White Rose Maths

Spring - Block 4

# Decimals

# Overview

## Small Steps

1. Recognise tenths and hundredths
2. Tenths as decimals
3. Tenths on a place value grid
4. Tenths on a number line
5. Divide 1-digit by 10
6. Divide 2-digits by 10
7. Hundredths
8. Hundredths as decimals
9. Hundredths on a place value grid
10. Divide 1 or 2-digits by 100

## NC Objectives

Recognise and write decimal equivalents of any number of tenths or hundredths.

Find the effect of dividing a one or two digit number by 10 or 100, identifying the value of the digits in the answer as ones, tenths and hundredths

Solve simple measure and money problems involving fractions and decimals to two decimal places.

Convert between different units of measure [for example, kilometre to metre]

# Tenths & Hundredths

## Notes and Guidance

Children recognise tenths and hundredths using a hundred square.

When first introducing tenths and hundredths, concrete manipulatives such as Base 10 can be used to support children's understanding.

They see that ten hundredths are equivalent to one tenth and can use a part-whole model to partition a fraction into tenths and hundredths.

## Mathematical Talk

If each row is one row out of ten equal rows, what fraction does this represent?

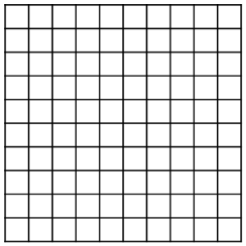
If each square is one square out of one hundred equal squares, what fraction does this represent?

How many squares are in one row? How many squares are in one column? How many hundredths are in one tenth?

How else could you partition these numbers?

## Varied Fluency

If the hundred square represents one whole :



Each square is ___ out of ___ equal squares.

Each square represents $\frac{\square}{\square}$

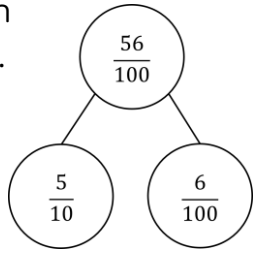
Each row is ___ out of ___ equal rows.

Each row represents $\frac{\square}{\square}$

Complete the table.

| Shaded | Tenths | Hundredths |
|---|---|---|
| 20 squares | $\frac{2}{10}$ | $\frac{20}{100}$ |
| 4 columns | | |
| 3 rows | | |
| | $\frac{7}{10}$ | |

We can use a part-whole model to partition 56 hundredths into tenths and hundredths.




Partition into tenths and hundredths:

- 65 hundredths
- $\frac{31}{100}$
- 80 hundredths

# Tenths and Hundredths

## Reasoning and Problem Solving

Who is correct?

Dora

5 hundredths is equivalent to 50 tenths.

50 hundredths is equivalent to 5 tenths.

Amir

Explain why.

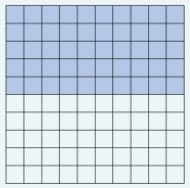
Amir is correct.

$\frac{50}{100}$ is equivalent to $\frac{5}{10}$

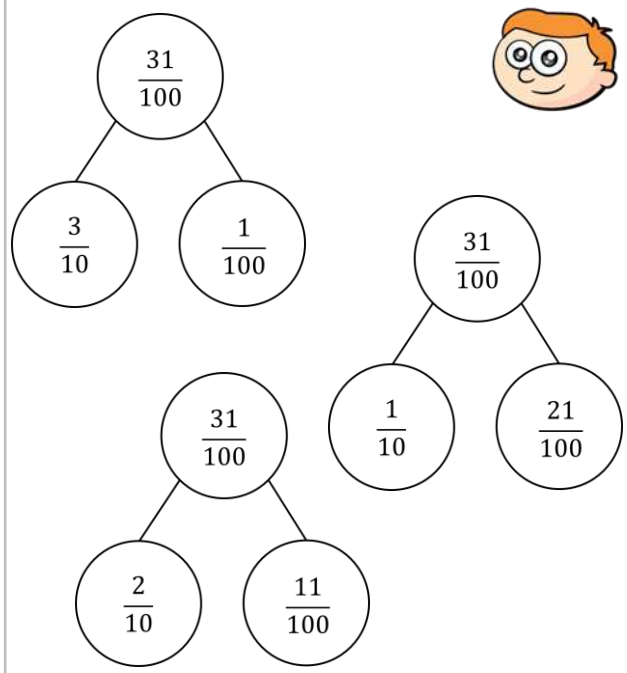
This can be demonstrated with Base 10 or a hundred square.

