

Year 5

Small Steps Guidance and Examples

Block 3 – Decimals & Percentages

WhiteRoseMaths

Year 5 – Yearly Overview

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number – Place Value			Number – Addition and Subtraction		Statistics		Number – Multiplication and Division		Perimeter and Area		Consolidation
Spring	Number – Multiplication and Division			Number – Fractions						Number – Decimals & Percentages		Consolidation
Summer	Number – Decimals				Geometry- Properties of Shapes		Geometry- Position and Direction	Measurement- Converting Units		Measures Volume		Consolidation

Overview

Small Steps

- Decimals up to 2 d.p.
- Decimals as fractions (1)
- Decimals as fractions (2)
- Understand thousandths
- Thousands 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 per cent 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

- 1 What number is represented on the place value chart?

Ones	Tenths	Hundredths
		
0	1	2

There are ____ ones, ____ tenths and ____ hundredths.
The number is ____

Represent these numbers on a place value chart

0.28

0.65

0.07

1.26

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

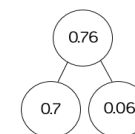
2.45

3.05

0.6

23.32

- 3 $0.76 = 0.7 + 0.06 = 7 \text{ tenths and } 6 \text{ hundredths}$
Fill in the missing numbers.



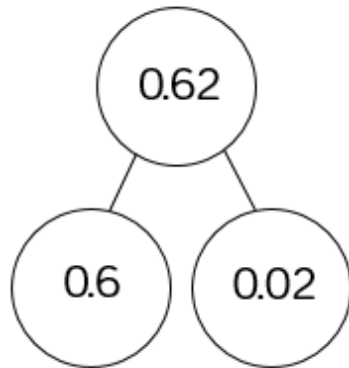
$0.83 = \square + 0.03 = \square$ and 3 hundredths.

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

Decimals up to 2 d.p

Reasoning and Problem Solving

Sally says there is only one way to partition 0.62



Prove Sally is incorrect by finding at least 3 different ways of partitioning 0.62

$$0.62 = 0.5 + 0.12$$

$$0.62 = 0.4 + 0.22$$

$$0.62 = 0.3 + 0.32$$

$$0.62 = 0.2 + 0.42$$

$$0.62 = 0.1 + 0.52$$

$$0.62 = 0 + 0.62$$

Match each description to the correct number.



Charlie

My number has the same amount of tens and tenths



Dylan

My number has one decimal place.



Megan

My number has two hundredths.



Jess

My number has six tenths.

46.2

2.64

46.02

40.46

Charlie – 40.46

Dylan – 46.2

Megan – 46.02

Jess – 2.64

Decimals as Fractions (1)

Notes and Guidance

Children explore the relationship between decimals and fractions. They start with a fraction 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?

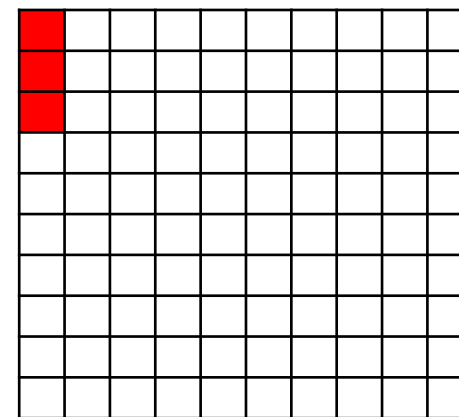
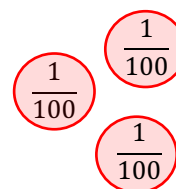
What does the decimal point mean?

Can the fraction be simplified?

