

**White**

**Rose  
Maths**

Spring - Block 3

**Decimals & Percentages**

# Overview

## Small Steps

- ▶ Decimals up to 2 d.p.
- ▶ Decimals as fractions (1)
- ▶ Decimals as fractions (2)
- ▶ Understand thousandths
- ▶ Thousandths as decimals
- ▶ Rounding decimals
- ▶ Order and compare decimals
- ▶ Understand percentages
- ▶ Percentages as fractions and decimals
- ▶ Equivalent F.D.P.

## NC Objectives

Read, write, order and compare numbers with up to three decimal places.

Recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents.

Round decimals with two decimal places to the nearest whole number and to one decimal place.

Solve problems involving number up to three decimal places.

Recognise the percent symbol (%) and understand that per cent relates to 'number of parts per hundred', and write percentages as a fraction with denominator 100, and as a decimal.

Solve problems which require knowing percentage and decimal equivalents of  $\frac{1}{2}$ ,  $\frac{1}{4}$ ,  $\frac{1}{5}$ ,  $\frac{2}{5}$ ,  $\frac{4}{5}$  and those fractions with a denominator of a multiple of 10 or 25

# Decimals up to 2 d.p.

## Notes and Guidance

Children use place value counters and a place value grid to make numbers with up to two decimal places.

They read and write decimal numbers and understand the value of each digit.

They show their understanding of place value by partitioning decimal numbers in different ways.

## Mathematical Talk

How many ones/tenths/hundredths are in the number?  
How do we write this as a decimal? Why?

What is the value of the \_\_\_ in the number \_\_\_\_\_?

When do we need to use zero as a place holder?

How can we partition decimal numbers in different ways?

## Varied Fluency

- Which number is represented on the place value chart?

Ones	Tenths	Hundredths
	0.1	0.01 0.01
0	1	2

There are \_\_\_ ones, \_\_\_ tenths and \_\_\_ hundredths.

The number is \_\_\_

Represent the numbers on a place value chart and complete the stem sentences.

0.28

0.65

0.07

1.26

- Make the numbers with place value counters and write down the value of the underlined digit.

2.45

3.04

4.44

43.34

- $0.76 = 0.7 + 0.06 = 7$  tenths and 6 hundredths.  
Fill in the missing numbers.

$$0.83 = \underline{\quad} + 0.03 = \underline{\quad} \text{ and } 3 \text{ hundredths.}$$

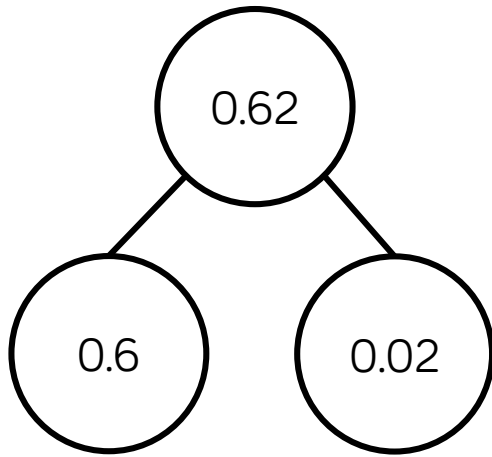
$$0.83 = 0.7 + \underline{\quad} = 7 \text{ tenths and } \underline{\quad}$$

How many other ways can you partition 0.83?

# Decimals up to 2 d.p.

## Reasoning and Problem Solving

Dexter says there is only one way to partition 0.62



Prove Dexter is incorrect by finding at least three different ways of partitioning 0.62

$$0.62 = 0.12 + 0.5$$

$$0.62 = 0.4 + 0.22$$

$$0.62 = 0.3 + 0.32$$

$$0.62 = 0.42 + 0.2$$

$$0.62 = 0.1 + 0.52$$

$$0.62 = 0.03 + 0.59$$

etc.

Match each description to the correct number.

My number has the same amount of tens and tenths.



Teddy



Amir

My number has one decimal place.

My number has two hundredths.



Rosie



Eva

My number has six tenths.

46.2

2.64

46.02

40.46

Teddy - 40.46  
Amir - 46.2  
Rosie - 46.02  
Eva - 2.64

# Decimals as Fractions (1)

## Notes and Guidance

Children explore the relationship between decimals and fractions. They start with a fraction (including concrete and pictorial representations of fractions) convert it into a decimal and as they progress, children will see the direct link between fractions and decimals.

