Decimals

Work through these tasks at your own pace and level:

 If you find this part of maths tricky, start here. You can always move up to something spicier!

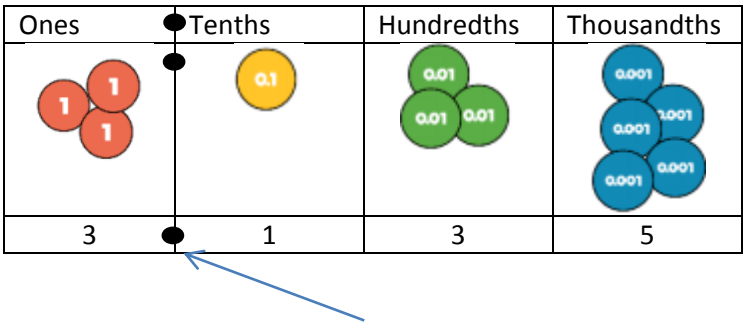
 Most people will want to start here. Fluency at this stage is really important before moving up. If you struggle, work on the lower level first, and come back to this.

 This is an extension. If you are happy at the level below, try this out and push yourself to reason with your maths.

Answers can be found at the end of the booklet. If your answers don't match – try the problem again and see if you can work out how to get to the correct answer.

1. *Decimals*

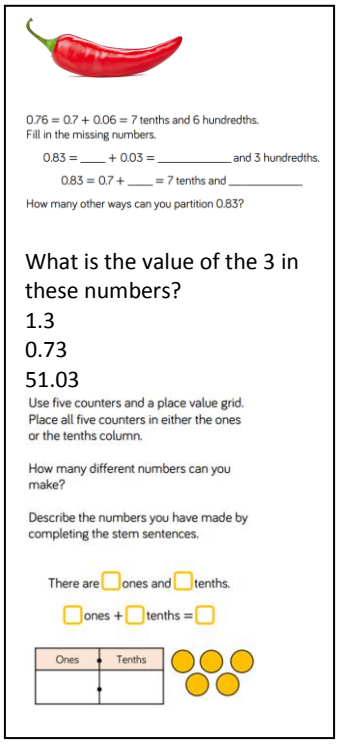
If I divide a number into parts that are smaller than 1, I get decimals: 3.135

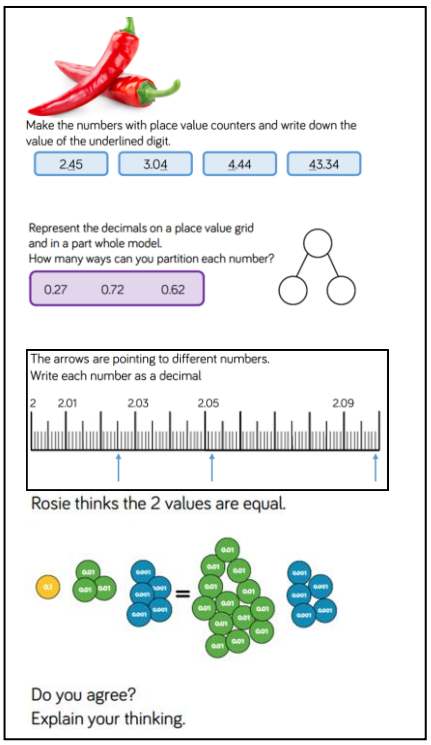


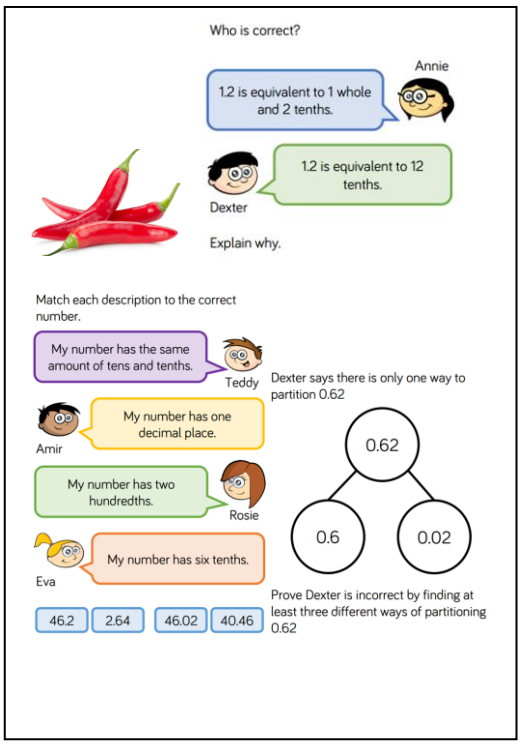
They are shown in a number using a decimal point. Everything to the right of the point is smaller than 1. For example: 2.56 the 2 is a whole number, but the 5 represents tenths and the 6 is hundredths because they come after the decimal place.

If the number has no tenths or hundredths etc. but does have a smaller place value of decimal (e.g. hundredths or thousandths), a place holder 0 is used to make sure that the number is represented properly. For example: 5.61 means 5 ones, 6 tenths and 1 hundredth, but 5.601 means 5 ones, 6 tenths and 1 thousandth. You can tell the place value of each digit by counting from the decimal point.

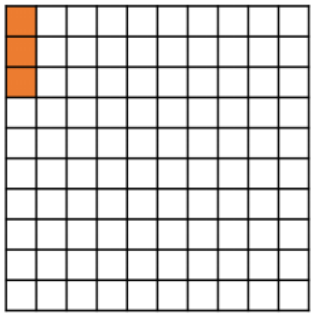
Just like with whole numbers, each jump in place value is ten times the space to the right of it, so 10 tenths will add up to 1 whole. 10 hundredths will make 1 tenth, and so on. The words also help to tell you how many you need to make a whole number, e.g. 100 **hundred**ths will make 1, 1000 **thousand**ths will make 1.