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

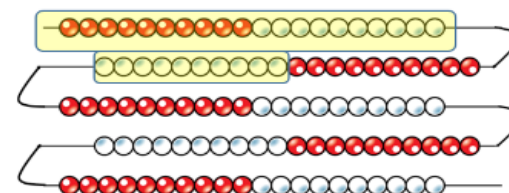
Varied Fluency

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



The fraction $\frac{\quad}{\quad}$ is the same as the decimal ____

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

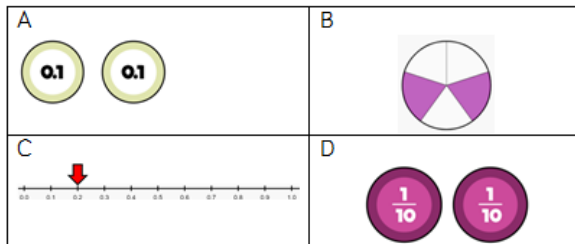


Decimals as Fractions (1)

Reasoning and Problem Solving

Odd one out.

Which of the images below is the odd one out?



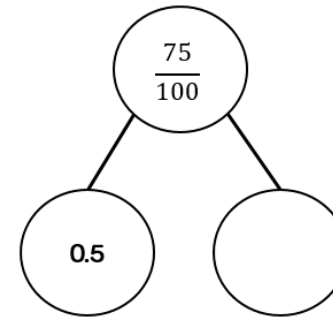
Explain why.

Possible answer:

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

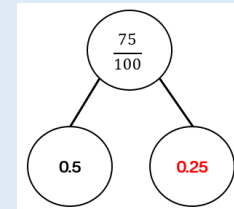
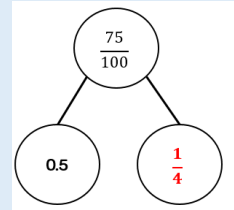
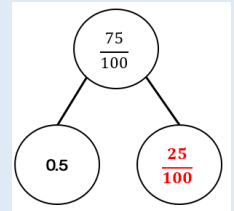
The other images show $\frac{2}{10}$.

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



Can you create another part whole model like the one above for a partner?

Possible answers:



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. They represent them as fractions and as decimals.

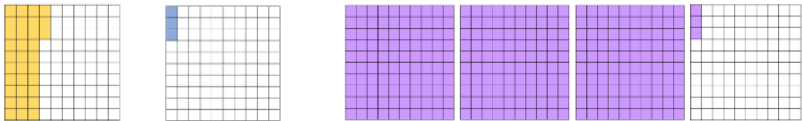
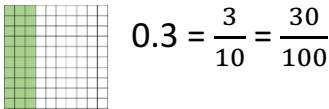
Children record the number in multiple representations, including expanded form and in words.

Mathematical Talk

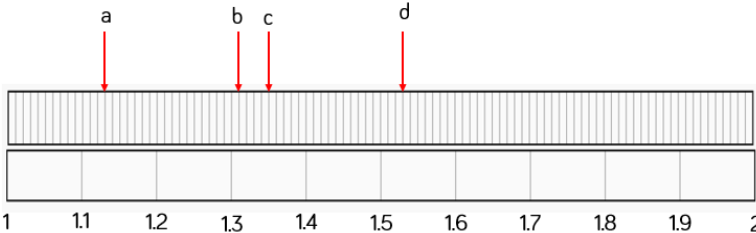
In the number 1.34 what does the 1 represent, what does the 3 represent, what does the 4 represent?
Can we represent this number in a different way, and another, and another?
On the number line, where can we see tenths? Where can we see hundredths?
Tell me another that would come in between c and d as a fraction. Tell me a number that would not come in between c and d.

Varied Fluency

- 1 Use the models to record equivalent decimals and fractions.



- 2 Record the value of a, b, c and d as fraction and as a decimal.



- 3 Complete the table.

Pictorial Representation	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

Sam 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 response:

Children may represent it in words, decimals, fractions, expanded form but also other ways of partitioning.

Possible responses could include where there are no tenths in a number or where there is an improper fraction:

$\frac{1}{100}$ is not equal to 0.1

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

0 .

List all the possible numbers you can make.

Can you write all the decimals as fractions?

Choose three of the numbers and write them as 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. They convert decimals to fractions.

Children develop their knowledge of exchange and apply it to the concept of decimals. For example 3 tenths = 30 hundredths = 300 thousandths)

Mathematical Talk

How many tenths are in a whole?