Children use their previous knowledge of fractions to aid this process.

## Mathematical Talk

What does the whole grid represent?

What can we use to describe the equal parts of the grid (fractions and decimals)?

How would you convert a fraction to a decimal?

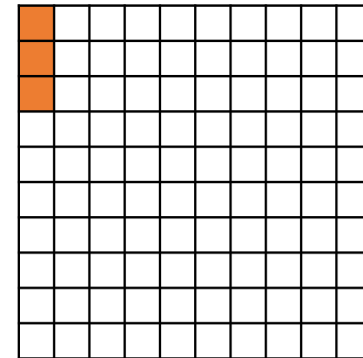
What does the decimal point mean?

Can the fraction be simplified?

How can you prove that the decimal \_\_\_\_ and the fraction \_\_\_\_ are the same?

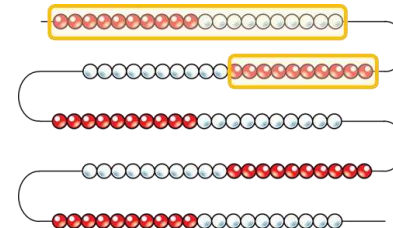
## Varied Fluency

- What fraction is shown in both representations?  
Can you convert this in to a decimal?



The fraction  $\frac{\square}{\square}$  is the same as the decimal \_\_\_\_\_

- If the whole bead string represents one whole, what decimal is represented by the highlighted part? Can you represent this on a 100 square?

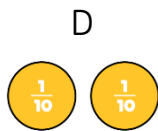
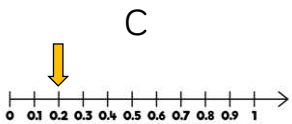
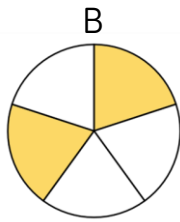


# Decimals as Fractions (1)

## Reasoning and Problem Solving

### Odd one out

Which of the images below is the odd one out?



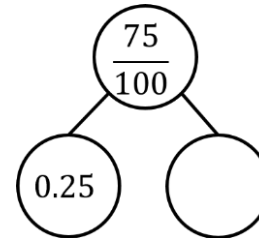
Explain why.

Possible answer:

B is the odd one out because it shows  $\frac{2}{5}$ , which is  $\frac{4}{10}$  or 0.4

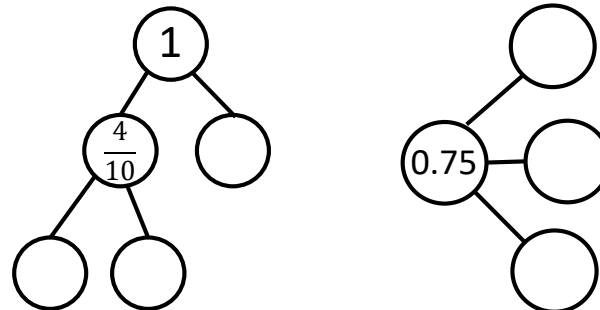
The other images show  $\frac{2}{10}$  or 0.2

How many different ways can you complete the part-whole model using fractions and decimals?



Create another part-whole model like the one above for your partner to complete.

Now complete the following part-whole models using fractions and decimals.



Possible answers:

$$\frac{50}{100}$$

$$\frac{1}{2}$$

$$0.5$$

There are various possible answers when completing the part-whole models. Ensure both fractions and decimals are represented.

# Decimals as Fractions (2)

## Notes and Guidance

Children concentrate on more complex decimals numbers (e.g. 0.96, 0.03, 0.27) and numbers greater than 1 (e.g. 1.2, 2.7, 4.01).

They represent them as fractions and as decimals.

Children record the number in multiple representations, including expanded form and in words.

## Mathematical Talk

In the number 1.34 what does the 1 represent, what does the 3 represent, what does the 4 represent?

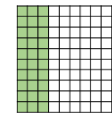
Can we represent this number in a different way, and another, and another?

On the number line, where can we see tenths? Where can we see hundredths?