2. *Decimals as fractions*



This grid shows 100 squares. Of those 100 squares, 3 are coloured in.

This is the fraction $\frac{3}{100}$ because 3 out of 100 are coloured.

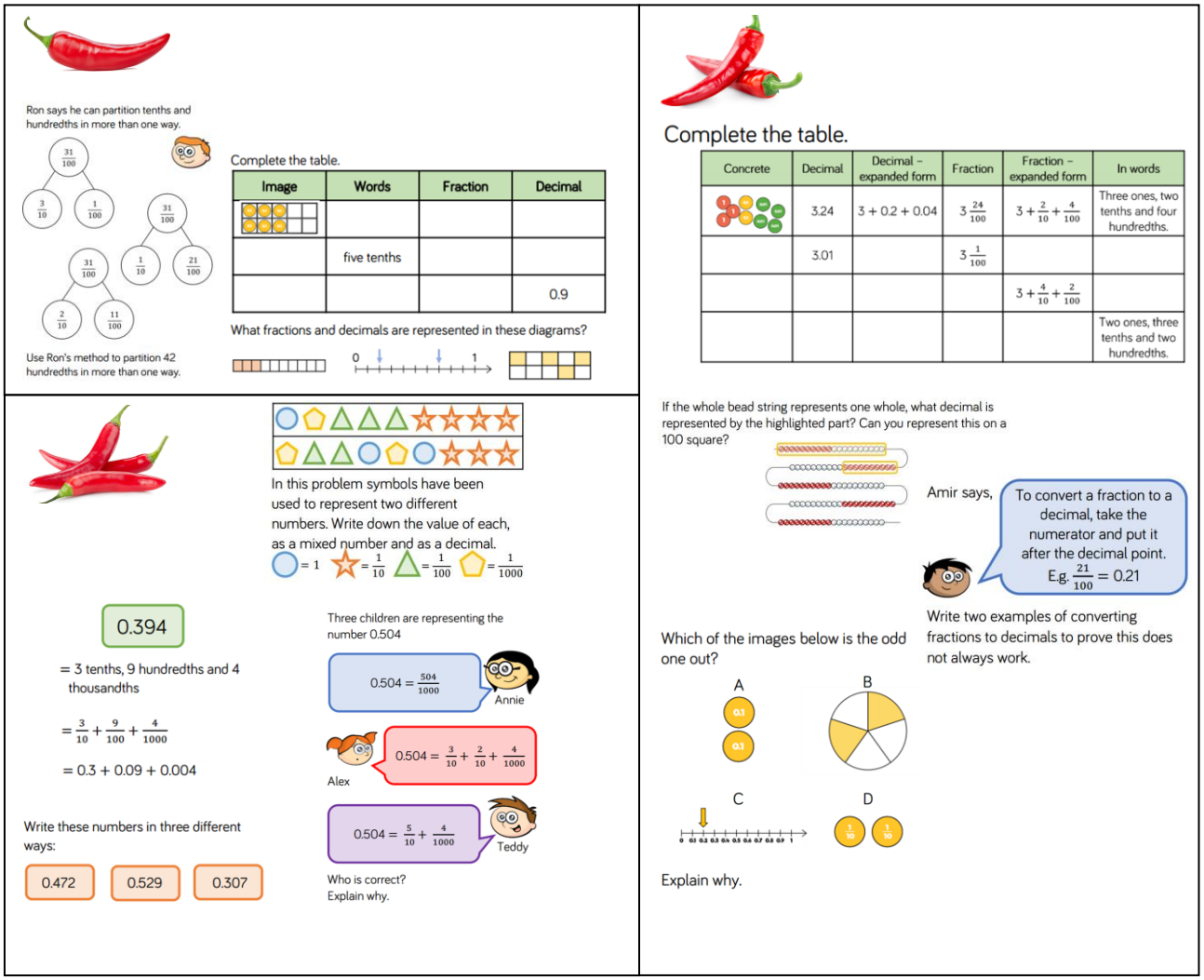
This is also a decimal. One whole is represented by the entire grid. This is then divided up into 100 parts, so each part is a hundredth. 3 are coloured in, so the grid shows 3 hundredths or 0.03.

If I have a decimal, I can convert it into a fraction by multiplying by ten enough times to make a whole number, then putting that multiplier underneath as a fraction. E.g.

$$0.7 = \frac{7}{10} \qquad 0.09 = \frac{9}{100}$$

$$0.004 = \frac{4}{1000} \qquad 0.47 = \frac{47}{100}$$

$$0.132 = \frac{132}{1000} \qquad 1.75 = \frac{175}{100}$$



3. Rounding decimals

Rounding involves taking a complex number and making it simpler by finding a number that is close to it. (for example, we would never talk about the Earth's population in exact numbers, but would round it to a simpler number: 7 million)

e.g. Round 3.451 to the nearest tenth

Tenths either side: 3.4 or 3.5

3.451

5 or higher so we round up to 3.500 = 3.5

Step 1: Check what you are rounding to – find the nearest options either side of your number

Step 2: Look one digit *lower* than the digit you are trying to round to – if it's 4 or lower round down to the lower option, if its 5 or higher round up

Step 3: All digits lower than that become zero – rounding is about removing smaller, less important digits

If the 0s are decimals, we can remove them completely as they are no longer needed as place holders

e.g. Round 56.157 to the nearest whole number

Whole numbers either side: 56 or 57

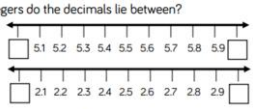
56.157

4 or lower so we round down to 56.000 = 56

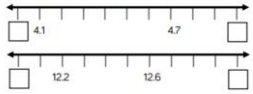
Top tip:

Integer means whole number

Which integers do the decimals lie between?