How many hundredths are there in 10 tenths?

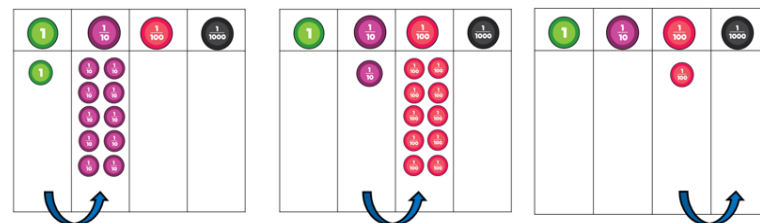
How many thousandths are there in 2 tenths?

How many different ways can this number be written?

Are seven hundredths equal to seven tenths? Why?

Varied Fluency

- Use the images to help you fill in the third model and the blanks.



1 = ___ tenths $\frac{1}{10}$ = ___ hundredths $\frac{1}{100}$ = ___ thousandths

- June is converting decimals to thousandths

$$0.345 = \frac{\boxed{}}{1000}$$

Use June's method to convert the decimals to thousandths

O	t	h	th
0	3	4	5

$$\begin{array}{r} 3 \\ \hline 10 \\ \hline 300 \\ \hline 1000 \end{array} + \begin{array}{r} 4 \\ \hline 100 \\ \hline 40 \\ \hline 1000 \end{array} + \begin{array}{r} 5 \\ \hline 1000 \end{array} = \frac{345}{1000}$$

0.276

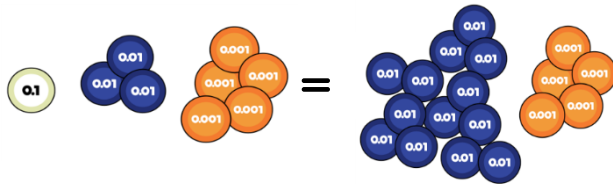
0.029

1.286

Understand Thousandths

Reasoning and Problem Solving

Tim thinks the 2 values below are equal.



Do you agree?

Explain your thinking.

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

Can you represent Tim's amount in at least three different ways?

Possible answers

$$0.135 = \frac{1}{10} + \frac{30}{1000} + \frac{5}{1000}$$

$$0.135 = \frac{100}{1000} + \frac{30}{1000} + \frac{5}{1000}$$

$$0.135 = \frac{13}{100} + \frac{5}{1000}$$

0.394

= 3 tenths, 9 hundredths and 4 thousandths

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

$$= 0.3 + 0.09 + 0.004$$

Can you write three other ways of saying the numbers below?

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 start to understand the link between tenths, hundredths and thousandths and write a thousandth as a decimal e.g. 0.001

Children use concrete materials to understand the connection between one tenth, one hundredth, one thousandth.

They will continue to represent decimals in different ways and will 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?

What does 0.21 represent? How do we record this as a fraction?


How many thousandths do I have?

How can I record this number differently? How will it look in expanded form?

Do we record 0 in the thousandth column? Why?

Varied Fluency

- 1 Use the place value chart and counters to represent these numbers as a decimal. Record the numbers as decimal.

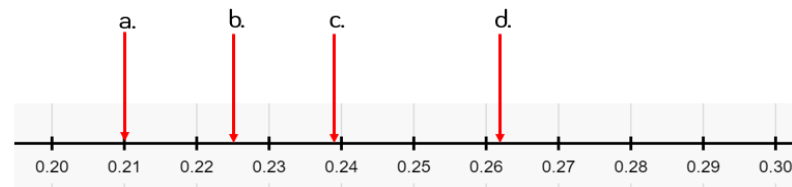
a) 

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


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

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

- 2 Estimate the value that each letter is pointing to.



- 3 Write your answer as a fraction and a decimal. Complete the table.