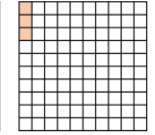
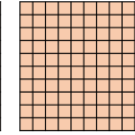
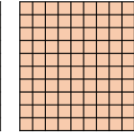
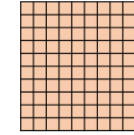
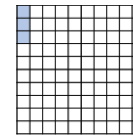
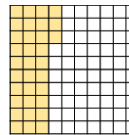
On the number line, tell me another number that is between c and d. Now give your answer as a fraction. Tell me a number that is not between c and d.

## Varied Fluency

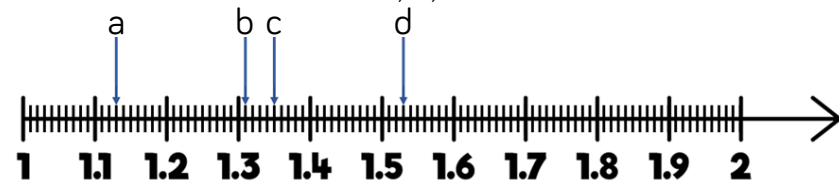
Use the models to record equivalent decimals and fractions.



$$0.3 = \frac{3}{10} = \frac{30}{100}$$



Write down the value of a, b, c and d as a decimal and a fraction.



Complete the table.

Concrete	Decimal	Decimal - expanded form	Fraction	Fraction - expanded form	In words
	3.24	$3 + 0.2 + 0.04$	$3 \frac{24}{100}$	$3 + \frac{2}{10} + \frac{4}{100}$	Three ones, two tenths and four hundredths.
	3.01		$3 \frac{1}{100}$		
				$3 + \frac{4}{10} + \frac{2}{100}$	
					Two ones, three tenths and two hundredths.

# Decimals as Fractions (2)

## Reasoning and Problem Solving

2.25 = 2 ones, 2 tenths and 5 hundredths.

Can you write the following numbers in at least three different ways?

23.7

2.37

9.08

0.98

Possible answer: Children may represent it in words, decimals, fractions, expanded form but also by partitioning the number in different ways.

Amir says,

To convert a fraction to a decimal, take the numerator and put it after the decimal point.

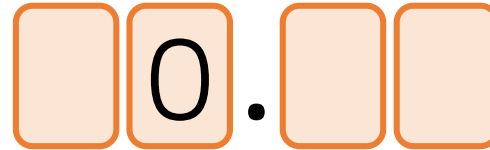
E.g.  $\frac{21}{100} = 0.21$



Write two examples of converting fractions to decimals to prove this does not always work.

Possible answers could include  $\frac{1}{100}$  is not equal to 0.1

Use the digits 3, 4 and 5 to complete the decimal number.



List all the possible numbers you can make.

Write these decimals as mixed numbers.

Choose three of the numbers and write them in words.

30.45, 30.54,  
40.35, 40.53,  
50.43, 50.34

$30 \frac{45}{100}$ ,  $30 \frac{54}{100}$ ,

$40 \frac{35}{100}$ ,  $40 \frac{53}{100}$ ,

$50 \frac{43}{100}$ ,  $50 \frac{34}{100}$



# Understand Thousandths

## Notes and Guidance

Children build on previous learning of tenths and hundredths and apply this to understanding thousandths.

Opportunities to develop understanding of thousandths through the use of concrete and pictorial representations need to be incorporated.

When exploring the relationships between tenths, hundredths and thousandths, consider decimal and mixed number equivalences.

## Mathematical Talk





If 4 tenths = 0.4, 4 hundredths = 0.04, what is 4 thousandths equal to?

Using the place value charts:

- How many tenths are in a whole?
- How many hundredths are there in 1 tenth?
- Using place value counters complete the final chart.
- How many thousandths in 1 hundredth?

## Varied Fluency

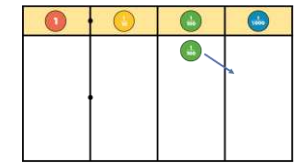
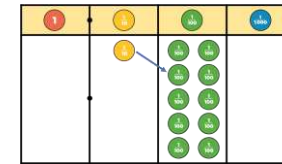
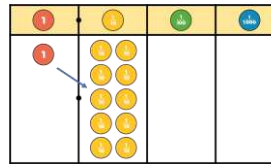
Eva is using Base 10 to represent decimals.