Complete the sentences to describe each decimal.



___ is closer to ___ than ___

___ rounds to ___ to the nearest whole number.

Circle the numbers that round up to the nearest whole number.

4.5 3.7 2.3 4.2 16.8 1.9

Mo says 0.4 rounded to the nearest whole number is zero.

Whitney says 0.4 rounded to the nearest whole number is one.

Who is correct? Why?

Use the number lines to round 3.24 to the nearest tenth and the nearest whole number.

Round each number to the nearest tenth and nearest whole number. Use number lines to help you.

A number with one decimal place rounded to the nearest whole number is 45

What could the number be?

Dexter is measuring a box of chocolates with a ruler that measures in centimetres and millimetres.

He measures it to the nearest cm and writes the answer 28 cm.
What is the smallest length the box of chocolates could be?

Whitney is thinking of a number.

Rounded to the nearest whole her number is 4
Rounded to the nearest tenth her number is 3.8
Write down at least 4 different numbers that she could be thinking of.

A number between 11 and 20 with 2 decimal places rounds to the same number when rounded to one decimal place and when rounded to the nearest whole number?

What could this be?
Is there more than one option?
Explain why.

4. Comparing and ordering decimals

Step 1: Look at the highest value digit in each number – do they all have the same place value?

Step 2: If the first digit is the same, move on to the next biggest digit, and so on down the number until you find a digit that differs

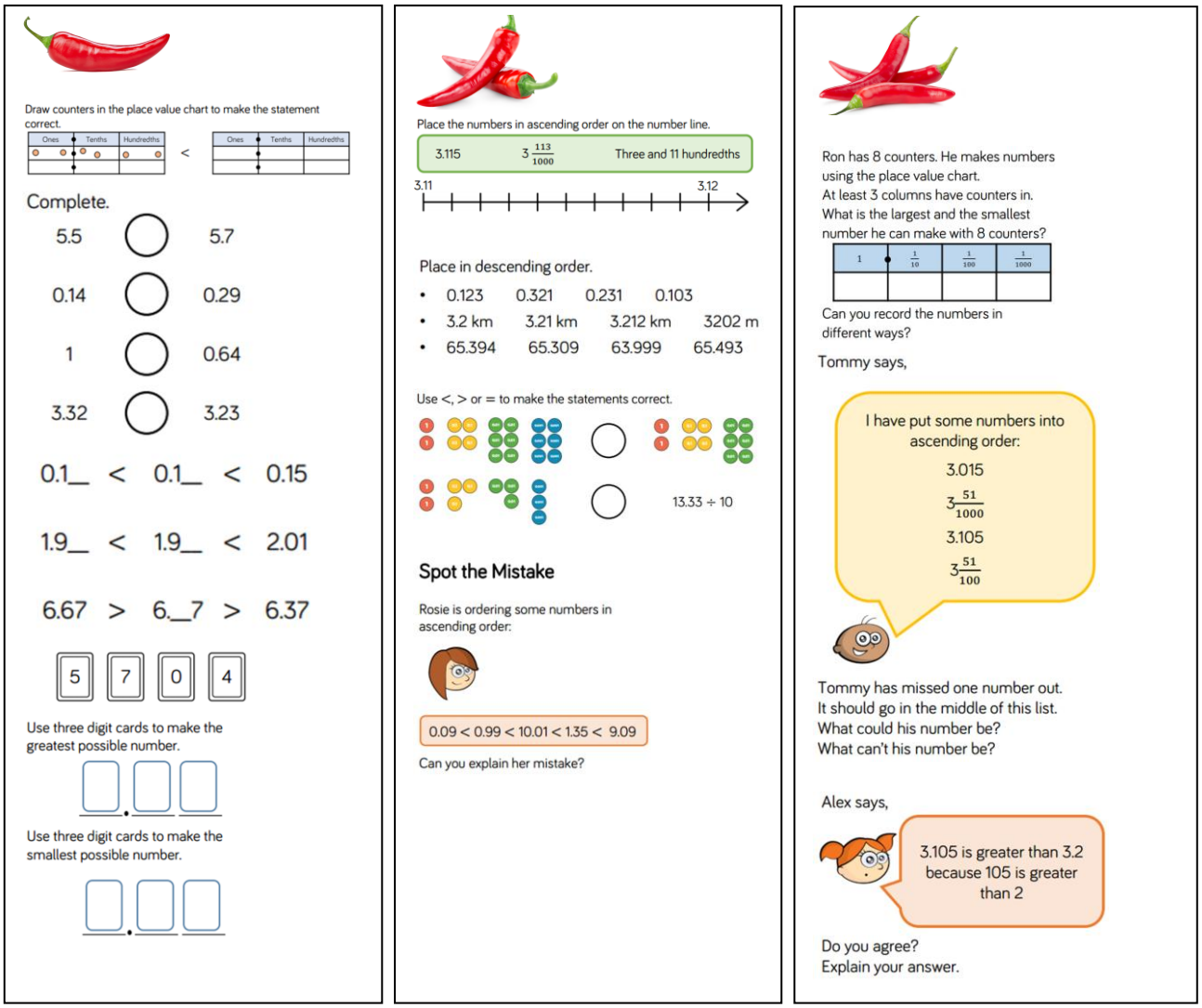
3.457 32.467 3.492

Smallest to biggest:

3.457 3.492 32.467

These two have the same number of ones and tenths but the hundredths are different which allows us to order them

This has tens which the others don't so the decimals don't matter



Draw counters in the place value chart to make the statement correct.

Ones | Tenths | Hundredths < Ones | Tenths | Hundredths

Complete.

5.5 ◯ 5.7

0.14 ◯ 0.29

1 ◯ 0.64

3.32 ◯ 3.23

0.1_ < 0.1_ < 0.15

1.9_ < 1.9_ < 2.01

6.67 > 6._7 > 6.37

5 7 0 4

Use three digit cards to make the greatest possible number.

