$ $\frac{\square}{\square} - \frac{\square}{\square} = \frac{\square}{\square}$

d $\frac{4}{6} + \mathbf{\frac{2}{3}}$ $\frac{\square}{\square} + \frac{\square}{\square} = \frac{\square}{\square}$

e $\frac{3}{4} - \mathbf{\frac{1}{2}}$ $\frac{\square}{\square} - \frac{\square}{\square} = \frac{\square}{\square}$

f $\mathbf{\frac{3}{4}} + \frac{1}{8}$ $\frac{\square}{\square} + \frac{\square}{\square} = \frac{\square}{\square}$

g Brad ate $\frac{2}{6}$ of a packet of chips. Jen ate $\frac{2}{3}$ of a packet of chips. How much did they eat altogether?

h Write a problem for a partner to solve:

Calculating – multiplying fractions by whole numbers

We can use repeated addition to multiply fractions by whole numbers.

$3 \times \frac{2}{8}$ ⟶ 3 lots of two eighths is $\frac{2}{8} + \frac{2}{8} + \frac{2}{8} = \frac{6}{8}$

$$3 \times \frac{2}{8} = \frac{6}{8}$$

1 **Use repeated addition to multiply these fractions. Show each of the steps:**

a $3 \times \frac{3}{12}$

$= \frac{3}{12} + \frac{3}{12} + \frac{3}{12}$

$= \frac{\square}{\square}$

b $3 \times \frac{2}{7}$

c $5 \times \frac{1}{8}$

d $3 \times \frac{2}{9}$

2 **Try these. Convert your answers to whole numbers:**

a $6 \times \frac{1}{2}$

b $5 \times \frac{2}{5}$

c $8 \times \frac{2}{4}$

d $15 \times \frac{3}{5}$

3 **Sam thinks that $6 \times \frac{2}{6}$ is the same as $5 \times \frac{2}{5}$. Is he right? Show how you know:**

4 **Sam's dad helped him with his homework. And we all know how that works out … Here is what his dad did. Is he right? If not, explain to him where he went wrong.**

$3 \times \frac{3}{8}$

$\frac{3}{8} + \frac{3}{8} + \frac{3}{8} = \frac{9}{24}$

$3 \times \frac{3}{8} = \frac{9}{24}$

Calculating – multiplying fractions by whole numbers

There is another way to multiply fractions by whole numbers. Look at $3 \times \frac{3}{5}$.

We have 3 lots of three fifths. We can express this as $\frac{3 \times 3}{5} = \frac{9}{5}$

We don't multiply the fifths because these don't change – we still have fifths.

5 **Multiply these fractions by whole numbers. Express the answers as improper fractions:**

a $4 \times \frac{3}{4}$ $\frac{\square \times \square}{4} = \frac{\square}{\square}$

b $4 \times \frac{2}{3}$ $\frac{\square \times \square}{3} = \frac{\square}{\square}$

c $5 \times \frac{2}{4}$ $\frac{\square \times \square}{4} = \frac{\square}{\square}$

d $3 \times \frac{3}{6}$ $\frac{\square \times \square}{6} = \frac{\square}{\square}$

e $2 \times \frac{4}{5}$ $\frac{\square \times \square}{5} = \frac{\square}{\square}$

f $5 \times \frac{2}{3}$ $\frac{\square \times \square}{3} = \frac{\square}{\square}$

Our answers are all improper fractions. How do we convert these to mixed numerals?

Look at $\frac{9}{4}$. This is nine quarters.

To change this to a mixed numeral we divide the numerator by the denominator:

$9 \div 4 = 2$ with 1 quarter left over. $\frac{9}{4}$ is the same as $2\frac{1}{4}$.