 = 1 whole    = 1 tenth    = 1 hundredth    = 1 thousandth


Use Base 10 to build:


- 4 wholes, 4 tenths, 4 hundredths, 4 thousandths
- 5 tenths, 7 hundredths and 5 thousandths
- 2.357

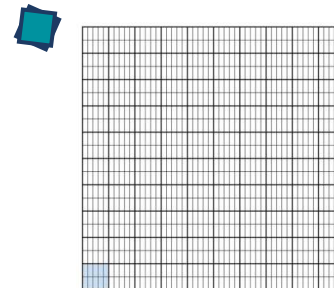
Use the place value charts to help you fill in the final chart.



 = \_\_\_ tenths

 = \_\_\_ hundredths

 = \_\_\_ thousandths



What has this hundred square been divided up into?

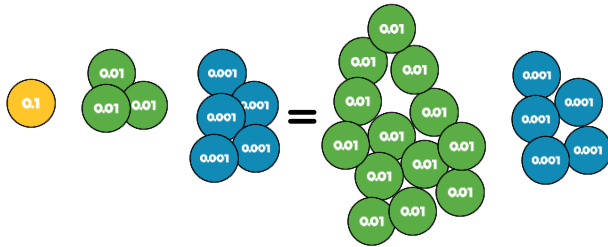
How many thousandths are there in one hundredth?

How many thousandths are in one tenth?

# Understand Thousandths

## Reasoning and Problem Solving

Rosie thinks the 2 values are equal.



Do you agree?  
Explain your thinking.

Can you write this amount as a decimal  
and as a fraction?

Agree.

We can exchange  
ten hundredth  
counters for one  
tenth counter.

$$0.135 = \frac{135}{1000}$$

0.394

= 3 tenths, 9 hundredths and 4  
thousandths

$$= \frac{3}{10} + \frac{9}{100} + \frac{4}{1000}$$

$$= 0.3 + 0.09 + 0.004$$

Write these numbers in three different  
ways:

0.472

0.529

0.307

0.472 = 4 tenths,  
seven hundredths  
and 2 thousandths  
 $= \frac{4}{10} + \frac{7}{100} + \frac{2}{1000}$   
 $= 0.4 + 0.07 +$   
0.002

0.529 = 5 tenths,  
two hundredths  
and 9 thousandths  
 $= \frac{5}{10} + \frac{2}{100} +$   
 $\frac{9}{1000} = 0.5 + 0.02$   
 $+ 0.009$

0.307 = 3 tenths  
and 7 thousandths  
 $= \frac{3}{10} + \frac{7}{1000} =$   
0.3 + 0.007

# Thousandths as Decimals

## Notes and Guidance

Children build on their understanding of decimals and further explore the link between tenths, hundredths and thousandths.

They represent decimals in different ways and also explore deeper connections such as  $\frac{100}{1000}$  is the same as  $\frac{1}{10}$

## Mathematical Talk

What number is represented? How will we show this on the place value chart? How many ones/tenths/hundredths/thousandths do I have?

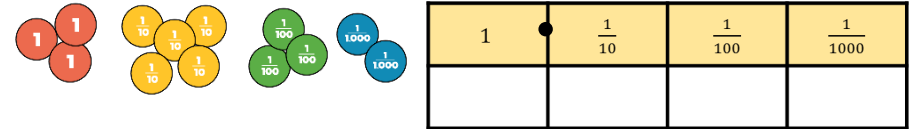
Where would 2.015 be positioned on the number line? How many thousandths do I have? How do I record this as a mixed number?

## Varied Fluency

Use the place value chart and counters to represent these numbers.

Write down the numbers as a decimal.

a)

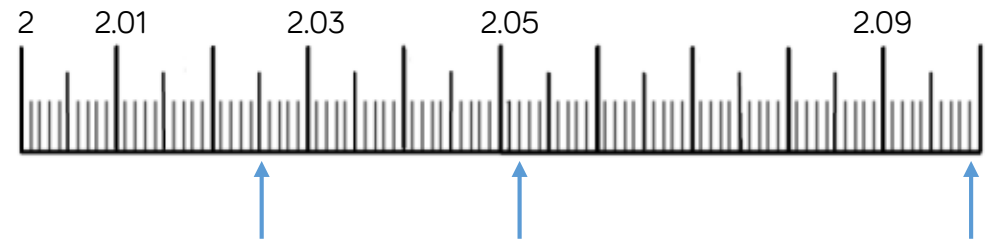


b) 4 ones, 6 tenths, 0 hundredths and 2 thousandths

c)  $3 \frac{34}{1000}$

The arrows are pointing to different numbers.