50 squares is $\frac{50}{100}$

5 rows is $\frac{5}{10}$



Ron says he can partition tenths and hundredths in more than one way.




Use Ron's method to partition 42 hundredths in more than one way.

Children may partition 42 hundredths as:

- 4 tenths and 2 hundredths
- 3 tenths and 12 hundredths
- 2 tenths and 22 hundredths
- 1 tenth and 32 hundredths
- 0 tenths and 42 hundredths

Other methods of partitioning are possible.

# Tenths as Decimals

## Notes and Guidance

Using the hundred square and Base 10, children can recognise the relationship between $\frac{1}{10}$ and 0.1

Children write tenths as decimals and as fractions. They write any number of tenths as a decimal and represent them using concrete and pictorial representations.

Children understand that a tenth is a part of a whole split into 10 equal parts.

In this small step children stay within one whole.

## Mathematical Talk

What is a tenth?

How many different ways can we write a tenth?

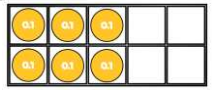
When do we use tenths in real life?

Which representation do you think is clearest? Why?

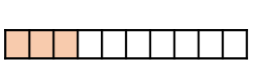
How else could you represent the decimal/fraction?

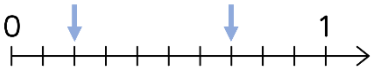
## Varied Fluency

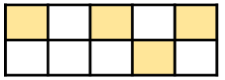
Complete the table.

| Image | Words | Fraction | Decimal |
|---|---|---|---|
|  | | | |
| | five tenths | | |
| | | | 0.9 |

What fractions and decimals are represented in these diagrams?





How could you represent these decimals?

0.4 0.8 0.2

What's the same? What's different?

# Tenths as Decimals

## Reasoning and Problem Solving

Who is correct?

Annie

1.2 is equivalent to 1 whole and 2 tenths.

1.2 is equivalent to 12 tenths.

Dexter

Explain why.

Both children are correct.
1 whole is equal to 10 tenths so 1.2 is equal to 12 tenths.

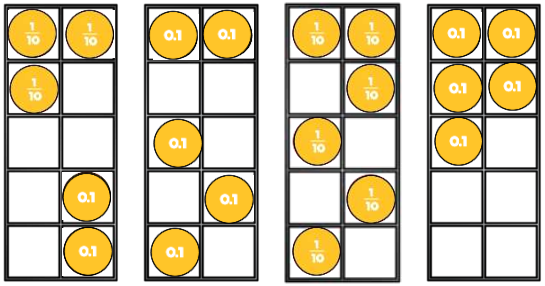
six tens

six tenths

What is the same? What's different?
Show me.

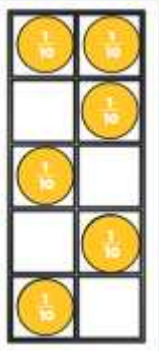
Children use concrete and pictorial representations to show the difference.

Which ten frame is the odd one out?



Explain your answer.

Three of the ten frames represent 0.5



This ten frame is the odd one out because it represents 6 tenths not 5 tenths.

# Tenths on a Place Value Grid

## Notes and Guidance

Children read and represent tenths on a place value grid. They see that the tenths column is to the right of the decimal point.
Children use concrete representations to make tenths on a place value grid and write the number they have made as a decimal.
In this small step children will be introduced to decimals greater than 1

## Mathematical Talk

How many ones are there?

How many tenths are there?

What's the same/different between 0.2 , 1.2 and 0.8?

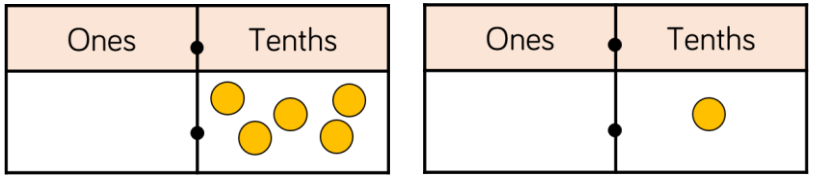
How many different ways can you make a whole using the three decimals?

Why do we need to use the decimal point?

How many tenths are equivalent to one whole?

## Varied Fluency

Complete the stem sentences for the decimals in the place value grid.




There are ☐ ones and ☐ tenths.