Pictorial Representation	Decimal	Decimal – expanded form	Fraction	Fraction – expanded form	In words
	4.251	$4 + 0.2 + 0.05 + 0.001$	$4\frac{251}{1000}$	$4 + \frac{2}{10} + \frac{5}{100} + \frac{1}{1000}$	four ones, two tenths, five hundredths and one thousandth
	4.512				
			$4\frac{25}{1000}$		
				$4 + \frac{5}{10} + \frac{1}{1000}$	

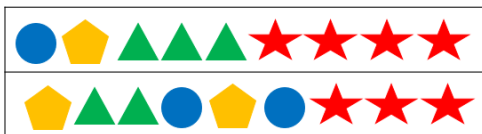
Thousandths as Decimals

Reasoning and Problem Solving

Johnny 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 a different way e.g. as a fraction, decimal, in expanded form?



In this problem decimal numbers have been replaced with symbols. What is the value in each box if:

$\text{blue circle} = 1$
 $\text{red star} = \frac{1}{10}$
 $\text{green triangle} = \frac{1}{100}$
 $\text{yellow pentagon} = \frac{1}{1000}$

Smallest: 0.116

Largest: 6.11

1.431

2.322

Three children are representing the number 0.504

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

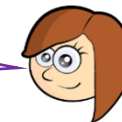


Lucinda



Terry

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



Sophie

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

Who is correct?
Explain why.

Possible answer:

They are all correct. Lucinda has recorded it as a fraction. Terry and Sophie have partitioned it differently.

Rounding Decimals

Notes and Guidance

Children are introduced to numbers with two decimal places and develop their understanding of rounding to the nearest whole number and to the nearest tenth.

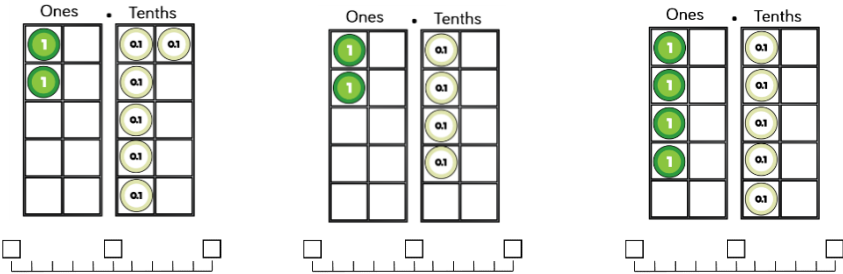
Number lines support children to understand where numbers appear in relation to other numbers and are important to developing conceptual understanding of rounding.

Mathematical Talk

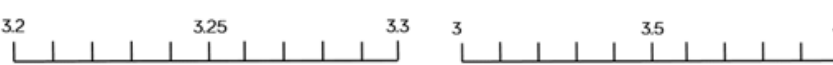
- What number is represented?
- How many decimal places does it have?
- When rounding to the nearest one decimal place, how many decimals will the answer have?
- Where would 3.25 appear on both number lines?
- What is the same and what is different about the two number lines?

Varied Fluency

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



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



- 3 Complete the table and use the number lines to help you round to the nearest tenth and the nearest whole number:

Pictorial representation	Number line	Rounded to the nearest tenth	Number line	Rounded to the nearest whole number

Rounding Decimals

Reasoning and Problem Solving

Simon 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 28cm.

What is the smallest length the box of chocolates could be?

What is the largest length the box of chocolates could be?

**Rounded to the nearest 0.1,
A is 3.5 and B is 3.0**

What is the smallest possible difference between A and B?

What is the largest possible difference?
Explain your strategy to a partner.

Smallest: 27.5cm

Largest 28.49cm

A can be between
3.45 and 3.54

B can be between
2.95 and 3.04

Smallest difference:
0.41

Largest difference:
0.59

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.

The whole number can range from 11 to 19 and the decimal places can range from ____ .95 to ____ .99.

Can children explain why this works?

Order and 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?