Write each number as a decimal and then as a mixed number.



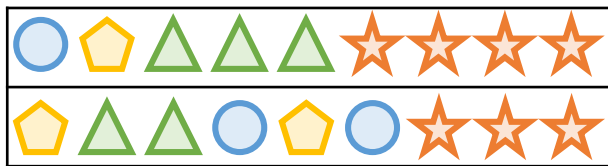
# Thousandths as Decimals

## Reasoning and Problem Solving

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?



In this problem symbols have been used to represent two different numbers. Write down the value of each, as a mixed number and as a decimal.

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

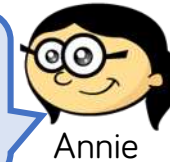
Smallest: 0.116  
Largest: 6.11

1.431

2.322

Three children are representing the number 0.504

$$0.504 = \frac{504}{1000}$$



$$0.504 = \frac{3}{10} + \frac{2}{10} + \frac{4}{1000}$$

Alex



$$0.504 = \frac{5}{10} + \frac{4}{1000}$$

Who is correct?  
Explain why.

Possible answer:

They are all correct. Annie has recorded it as a fraction. Alex and Teddy have partitioned it differently.

# Rounding Decimals

## Notes and Guidance

Children develop their understanding of rounding to the nearest whole number and to the nearest tenth.

Number lines support children to understand where numbers appear in relation to other numbers and are important in developing conceptual understanding of rounding.

## Mathematical Talk

What number do the ones and tenths counters represent?

How many decimal places does it have?

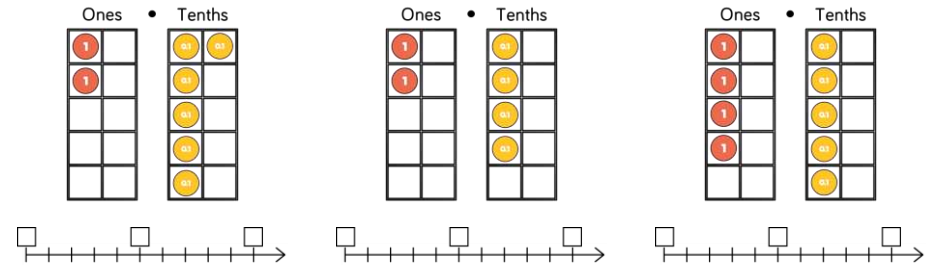
When rounding to the nearest one decimal place, how many digits will there be after the decimal point?

Where would 3.25 appear on both number lines?

What is the same and what is different about the two number lines?

## Varied Fluency

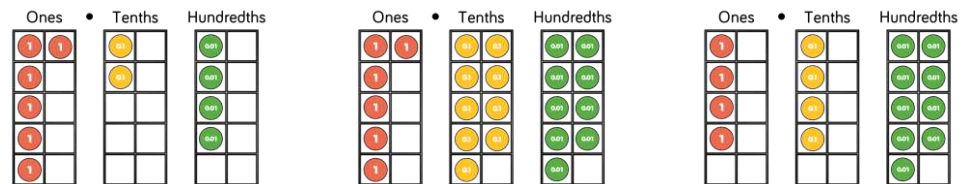
- Complete the number lines and round the representations to the nearest whole number:



- 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.



# Round Decimals

## Reasoning and Problem Solving

<p>Dexter is measuring a box of chocolates with a ruler that measures in centimetres and millimetres.</p>  <p>He measures it to the nearest cm and writes the answer 28 cm.</p> <p>What is the smallest length the box of chocolates could be?</p>	<p>Smallest: 27.5 cm</p>	<p>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?</p> <p>What could this be? Is there more than one option? Explain why.</p>	<p>The whole number can range from 11 to 19 and the decimal places can range from <math>___ .95</math> to <math>___ .99</math></p> <p>Can children explain why this works?</p>
<p>Whitney is thinking of a number.</p>  <p>Rounded to the nearest whole her number is 4</p> <p>Rounded to the nearest tenth her number is 3.8</p> <p>Write down at least 4 different numbers that she could be thinking of.</p>	<p>Possible answers: 3.84 3.83 3.82 etc.</p> <p>Some children might include answers such as 3.845</p>		

# Order & Compare Decimals

## Notes and Guidance

Children order and compare numbers with up to three decimal places.