Use three digit cards to make the smallest possible number.

Place the numbers in ascending order on the number line.

3.115 $3\frac{113}{1000}$ Three and 11 hundredths

3.11 3.12

Place in descending order.

- 0.123 0.321 0.231 0.103
- 3.2 km 3.21 km 3.212 km 3202 m
- 65.394 65.309 63.999 65.493

Use <, > or = to make the statements correct.

◯ ◯ 13.33 ÷ 10

Spot the Mistake

Rosie is ordering some numbers in ascending order:

0.09 < 0.99 < 10.01 < 1.35 < 9.09

Can you explain her mistake?

Ron has 8 counters. He makes numbers using the place value chart.
At least 3 columns have counters in.
What is the largest and the smallest number he can make with 8 counters?

1 | $\frac{1}{10}$ | $\frac{1}{100}$ | $\frac{1}{1000}$

Can you record the numbers in different ways?

Tommy says,

I have put some numbers into ascending order:
3.015
$3\frac{51}{1000}$
3.105
$3\frac{51}{100}$

Tommy has missed one number out.
It should go in the middle of this list.
What could his number be?
What can't his number be?

Alex says,

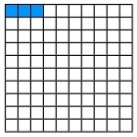
3.105 is greater than 3.2 because 105 is greater than 2

Do you agree?
Explain your answer.

5. *Percentages*

Per cent means parts per 100. So a percentage is how many parts out of 100 are coloured in or included. The percentage sign looks like this: %

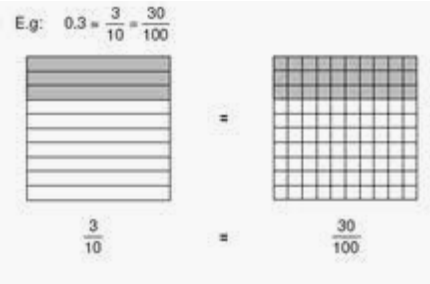
This means that a percentage is the same of the numerator in a fraction where the denominator is 100, or the same as asking how many hundredths a number has.

$\frac{3}{100}$	0.03
3%	

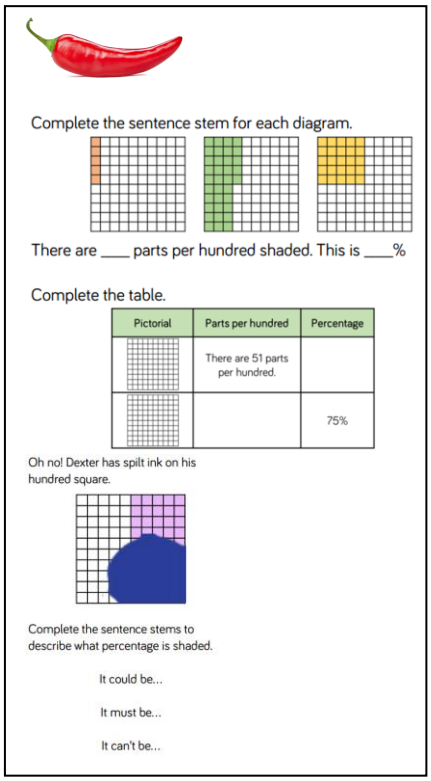
Any fraction that can be converted into a number over 100 will enable you to find a percentage. I know that I can change fractions by doing the same thing to the top numbers as I do to the bottom number. As long as I do the same to both parts the fraction will be equal.

E.g. $\frac{3}{10}$ if I multiply the top and the bottom numbers by 10, I get 30 hundredths.

If my number is 0.3 that is the same as 0.30 which is 30 hundredths



So $\frac{3}{10}$ = 30% = 0.3



Complete the sentence stem for each diagram.

There are ___ parts per hundred shaded. This is ___%

Complete the table.

Pictorial	Parts per hundred	Percentage
	There are 51 parts per hundred.	
		75%

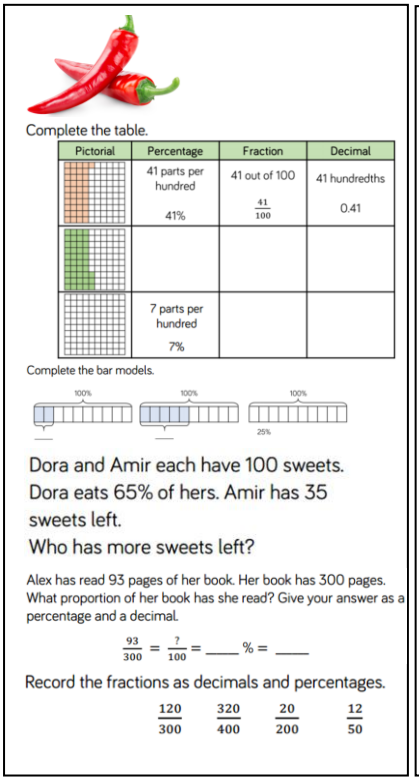
Oh no! Dexter has spilt ink on his hundred square.

Complete the sentence stems to describe what percentage is shaded.

It could be...

It must be...

It can't be...



Complete the table.

Pictorial	Percentage	Fraction	Decimal
	41 parts per hundred 41%	41 out of 100 $\frac{41}{100}$	41 hundredths 0.41
	7 parts per hundred 7%		

Complete the bar models.