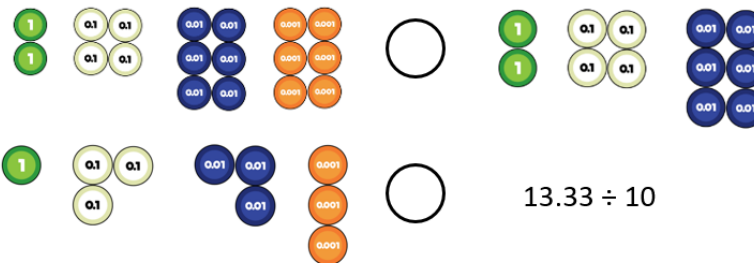
_____ is greater/less than _____ because...

Explain how you know.

Can you build the number using place value counters?

Varied Fluency

1 Compare using $<$, $>$ or $=$



2 Place the numbers in ascending order on the number line:

3.115

$3 \frac{113}{1000}$

Three and 11 hundredths

3.11



3.12

3 Order 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

Order and Compare Decimals

Reasoning and Problem Solving

Jess says,



3.105 is greater than 3.2 because it has more digits

Do you agree? Explain why.

Jess is wrong because 3.2 has more tenths than 3.105 so it is greater.

Three children are thinking of 3 different numbers that appear somewhere on this number line:



Child A: My number is the largest number able to round to 12.32 to the nearest hundredth.

Child B: My number is 2 thousandths more than Child C's.

Child C: My number has a digit total of 15.

Plot Child A, B and C's numbers on the number line.

A = 12.324

B = 12.327

C = 12.329



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’.

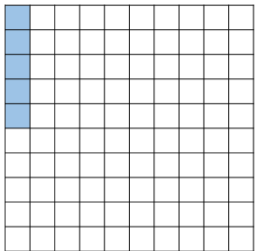
They will explore this through different representations which show different parts of a hundred. Children will use ‘number of parts per hundred’ alongside the % symbol.

Mathematical Talk

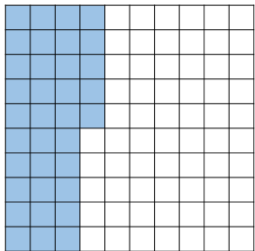
- How many parts is the square split in to?
- How many parts per hundred are shaded/not shaded?
- Can we represent this percentage differently?
- Look at the bar model, how many parts is it split into? If the bar is worth 100, what is each part worth? How would we say this as a percentage?
- In the table, what does the score represent? How many parts per hundred did ___ score?

Varied Fluency

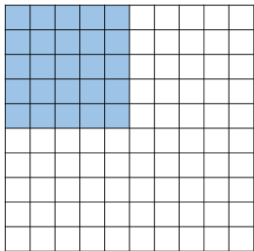
1 Complete the sentence stems to describe how many parts per hundred are shaded.



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



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

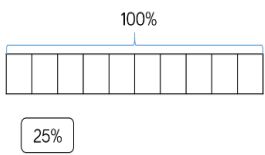
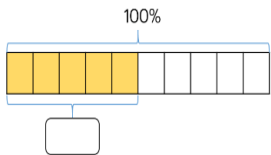
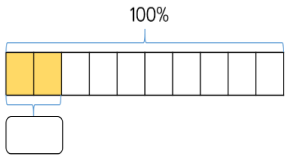


There are ___ parts per hundred shaded.
This is ___ %

2 Complete the table.
Shade in the parts and record the missing information.

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

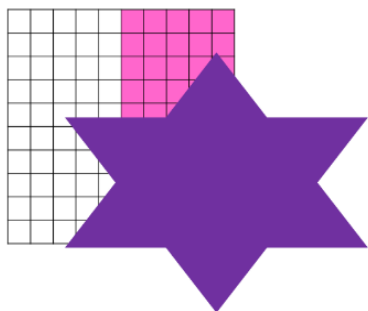
3 Record the percentages shown.



Understand Percentages

Reasoning and Problem Solving

Here is a representation of a percentage.
Part of it has been covered by a star.



There is less than 60%

There is less than 50%



Ellis



Evie

There is less than 30%

Explain why each child could be correct.

Rhys could be correct because you can clearly see 30% and 2 lots of 5%. Ellis could be correct because it looks like there is 50% hidden but it could be more as we do not know if all of the parts are shaded under the star. Evie could be correct because there might only be 25% shaded.