They use place value counters to represent the numbers they are comparing.

Number lines support children to understand where numbers appear in relation to other numbers.

## Mathematical Talk

What number is represented by the place value counters?

\_\_\_\_\_ is greater/less than \_\_\_\_\_ because...

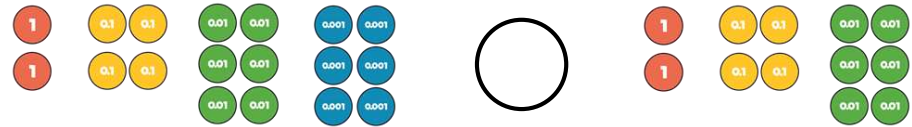
Explain how you know.

Can you build the numbers using place value counters?

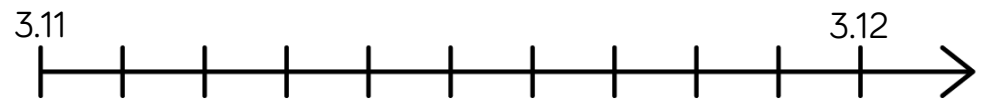
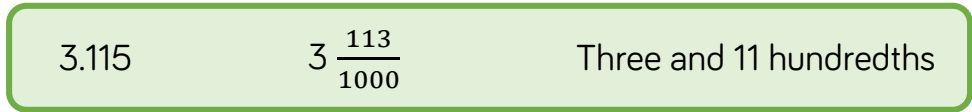
How can you use these concrete representations to compare sizes?

## Varied Fluency

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



Place the numbers in ascending order on the number line.



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

Check your answers using place value chart.

# Order & Compare Decimals

## Reasoning and Problem Solving

Alex says,

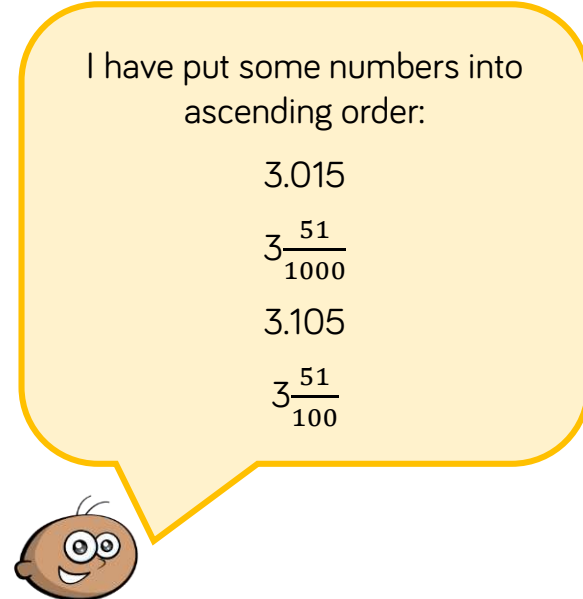


3.105 is greater than 3.2 because 105 is greater than 2

Do you agree?  
Explain your answer.

Alex is wrong because 2 tenths is larger than 105 thousandths.

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?

Could be:  
3.052  
3.053  
3.054  
3.104 etc.

It can't be a number below 3.051 or above 3.105



# Understand Percentages

## Notes and Guidance

Children are introduced to 'per cent' for the first time and will understand that 'per cent' relates to 'number of parts per hundred'.

They will explore this through different representations which show different parts of a hundred. Children will use 'number of parts per hundred' alongside the % symbol.

## Mathematical Talk

How many parts is the square split in to?

How many parts per hundred are shaded/not shaded?

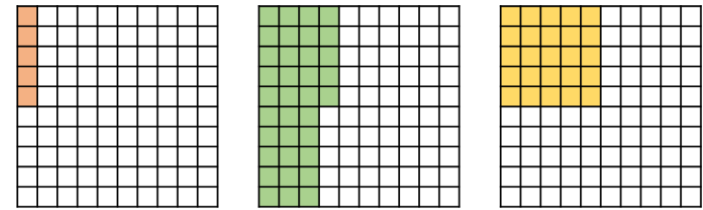
Can we represent this percentage differently?