6 **Warm up with these problems. There will be no remainders.**

a $\frac{8}{4}$ $\square \div \square = \square$

b $\frac{9}{3}$ $\square \div \square = \square$

c $\frac{12}{6}$ $\square \div \square = \square$

d $\frac{15}{5}$ $\square \div \square = \square$

e $\frac{16}{4}$ $\square \div \square = \square$

f $\frac{14}{7}$ $\square \div \square = \square$

g $\frac{8}{2}$ $\square \div \square = \square$

h $\frac{10}{5}$ $\square \div \square = \square$

7 **Now take your answers from Question 5 and write them here. Divide the numerators by the denominators to find their mixed numeral equivalents:**

a $\frac{\square}{\square} = \square$

b $\frac{\square}{\square} = \square\frac{\square}{\square}$

c $\frac{\square}{\square} = \square\frac{\square}{\square}$

d $\frac{\square}{\square} = \square\frac{\square}{\square}$

e $\frac{\square}{\square} = \square\frac{\square}{\square}$

f $\frac{\square}{\square} = \square\frac{\square}{\square}$

Calculating – adding decimal fractions

How do we add decimal fractions using a written strategy?

We arrange the numbers so the place values line up and then we start with the smallest value.

We first add the tenths. 9 tenths and 4 tenths is 13 tenths.

We rename this as 1 whole and 3 tenths.

We write the 3 in the tenths column and move the 1 whole to the ones column. Then we add the ones. 1 + 4 + 6 = 11

Don't forget the decimal point in your answer!

$$\begin{array}{r} {}^{1}4.9 \\ +\ 6.4 \\ \hline 11.3 \end{array}$$

1 **Add these decimal numbers. The first one has been done for you.**

a
$$\begin{array}{r} 42.3 \\ +\ 34.4 \\ \hline 76.7 \end{array}$$

b
$$\begin{array}{r} 84.2 \\ +\ 34.6 \\ \hline \\ \hline \end{array}$$

c
$$\begin{array}{r} 60.4 \\ +\ 25.1 \\ \hline \\ \hline \end{array}$$

d
$$\begin{array}{r} 3.07 \\ +\ 9.2 \\ \hline \\ \hline \end{array}$$

e
$$\begin{array}{r} 4.1 \\ +\ 3.44 \\ \hline \\ \hline \end{array}$$

f
$$\begin{array}{r} 7.02 \\ +\ 1.87 \\ \hline \\ \hline \end{array}$$

g
$$\begin{array}{r} 47.2 \\ +\ 26.07 \\ \hline \\ \hline \end{array}$$

h
$$\begin{array}{r} 45.71 \\ +\ 31.34 \\ \hline \\ \hline \end{array}$$

i
$$\begin{array}{r} 64.23 \\ +\ 10.4 \\ \hline \\ \hline \end{array}$$

2 **We use the same process when adding more than two numbers. Add these bills:**

1 cola	$2.80
1 lime milkshake	$3.25
4 dim sims	$4.80
3 crab cakes	$2.60
Total	_____

1 child's entry ticket	$15.60
1 disposable camera	$ 7.95
3 fridge magnets	$15.45
1 t-shirt – medium	$22.99
Total	_____

Calculating – adding decimal fractions

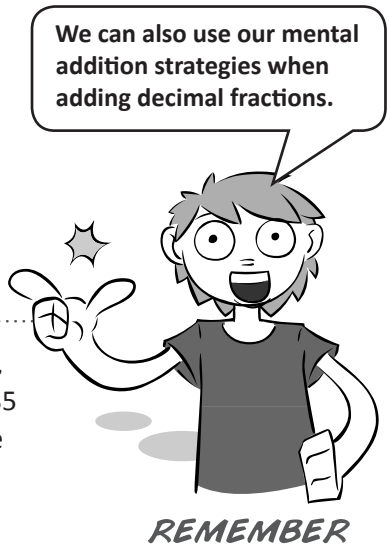
3 **Use a mental or written strategy of your choice to solve these problems:**

a Add 16.05 and 5.64

b Add 122.54 and 47.12

c Bob decided it was time to drop some weight before the big game. He lost 3.63 kg in the first week and 1.25 kg in the 2nd week. How much weight did he lose altogether?

d Kate spent $13.65 at one shop, $4.59 at the second, and $17.35 at the third. How much did she spend altogether?