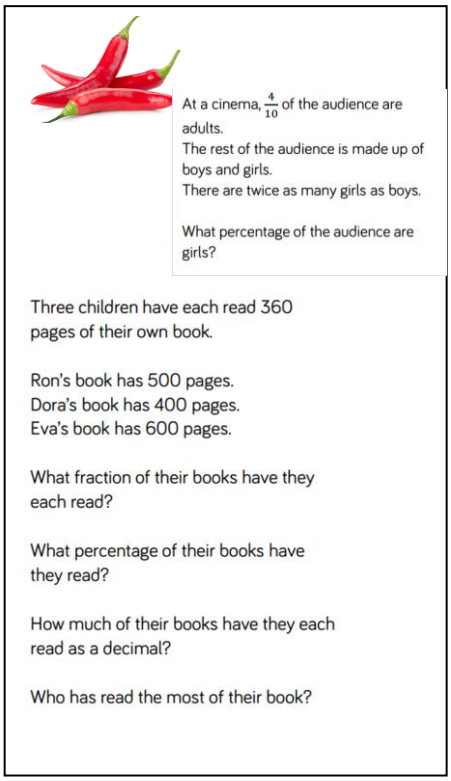
Dora and Amir each have 100 sweets. Dora eats 65% of hers. Amir has 35 sweets left.
Who has more sweets left?

Alex has read 93 pages of her book. Her book has 300 pages. What proportion of her book has she read? Give your answer as a percentage and a decimal.

$\frac{93}{300} = \frac{?}{100} = \_\_\_\_\% = \_\_\_\_$

Record the fractions as decimals and percentages.

$\frac{120}{300}$ $\frac{320}{400}$ $\frac{20}{200}$ $\frac{12}{50}$



At a cinema, $\frac{4}{10}$ of the audience are adults.
The rest of the audience is made up of boys and girls.
There are twice as many girls as boys.

What percentage of the audience are girls?

Three children have each read 360 pages of their own book.

Ron's book has 500 pages.
Dora's book has 400 pages.
Eva's book has 600 pages.

What fraction of their books have they each read?

What percentage of their books have they read?

How much of their books have they each read as a decimal?

Who has read the most of their book?

6. Fraction, Decimal, Percentage Equivalence

Some fraction:decimal:percentage equivalents are much easier if you just know them. Try learning these quick facts, then come back to the questions below to check your recall and application:

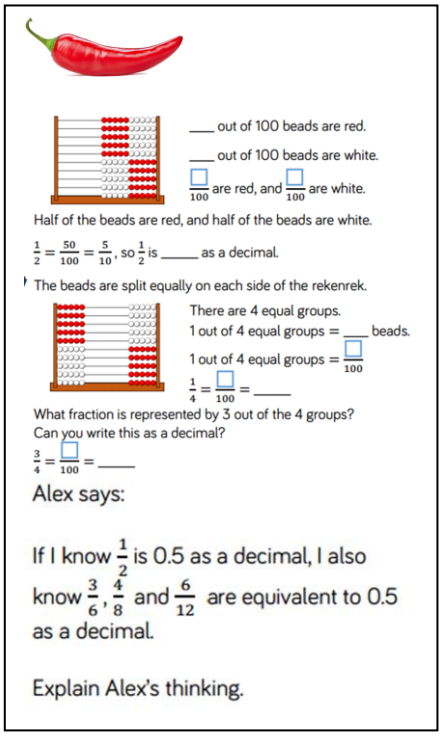
½ = 0.5 = 50%

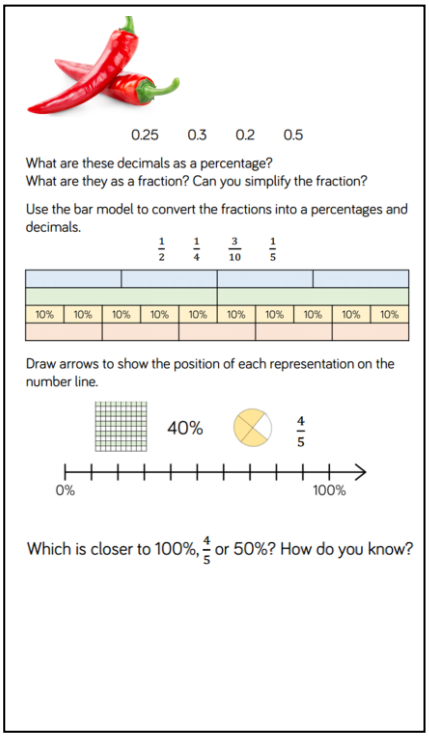
¼ = 0.25 = 25%

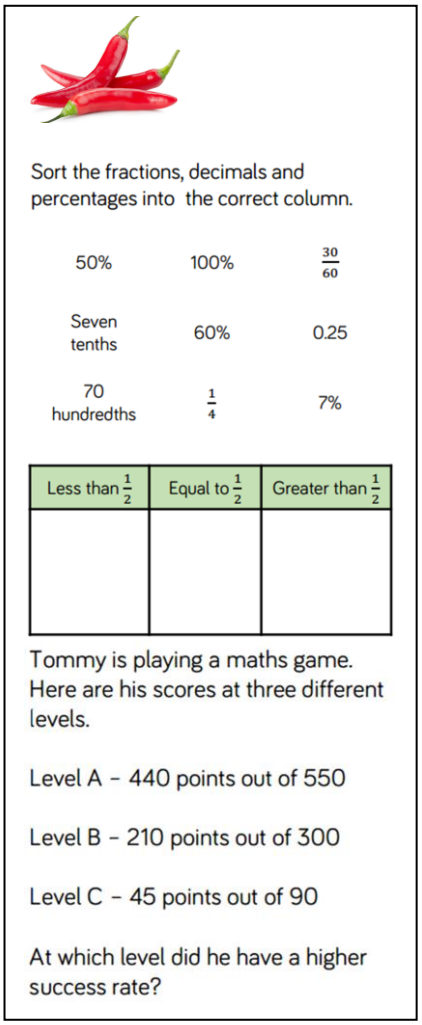
¾ = 0.75 = 75%

1/5 = 0.2 = 20%

2/5 = 0.4 = 40%

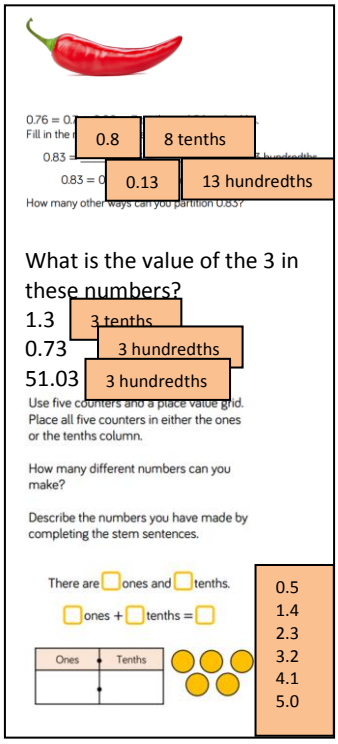


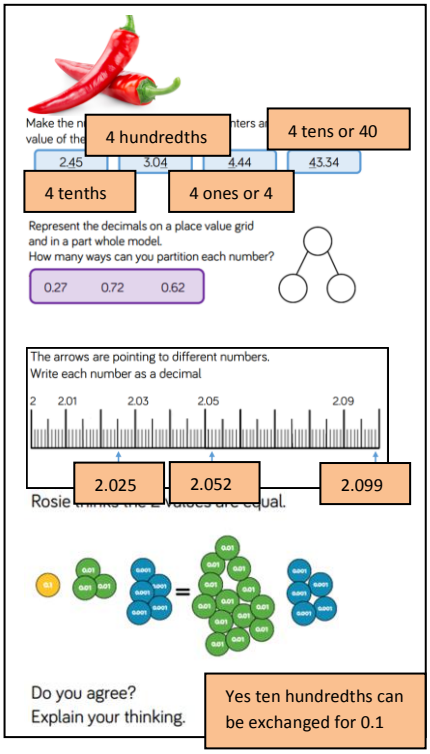


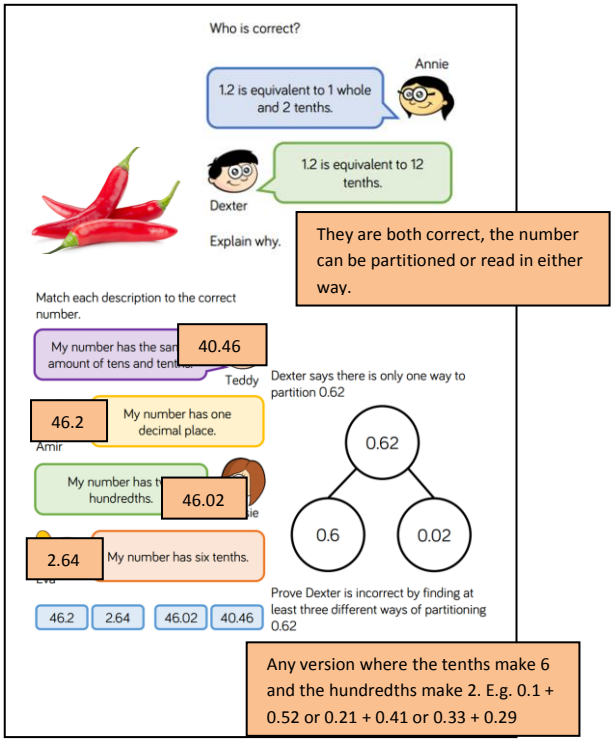


Answers

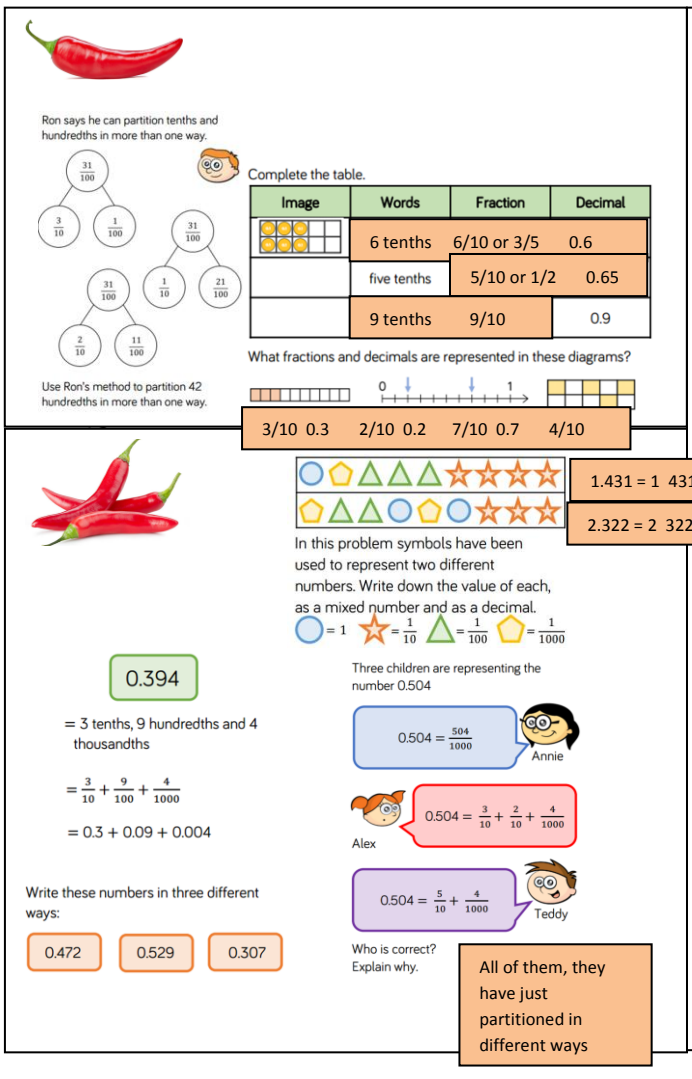
1. *Decimals*

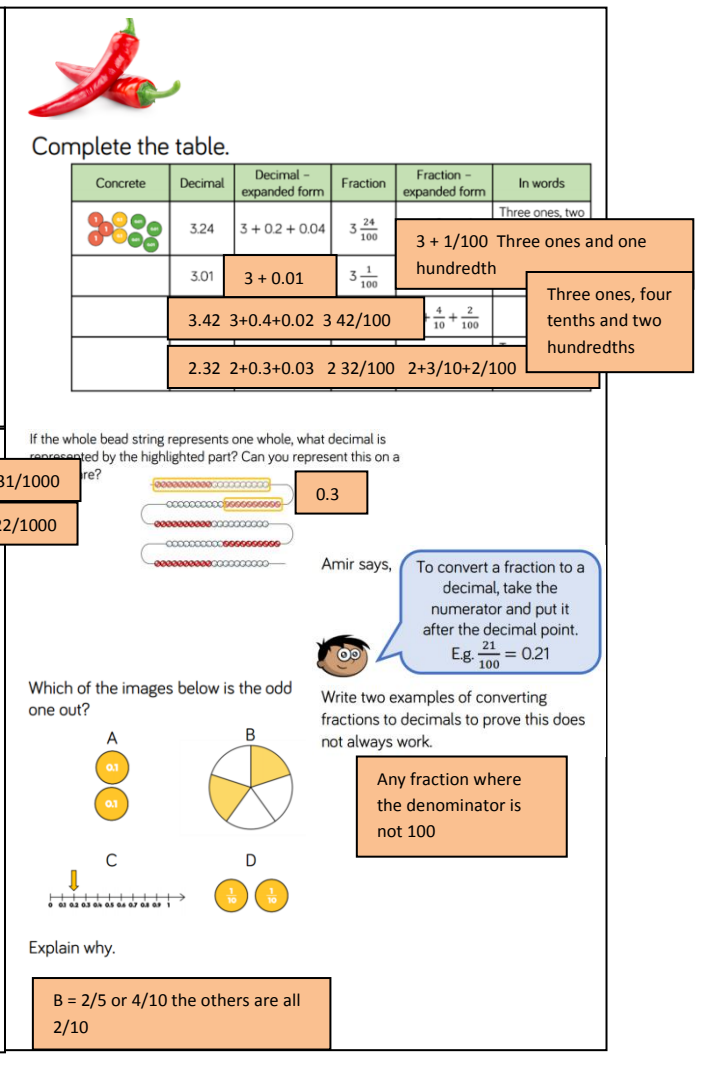






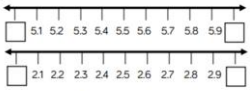
2. *Decimals as fractions*



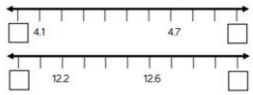


3. Rounding Decimals

Which integers do the decimals lie between?



Complete the sentences to describe each decimal.



___ is closer to ___ than ___

___ rounds to ___ to the nearest whole number.

Circle the numbers that round up to the nearest whole number.

4.5 3.7 2.3 4.2 16.8 1.9

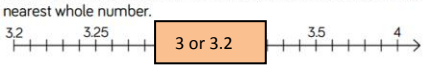
Mo says 0.4 rounded to the nearest whole number is zero.

Whitney says 0.4 rounded to the nearest whole number is one.

Who is correct? Why?

Mo because you round 4 down

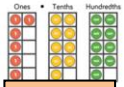
Use the number lines to round 3.24 to the nearest tenth and the nearest whole number.



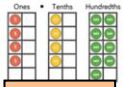
3 or 3.2

Round each number to the nearest tenth and nearest whole number. Use number lines to help you.

6 or 6.2



7 or 7.0



4 or 4.5

A number with one decimal place rounded to the nearest whole number is 45

What could the number be?