Look at the bar model, how many parts is it split into?

If the bar is worth 100%, what is each part worth?

## Varied Fluency

Complete the sentence stem for each diagram.

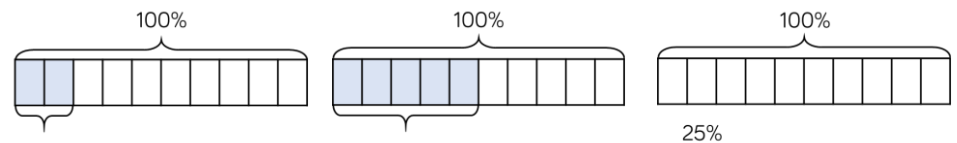


There are \_\_\_ parts per hundred shaded. This is \_\_\_%

Complete the table.

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

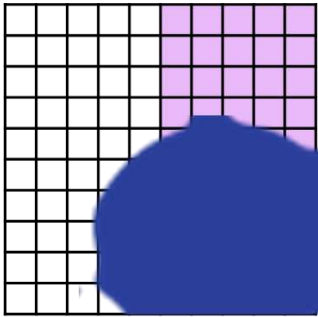
Complete the bar models.



# Understand Percentages

## Reasoning and Problem Solving

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...

Some possible answers:

It could be 25%

It must be less than 70%

It can't be 100%

Mo, Annie and Tommy all did a test with 100 questions. Tommy got 6 fewer questions correct than Mo.

Name	Score	Percentage
Mo	56 out of 100	
Annie		65%
Tommy		

Complete the table.

How many more marks did each child need to score 100%?

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

Who has more sweets left?

56%  
65 out of 100  
50 out of 100  
50%

Mo needs 44  
Annie needs 35  
Tommy needs 50

Neither. They both have an equal number of sweets remaining.

# Percentages as Fractions & Decimals

## Notes and Guidance

Children represent percentages as fractions using the denominator 100 and make the connection to decimals and hundredths.

Children will recognise percentages, decimals and fractions are different ways of expressing proportions.

## Mathematical Talk

What do you notice about the percentages and the decimals?

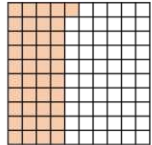
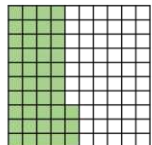
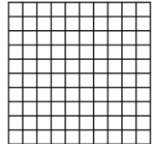
What's the same and what's different about percentages, decimals and fractions?

How can we record the proportion of pages Alex has read as a fraction? How can we turn it into a percentage?

Can you convert any percentage into a decimal and a fraction?

## Varied Fluency

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%		

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.

$$\frac{93}{300} = \frac{?}{100} = \text{_____} \% = \text{_____}$$

Record the fractions as decimals and percentages.

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

# Percentages as Fractions & Decimals

## Reasoning and Problem Solving

Teddy says,



To convert a fraction to a percentage, you just need to put a percent sign next to the numerator.

Teddy is incorrect, this only works when the denominator is 100 because percent means parts per hundred.

Is Teddy correct? Explain your answer.

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.

60% are children, so 40% are girls and 20% boys.

Children may use a bar model to represent this problem.

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.

Ron has read  $\frac{360}{500}$ , 72% or 0.72

Dora has read  $\frac{360}{400}$ , 90% or 0.9

Eva has read  $\frac{360}{600}$ , 60% or 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 has read the most of her book.



# Equivalent F.D.P.

## Reasoning and Problem Solving

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 $\frac{1}{2}$

Less than  $\frac{1}{2}$ :  
 $\frac{1}{4}$ , 0.25, 7%

Equal to  $\frac{1}{2}$ :  
50% and  $\frac{30}{60}$

Greater than  $\frac{1}{2}$ :  
Seven tenths, 70 hundredths, 60% and 100%

Jack has £55  
He spends  $\frac{3}{5}$  of his money on a coat and 30% on shoes.  
How much does he have left?

£5.50

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?

Level A: 80%  
Level B: 70%  
Level C: 50%

Tommy had a higher success rate on level A.

Children may wish to compare using decimals instead.