4 **Use a mental or written strategy of your choice to complete these magic number squares. Remember in magic number squares, each row, column and diagonal adds to give the magic number. Your knowledge of inverse operations will come in handy.**

The magic number is 4.5

	0.9	2.4
		0.3

The magic number is 6.0

1.2		2.8
1.6		

The magic number is 1.5

	0.5	
	0.1	0.8

Use this space for any working out:

Calculating – subtracting decimal fractions

How do we subtract decimal fractions using a written strategy?

We arrange the numbers so the place values line up and then we start with the smallest value.

We first subtract the tenths. We have 4 tenths, can we subtract 5 tenths?

No, so we rename a one as 10 tenths. Now we have 14 tenths. 14 tenths subtract 5 tenths is 9 tenths.

We have 5 ones, can we takeaway 3 ones? Yes, the answer is 2.

$$\begin{array}{r} {}^{5}\cancel{6}\,.\,{}^{1}4 \\ -\ 3\,.\,5 \\ \hline 2\,.\,9 \\ \hline \end{array}$$

1 **Solve these problems:**

a
$$\begin{array}{r} 4\,2\,.\,5 \\ -\ 3\,4\,.\,4 \\ \hline \\ \hline \end{array}$$

b
$$\begin{array}{r} 8\,6\,.\,2 \\ -\ 3\,4\,.\,6 \\ \hline \\ \hline \end{array}$$

c
$$\begin{array}{r} 3\,2\,.\,7 \\ -\ 2\,0\,.\,4 \\ \hline \\ \hline \end{array}$$

d
$$\begin{array}{r} 7\,.\,4\,0 \\ -\ 5\,.\,2\,5 \\ \hline \\ \hline \end{array}$$

e
$$\begin{array}{r} 2\,.\,4\,7 \\ -\ 2\,.\,1\,5 \\ \hline \\ \hline \end{array}$$

f
$$\begin{array}{r} 6\,.\,7\,2 \\ -\ 4\,.\,5\,1 \\ \hline \\ \hline \end{array}$$

g
$$\begin{array}{r} 3\,2\,.\,8\,5 \\ -\ 2\,1\,.\,6\,3 \\ \hline \\ \hline \end{array}$$

h
$$\begin{array}{r} 7\,4\,.\,1\,4 \\ -\ 1\,2\,.\,0\,1 \\ \hline \\ \hline \end{array}$$

i
$$\begin{array}{r} 7\,6\,.\,3\,3 \\ -\ 2\,0\,.\,2\,5 \\ \hline \\ \hline \end{array}$$

Sometimes we have to work with numbers that have a different amount of digits such as 8.4 – 5.35

When this happens, we rename. 4 tenths becomes 40 hundredths: 8.40 – 5.35

2 **Rename these problems and solve:**

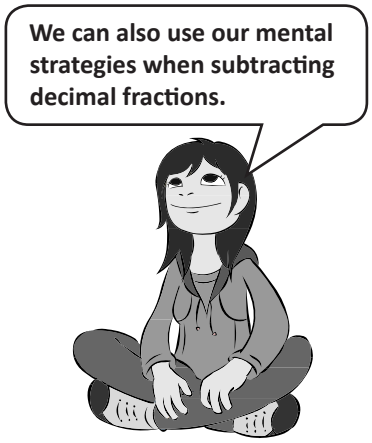
a
$$\begin{array}{r} 1\,6\,.\,5 \\ -\ \ 3\,.\,3\,8 \\ \hline \\ \hline \end{array}$$

b
$$\begin{array}{r} 7\,.\,1\,7 \\ -\ 3\,.\,4 \\ \hline \\ \hline \end{array}$$

c
$$\begin{array}{r} 8\,9\,.\,2 \\ -\ \ 4\,.\,7\,2 \\ \hline \\ \hline \end{array}$$

Calculating – subtracting decimal fractions

3 **Use a mental or written strategy of your choice to solve these problems:**



a 125.47 – 9.08

b 24.75 – 8.35

c Donny spent $25.50 on a new memory card for his phone. The next day it appeared on special for $17.95. If he had waited another day, how much would he have saved?

d Natasha buys Complete Girl at $4.95 an issue. Her sister Nina buys Dolly at $5.70 an issue. How much more does Nina spend?