44.5 44.6 44.7 44.8 44.9 45.1 45.2 45.3 45.4

Dexter is measuring a box of chocolates with a ruler that measures in centimetres and millimetres.

He measures it to the nearest cm and writes the answer 28 cm.
What is the smallest length the box of chocolates could be?

27.5cm

Whitney is thinking of a number.

Rounded to the nearest whole her number is 4
Rounded to the nearest tenth her number is 3.8
Write down at least 4 different numbers that she could be thinking of.

Anything from 3.75 to 3.849

A number between 11 and 20 with 2 decimal places rounds to the same number when rounded to one decimal place and when rounded to the nearest whole number

What could thi
Is there more t
Explain why.

Any whole number from 11-19

Decimals .95-99

Because when they round to the nearest tenth this causes an exchange

4. Comparing and ordering decimals

Draw counters in the place value chart to make the statement correct.

Ones	Tenths	Hundredths		Ones	Tenths	Hundredths
●	● ● ●	● ●	<			

Complete.

5.5 < 5.7

0.14 < 0.29

1 > 0.64

3.32 > 3.23

0.1_ < 0.1_ < 0.15

1.9_ < 1.9_ < 2.01

6.67 > 6._7 > 6.37

5	7	0	4

Use three digit cards to make the greatest possible number.

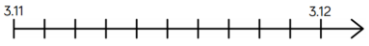
7.54

Use three digit cards to make the smallest possible number.

0.45

Place the numbers in ascending order on the number line.

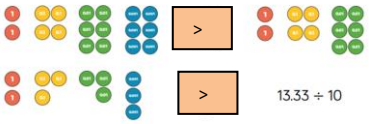
3.115 $3\frac{113}{1000}$ Three and 11 hundredths



Place in descending order.