The decimal represented is ☐

Use counters or place value counters to make the decimals on a place value grid.

| 0.2 | 1.2 | 0.8 |
|---|---|---|

| Ones | Tenths |
|---|---|
| 3 | 2 |

There are ☐ ones and ☐ tenths.
☐ ones + ☐ tenths
= 3 + 0.2
= 3.2

Use the place value grid and stem sentences to describe the decimals:

| 4.0 | 5.9 | 2.2 |
|---|---|---|

# Tenths on a Place Value Grid

## Reasoning and Problem Solving

Use five counters and a place value grid. Place all five counters in either the ones or the tenths column.

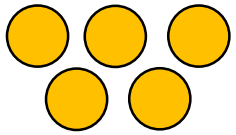
How many different numbers can you make?

Describe the numbers you have made by completing the stem sentences.

There are ☐ ones and ☐ tenths.

☐ ones + ☐ tenths = ☐

| Ones | Tenths |
|---|---|
| | |

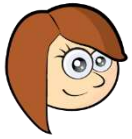


Children can make:
0.5
1.4
2.3
3.2
4.1
5.0

Two children are making eleven tenths.

| Ones | Tenths |
|---|---|
| 1 | 0.1 |

Amir



Rosie

| Ones | Tenths |
|---|---|
| | 0.1 0.1<br>0.1 0.1<br>0.1 0.1<br>0.1 0.1<br>0.1 0.1<br>0.1 |

Who has made it correctly?
Explain your answer.

Amir and Rosie have both made eleven tenths correctly.
Amir has seen that 10 tenths is equivalent to 1 one.

# Tenths on a Number Line

## Notes and Guidance

Children read and represent tenths on a number line.

They link the number line to measurement, looking at measuring in centimetres and millimetres.

Children use number lines to explore relative scale.

## Mathematical Talk

How many equal parts are between 0 and 1?

What are the intervals between each number?

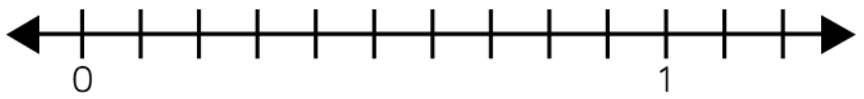
How many tenths are in one whole?

What is 0.1 metres in millimetres?

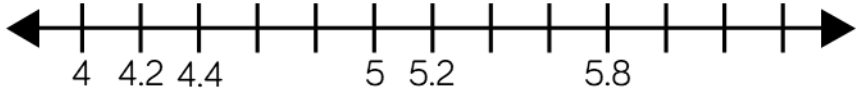
## Varied Fluency

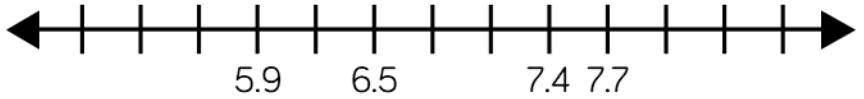
Place the decimals on the number line.

0.5 0.9 1.1




Complete the number lines.



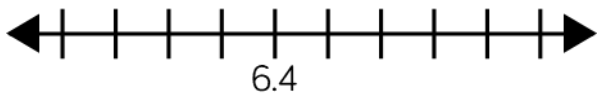

How long is the ribbon?


The ribbon is ___ metres long.

# Tenths on a Number Line

## Reasoning and Problem Solving

What could the start and end numbers on the number line be?

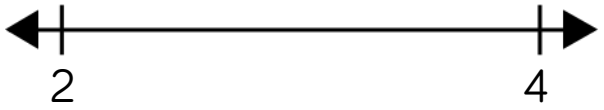



Explain your reasons.

The start and end numbers could be 6 and 6.9 respectively, or 5.6 and 7.4

Children can find different start and end numbers by adjusting the increments that the number line is going up in.

Place the decimals on the number line.




2.7 2.3 1.9 2.5 2.9 3.2

Which order did you place your numbers on the number line?

Some children will draw on 20 intervals first. This method will allow them to identify where the numbers are placed but can be considered inefficient. Encourage children to think about the numbers first and consider which numbers are easiest to place e.g. 2.5 is probably easiest, followed by 1.9 or 2.9 etc.

# Divide 1-digit by 10

## Notes and Guidance

Children need to understand when dividing by 10 the number is being split into 10 equal parts and is 10 times smaller.