4 **Find the answers to these problems and solve the riddle: *Why did the man freeze his money?***

☐	☐		☐	☐	☐	☐	☐	☐		☐	☐	☐	☐		
7.7	19.9		36.41	11.5	142.4	13.05	19.9	27.4		10.32	17.93	10.3	27.4		

☐	☐	☐	☐		☐	☐	☐	☐
7.7	11.5	17.4	27.4		10.32	11.5	14.77	7.7

A	7.2 + 4.3	T	5.16 + 7.89
W	25.29 + 11.12	E	13.4 + 6.5
S	5.63 + 9.14	C	2.16 + 8.16
O	13.4 + 4.53	N	69.3 + 73.1
L	5.1 + 5.2	D	13.5 + 13.9
H	3.4 + 4.3	R	9.85 + 7.55

Calculating – multiplying decimals by 10, 100 and 1000

When we multiply by 10 the number becomes larger by 1 place value.
When we multiply by 100 the number becomes larger by 2 place values.
When we multiply by 1 000 the number becomes larger by 3 place values.
Look what happens to 45.216 when we apply these rules:

45.216 × 10 = 452.16 **45.216 × 100 = 4521.6** **45.216 × 1 000 = 45216**

1 **Warm up with these. Work with a partner and a calculator. Predict your answers to the following then try out the problems. Your answers will be one or more of the following. The first one has been done for you.**

tens | tenths | hundredths | ones

What place values are in your answers? Multiply by 10:

a these ones: 6, 3, 1 ..... *We get 60, 30, 10 (tens)*

b these tenths: 0.6, 0.3 and 0.1..... *We get*

c these hundredths: 0.06, 0.03 and 0.01 ..... *We get*

d these ones and tenths: 1.6, 2.3 and 3.4 ..... *We get*

e these tenths and hundredths: 0.16, 0.23, 0.31 and 0.49 .. *We get*

2 **Multiply these decimals by 10, 100 and 1000. Estimate first.**

	× 10	× 100	× 1000
0.5		50	
0.25	2.5		
0.37			370
1.2			
7.34		734	

3 **Estimate, then calculate the answers:**

a 10 × 0.7 = ☐ **b** 100 × 0.9 = ☐ **c** 10 × 0.3 = ☐

d 100 × 0.15 = ☐ **e** 1000 × 0.27 = ☐ **f** 100 × 0.45 = ☐

g 100 × 0.255 = ☐ **h** 10 × 0.555 = ☐ **i** 1000 × 0.178 = ☐

Calculating – dividing decimals by 10, 100 and 1000

When we divide by 10 the number becomes smaller by 1 place value.
When we divide by 100 the number becomes smaller by 2 place values.
When we divide by 1000 the number becomes smaller by 3 place values.
Look what happens to 45 when we apply these rules:

45 ÷ 10 = 4.5 **45 ÷ 100 = 0.45** **45 ÷ 1000 = 0.045**

1 **Divide these numbers by 10, 100 and 1000. Estimate first.**

	÷ 10	÷ 100	÷ 1000
50	*5*		
25		*0.25*	
37.2			
48.5			*0.0485*
542			

2 **Estimate, then calculate the answers:**

a 72 ÷ 10 = ☐ **b** 48 ÷ 1000 = ☐ **c** 35.2 ÷ 100 = ☐

d 92.05 ÷ 10 = ☐ **e** 345.7 ÷ 1000 = ☐ **f** 55.07 ÷ 100 = ☐

3 **You'll work with a partner for this activity. You'll also need a calculator. Take turns giving each other a decimal number to transform.**

a Give them the starting number and the number you want it to become.

b Your partner then has to do so in one move on the calculator, dividing by either 10, 100 or 1000.

c If they can do so, they score 10 points. If they get it wrong, you score 10 points. If you give them a problem that can't be solved by dividing by 10, 100 or 1000, they score the 10 points.

d Swap roles. First person to 50 points wins. Record the numbers below:

Calculating – multiplying decimal fractions

How do we multiply decimal fractions using a written strategy?
First we estimate: 5 × 3 = 15. Our answer will be around 15.
3 × 5 tenths is 15 tenths. We rename this as 1 whole and 5 tenths.
We write the 5 in the tenths column and move the 1 to the wholes column.
3 × 4 is 12. We also add the 1.
3 × 4.5 = 13.5
We check the answer against our estimate. Do they fit?

$$\begin{array}{r} {}^{1}4.5 \\ \times \quad 3 \\ \hline 13.5 \\ \hline \end{array}$$

1 **Multiply these decimal fractions:**

a 2.6×2

b 3.7×4

c 5.2×5

d 8.4×8

e 14.5×3

f 24.5×7

2 **Now try these:**

a 3.23×4

b 5.33×3

c 8.42×8

d 7.44×6

e 6.28×4

f 3.45×8

3 **Use the templates to set up and solve these money problems:**

a Yasmin buys 3 cartons of choc milk. Each carton costs $2.45. How much money does she spend?

$$\begin{array}{r} \square\square.\square\square \\ \times \quad \square \\ \hline \$\,\square\square.\square\square \\ \hline \end{array}$$

b Lisa buys 4 magazines. Each magazine costs $4.95. How much does she spend on magazines in total?

$$\begin{array}{r} \square\square.\square\square \\ \times \quad \square \\ \hline \$\,\square\square.\square\square \\ \hline \end{array}$$

c Omar wants to buy 3 games for his computer. Each game is $14.95. He has saved $45. Does he have enough money?

$$\begin{array}{r} \square\square.\square\square \\ \times \quad \square \\ \hline \$\,\square\square.\square\square \\ \hline \end{array}$$

Calculating – multiplying decimal fractions

We can also use renaming to multiply decimal fractions. Look at 4 × 3.6:

$$\begin{array}{r} {}^{2}3\ 6 \\ \times\quad 4 \\ \hline 1\ 4\ 4 \end{array}$$ tenths

3.6 can also be expressed as 36 tenths.
36 × 4 = 144
Then we convert back to decimals:
144 tenths is 14.4

4 **Rename these decimal fractions then multiply. The first one has been started for you.**

a 3 × 2.7 = ☐

2.7 is 27 tenths

$$\begin{array}{r} 2\ 7 \\ \times\quad 3 \\ \hline \\ \hline \end{array}$$

3 × 2.7 = _____

b 5 × 3.4 = ☐

c 4 × 9.7 = ☐

d 7 × 1.9 = ☐

5 **Try these. These numbers have hundredths so we will rename the decimal fractions as hundredths. The first one has been done for you.**

a 4 × 6.12 = *24.48*

6.12 is 612 hths

$$\begin{array}{r} 6\ 1\ 2 \\ \times\quad 4 \\ \hline 2\ 4\ 4\ 8 \end{array}$$

4 × 6.12 = 24.48

b 5 × 3.42 = ☐

c 4 × 9.73 = ☐

d 7 × 1.94 = ☐

6 **Solve these problems:**

a Danielle and her twin brothers are each 1.57 m tall. What is their combined height?

b Your favourite cereal is on special for $4.55 per box. You wait until your mum is in a weakened state and then masterfully convince her that buying 7 boxes is a great idea. How much will this cost?

Unless there's a zero at the end, if I multiply tenths, I will always have tenths in my answer. If I multiply by hundredths, I'll always have hundredths in my answer.

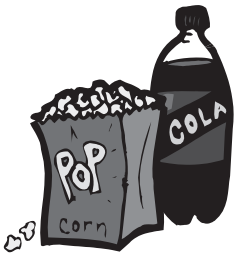
It's a good way to check that my answers are right.

Calculating – multiplying decimal fractions

7 **You and your friends are going to the movies and it's your shout. Look at the price list below and use a multiplication strategy of your choice to answer the following questions. Show your thinking:**

a How much will it cost you for 4 "Under 13" tickets?

b Two of your friends each want a large drink and a medium popcorn. What will that cost you?