Max, Isla and Ethan all did a test with 100 questions.

- Ethan got 6 less questions correct than Max.

Name	Score	Percentage
Max	56 out of 100	
Isla		65%
Ethan		

Can you complete the table?
How many more marks did each child need to get 100%?

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

Name	Score	Percentage
Max	56 out of 100	56%
Isla	65 out of 100	65%
Ethan	50 out of 100	50%

Max needs 44 marks.

Isla needs 35 marks

Ethan needs 50 marks

Neither. They have the same.

% 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 percentage and the decimal?

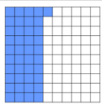
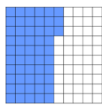
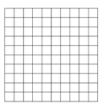
What's the same? What's different about percentages, decimals and fractions?

How can we record this proportion as a fraction? How can we turn it into a percentage?

Explain your method.

Varied Fluency

1 Complete the table.

Pictorial representation	Percentage	Fraction	Decimal
	There are 41 parts per hundred 41%	41 out of 100 $\frac{41}{100}$	41 hundredths 0.41
		___ out of 100 $\frac{\quad}{100}$	___ hundredths
	There are 31 parts per hundred 31%		

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

$$\frac{93}{300} = \frac{\square}{100} = \square \% = \square$$

3 Record the fractions as a percentage and as a decimal.

$$\frac{120}{300} \qquad \frac{320}{400} \qquad \frac{20}{200}$$

% as Fractions & Decimals

Reasoning and Problem Solving

Paulo says,



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

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

Is Paulo correct? Explain your answer.

At a cinema, 0.4 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%
Children may use a bar model to represent this problem.

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

Kenny's book has 500 pages.
Lenny's book has 400 pages.
Penny's book has 600 pages.

What fraction of their books have they each read?

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

Who has read the most of their book?

Kenny has read 72% or 0.72
Lenny has read 90% or 0.9
Penny has read 60% or 0.6

Lenny has read the most of his book.

Equivalent FDP

Notes and Guidance

Children recognise simple equivalent fractions and represent them as decimals and percentages.

Children then 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

Mathematical Talk

Show these decimals on the bead string. What are they as a decimal? What are they as a fraction? Can you simplify the fraction?

How can we represent the fractions on a number line? What are they equivalent to?

Which is closer to 100%, $\frac{4}{5}$ or 70%? How do you know?

Varied Fluency

1 Use a bead string to show me

0.25 0.3 0.2 0.5

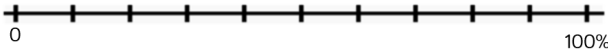
What are these decimals as a percentage?
What are they as a fraction? Can you simplify the fraction?

2 Use the bar models to convert the fractions into a percentage and a decimal.

10%	10%	10%	10%	10%	10%	10%	10%	10%	10%

$\frac{1}{2}$ is equivalent to ____ & ____ $\frac{1}{4}$ is equivalent to ____ & ____
 $\frac{3}{10}$ is equivalent to ____ & ____ $\frac{1}{5}$ is equivalent to ____ & ____

3 Draw a line to show where each representation goes on a number line.



Equivalent FDP

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	$\frac{1}{4}$	0.5

Less than $\frac{1}{2}$	Equal to $\frac{1}{2}$	More than $\frac{1}{2}$
$\frac{1}{4}$ 0.25	50% $\frac{30}{60}$ 0.5	Seven tenths 100% 60% 70 hundredths

Less than $\frac{1}{2}$	Equal to $\frac{1}{2}$	More than $\frac{1}{2}$

Ash has £55

He spends $\frac{3}{5}$ of his money on a coat and 30% on shoes.

How much does he have left?

$$\frac{3}{5} = 0.6 = 60\%$$

$$60\% + 30\% = 90\%$$

Ash has 10% left
and 10% of £55 is
£5.50

Tom 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%

He had the higher success rate on level A.

Children may wish to compare using decimals instead.