Children use counters on a place value chart to see how the digits move when dividing by 10. Children should make links between the understanding of dividing by 10 and this more efficient method.

Emphasise the importance of 0 as a place holder.

## Mathematical Talk

What number is represented on the place value chart?

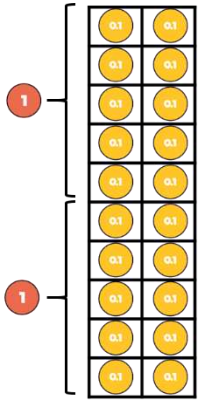
What links can you see between the 2 methods?

Which method is more efficient?

What is the same and what is different when dividing by 10 on a Gattegno chart compared to a place value chart?

## Varied Fluency

Eva uses counters to make a 1-digit number.




| Tens | Ones | Tenths | Hundredths |
|---|---|---|---|
| | | | |

To divide the number by 10, we move the counters one column to the right.
What is the value of the counters now?

Use this method to solve:

$3 \div 10 = \square$ $\quad 7 \div 10 = \square$ $\quad \square = 4 \div 10$

Here is a one-digit number on a place value chart.

| Ones | Tenths |
|---|---|
| 5 | |

When dividing by 10, we move the digits one place to the _____.

$5 \div 10 = \square$

Use this method to solve:

$8 \div 10 = \square$ $\quad \square = 9 \div 10$ $\quad 0.2 = \square \div 10$

# Divide 1-digit by 10

## Reasoning and Problem Solving

Choose a digit card from 1 – 9 and place a counter over the top of that number on the Gattegno chart.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 | 900 |
| 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
| 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 |

Ron says,

To divide by 10, you need to move the counters to the right.

Do you agree? Use the Gattegno chart to explain your reason.

Ron is incorrect. Children will see that you move down one row to divide by 10 on a Gattegno chart whereas on a place value chart you move on column to the right.

Complete the number sentences.

$4 \div 10 = 8 \div \square \div 10$ — 2

$15 \div 3 \div 10 = \square \div 10$ — 5

$64 \div \square \div 10 = 32 \div 4 \div 10$ — 8

# Divide 2-digits by 10

## Notes and Guidance

As in the previous step, it is important for children to recognise the similarities and differences between the understanding of dividing by 10 and the more efficient method of moving digits.
Children use a place value chart to see how 2 digit-numbers move when dividing by 10
They use counters to represent the digits before using actual digits within the place value chart.

## Mathematical Talk

What number is represented on the place value chart?

Do I need to use 0 as a place holder when dividing a 2-digit number by 10?

What is the same and what is different when dividing by 10 on a Gattegno chart compared to a place value chart?

## Varied Fluency

Teddy uses counters to make a 2-digit number.

| Tens | Ones | Tenths | Hundredths |
|---|---|---|---|
| ● | ●● | | |

To divide the number by 10, we move the counters one column to the right.
What is the value of the counters now?
Use this method to solve:

$42 \div 10 = \square$ $\quad 35 \div 10 = \square$ $\quad \square = 26 \div 10$

Here is a 2-digit number on a place value chart.

| Tens | Ones | Tenths | Hundredths |
|---|---|---|---|
| | ●●●●● | ●● | |

When dividing by 10, we move the digits 1 place to the _____.

$82 \div 10 = \square$

Use this method to solve:

$55 \div 10 = \square$ $\quad \square = 90 \div 10$ $\quad 3.2 = \square \div 10$

# Divide 2-digits by 10

## Reasoning and Problem Solving

Jack has used a Gattegno chart to divide a 2-digit number by 10
He has placed counters over the numbers in his answer.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 | 900 |
| 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
| 1 | ● | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | ● | 0.7 | 0.8 | 0.9 |
| 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 |

What was Jack's original number?
How can you use the chart to help you?

Jack's original number was 26
You can move each counter up one to multiply them by 10, which is the inverse to division.

Dexter says,

When I divide a 2-digit number by 10, my answer will always have digits in the ones and tenths columns.

Show that Dexter is incorrect.

Children should give an example of when Dexter is incorrect.
For example, when you divide 80 by 10, the answer is 8 so there does not need to be anything in the tenths column.

# Hundredths

## Notes and Guidance

Children recognise that hundredths arise from dividing one whole into one hundred equal parts.

Linked to this, they see that one tenth is ten hundredths.

Children count in hundredths and represent tenths and hundredths on a place value grid and a number line.