Ticket prices		
Under 13		$10.50
Adult		$14.50
Refreshments		
Popcorn	S	$2.50
	M	$3.50
	L	$4.50
Drink	S	$2.50
	M	$3.00
	L	$3.50
Chocolate bar		$1.95
Choc top		$3.25
Water		$1.95
Chips/Crisps		$2.95

c You and your other friend want a choc top and a large drink each. What will that cost?

d Halfway through the movie, you are all dying of thirst and you go out and buy 4 bottles of water. You pay for them with a $20 note. How much change do you receive?

e Use the refreshment price list to design and calculate the cost of a snack that would help get you through this Maths lesson.

Calculating – dividing decimal fractions

Look at 64.4 divided by 5. We start with the largest place value.

6 tens divided by 5 is 1 ten with a remainder of 1 ten.
We rename this as 10 ones and carry it over to the ones column.

14 ones divided by 5 is 2 with 4 ones left over.

We rename this as 40 tenths and carry it. We now have 44 tenths.

44 tenths divided by 5 is 8 with a remander of 4. We rename this as 40 hundredths. 40 hundredths divided by 5 is 8.

64.4 divided by 5 is 12.88

$$5\overline{)\,6\,{}^{1}4.\,{}^{4}4\,{}^{4}0} \quad 1\,2.\,8\,8$$

1 **Divide these:**

a $8\overline{)\,8\;5\;.\;6}$

b $5\overline{)\,4\;7\;.\;0}$

c $7\overline{)\,5\;8\;.\;1}$

d $5\overline{)\,6\;3\;.\;5}$

e $5\overline{)\,9\;9\;.\;0}$

f $6\overline{)\,7\;2\;.\;3\;0}$

2 **Sharing money is a time when we divide decimal fractions. Add the bills then divide them evenly among 4 people. Don't listen to the guy who said he only ate the rice – he's a cheapskate.**

2 hot chocolates	$5.60
2 milkshakes	$4.20
2 muffins	$5.80
1 large bowl chips	$4.60
Total	_____

1 Pad Thai	$ 9.50
1 king prawns with veg	$19.30
1 beef and broccoli	$12.50
1 large rice	$ 3.30
4 colas	$ 8.60
Total	_____

3 **Solve these decimal word problems using a mental or written strategy of your choice:**

a You and 6 friends win a jackpot totalling $248.15. If you share the prize equally, how much will each of you receive?

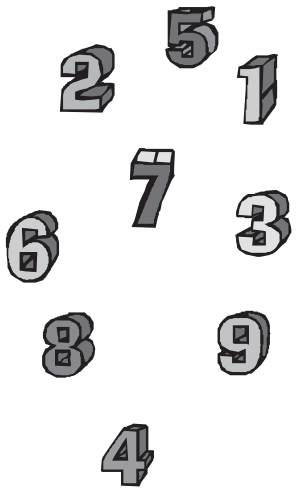
b Two of these friends decide that money is the root of all evil and forgo their share. How much do you each receive now?

c To celebrate you go out and buy 5 ice creams, costing a total of $11.25. What was the cost of an individual ice cream?

4 **You remember the answer 6.125. But you have lost the question! You know it was a division problem and that you divided 2 whole numbers to get to the answer. Both the numbers were smaller than 60. But that's all you remember. And your teacher wants to see what you have been doing during the lesson or you can kiss recess goodbye.**

Save your recess and work out what the division problem was. You can try this with or without a calculator.

? ÷ ? = 6.125



What number am I? solve

Getting ready

See if you can guess the secret numbers below.
You can use a calculator and co-opt a partner if you like.

What to do

1 I start with the number. I halve it, add 3.6 to that answer, divide this new number by 4 and then I add 0.3. My answer is 6.5. What number did I start with?

2 I start with a new secret number. I add 1.4 to this, divide the new number by 11, halve the quotient and then halve it again. My answer is 1.25. What number did I start with?

3 I start with a number, then halve it. I subtract 18.05 from the answer and then multiply this number by 3. I add 6 to the total and my answer is 96.3. What number did I start with?

4 I start with a number and divide it by 8. I multiply the answer by 3.2 and then subtract 4.1 from this new answer. I multiply this by 23 and end up with 52.9. What number did I start with?

What to do next

Now you know how these work, can you write your own problem for a partner to solve?