- 0.321 0.231 0.123 0.103
- 3.212km 3202m 3.21km 3.2km
- 65.493 65.394 65.309 63.999

Use <, > or = to make the statements correct.



13.33 ÷ 10

Spot the Mistake

Rosie is ordering some numbers in ascending order:

0.09 < 0.99 < 10.01 < 1.35 < 9.09

Can you explain her mistake?

She hasn't thought about the place value

0.09 < 0.99 < 1.35 < 9.09 < 10.01

Ron has 8 counters. He makes numbers using the place value chart.
At least 3 columns have counters in.
What is the largest and the smallest number he can make with 8 counters?

1	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1000}$

6.11

0.116

Can you record the numbers in different ways?

Tommy says,

I have put some numbers into ascending order:

3.015

$3\frac{51}{1000}$

3.105

$3\frac{51}{100}$

Any number between 3.051 and 3.105

It can't be smaller than 3.051 or bigger than 3.105

Tommy has missed one numb
It should go in the middle of this list.
What could his number be?
What can't his number be?

Alex says,

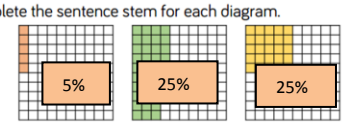
3.105 is greater than 3.2 because 105 is greater than 2

Do you agree?
Explain your answer.

No 2 tenths is bigger than 1 tenth

5. Percentages

Complete the sentence stem for each diagram.

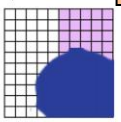


There are ___ parts per hundred shaded. This is ___%

Complete the table.

Pictorial	Parts per hundred	Percentage
	There are 51 parts per hundred.	51%
	75 parts per hundred	75%

Oh no! Dexter has spilt ink on h
hundred square.



Complete the sentence stems to
describe what percentage is sha

It could be...

It must be...

It can't be...

It could be any number from 23% to 57%

It must be at least 23%

It can't be less than 23% or more than 57%

Complete the table.

Pictorial	Percentage	Fraction	Decimal
	41 parts per hundred 41%	41 out of 100 $\frac{41}{100}$	41 hundredths 0.41
	43%	43/100	0.43
	7 parts per hundred 7%	7/100	0.07

Complete the bar models.

20%

50%

Dora and Amir each have 100 sweets.
Dora eats 65% of hers. Ami
sweets left.
Who has more sweets left?

They have the same

Alex has read 93 pages of her book. Her book has 300 pages.
What proportion of her book has she read? Give your answer as a percentage and a decimal.

$\frac{93}{300}$ = 31/100 31% 0.31

Record the fractions as decimals and percentages.

$\frac{120}{300}$	$\frac{320}{400}$	$\frac{20}{200}$	$\frac{12}{50}$
40% 0.4	80% 0.8	10% 0.1	24% 0.24

At a cinema, $\frac{4}{10}$ of the audience are adults.
The rest of the audience is made up of boys and girls.
There are twice as many girls as boys.

What percentage of the audience are girls?

40%

Three children have each read 360 pages of their own book.

Ron's book has 500 pages.
Dora's book has 400 pages.
Eva's book has 600 pages.

72/100 72% 0.72
90/100 90% 0.9
60/100 60% 0.6

What fraction of their books have they each read?

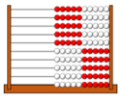
What percentage of their books have they read?

How much of their books have they each read as a decimal?

Who has read the most of their book?

Dora

6. Fraction, decimal, percentage equivalence



___ out of 100 beads are red.

___ out of 100 beads are white.

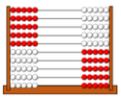
$\frac{\square}{100}$ are red, and $\frac{\square}{100}$ are white.

Half of the beads are red, and half of the beads are white.

$\frac{1}{2} = \frac{50}{100} = \frac{5}{10}$, so $\frac{1}{2}$ i a decimal.

0.5

The beads are split equally on each side of the rekenrek.



There are 4 equal groups.
1 out of 4 equal groups = ___ beads.
1 out of 4 equal groups = $\frac{\square}{100}$

$\frac{1}{4} = \frac{\square}{100}$

0.25

What fraction is represented by 3 out of the 4 groups?
Can you write this as a decimal?

$\frac{3}{4} = \frac{\square}{100} =$

0.75

Alex says:

If I know $\frac{1}{2}$ is 0.5 as a decimal, I also know $\frac{3}{6}$, $\frac{4}{8}$ and $\frac{6}{12}$ are equivalent to 0.5 as a decimal.

Explain Alex's thinking.

They are all equivalent fractions so they are worth the same

30%
30/100
3/10

50%
50/100
1/2

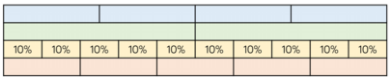
0.25 0.3 0.2 0.5

What are as a
What are n? C he fraction?
Use the vert a percentages and decimals

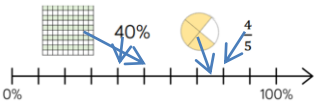
25%
25/100
1/4

20%
20/100
1/5

2 4 10 5



Draw arrows to show the position of each representation on the number line.



Which is closer to 100%, $\frac{4}{5}$ or 50%? How do you know?

4/5 is 80% so it's bigger

Sort the fractions, decimals and percentages into the correct column.

50%	100%	$\frac{30}{60}$
Seven tenths	60%	0.25
70 hundredths	$\frac{1}{4}$	7%

Less than $\frac{1}{2}$	Equal to $\frac{1}{2}$	Greater than $\frac{1}{2}$
0.25 ¼ 7%	50% 30/60	100% Seven tenths 60% 70 hundredths

Tommy is playing a maths game. Here are his scores at three different levels.

Level A – 440 points out of 550

Level B – 210 points out of 300

Level C – 45 points out of 90

At which level did he have a higher success rate?

A