## Mathematical Talk

One hundredth is one whole split into how many equal parts?

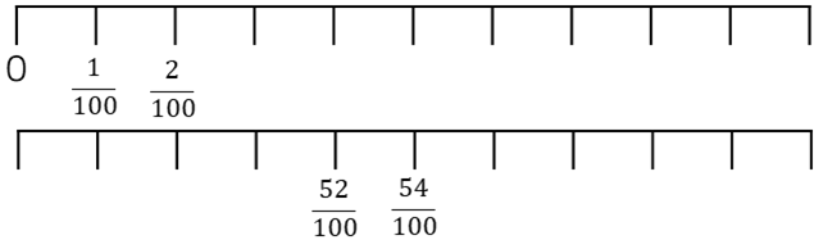
How many hundredths can I exchange one tenth for?

How many hundredths are equivalent to 5 tenths? How does this help me complete the sequence?

How does Base 10 help you represent the difference between tenths and hundredths?

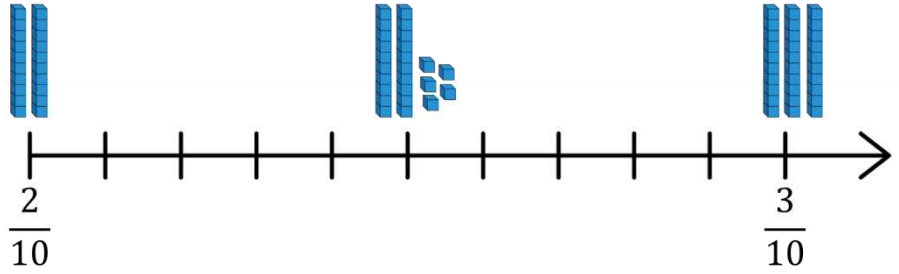
## Varied Fluency

- Complete the number lines.




- Complete the sequences.
  - $\frac{27}{100}, \frac{28}{100}, \square, \square, \frac{31}{100}, \square$
  - $\frac{52}{100}, \frac{51}{100}, \frac{5}{10}, \square, \square, \square$

- Use fractions to complete the number lines

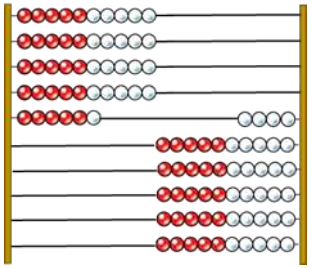


# Hundredths

## Reasoning and Problem Solving

Here is a Rekenrek made from 100 beads.

If the Rekenrek represents one whole, what fractions have been made on the left and on the right?



Can you partition both of the fractions into tenths and hundredths?

On the left, there are 46 hundredths, this is equivalent to 4 tenths and 6 hundredths.
On the right, there are 54 hundredths, this is equivalent to 5 tenths and 4 hundredths.

Children could also explore hundredths using a 100 bead string.

Complete the statements.

3 tenths and 2 hundredths = 2 tenths and ☐ hundredths

12

14 hundredths and 3 tenths = 4 tenths and ☐ hundredths

4

5 tenths and 1 hundredth < 5 tenths and ☐ hundredths

Anything more than 1

5 tenths and 1 hundredth > ☐ tenths and 5 hundredths

0, 1, 2, 3 or 4

Can you list all the possibilities?

# Hundredths as Decimals

## Notes and Guidance

Using the hundred square and Base 10, children can recognise the relationship between $\frac{1}{100}$ and 0.01

Children write hundredths as decimals and as fractions. They write any number of hundredths as a decimal and represent the decimals using concrete and pictorial representations.

Children understand that a hundredth is a part of a whole split into 100 equal parts.

In this small step children stay within one whole.

## Mathematical Talk

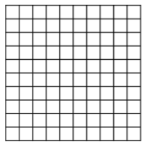
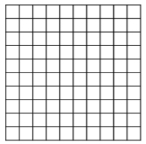
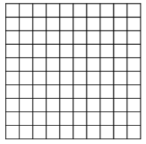
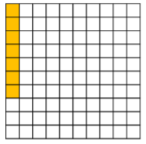
One hundredth is one whole split into _____ equal parts.

What is the same and what is different about a number written as a fraction and a number written as a decimal?

What is the same and different between 0.3 and 4 hundredths?

## Varied Fluency

Complete the table.

| Image | Words | Fraction | Decimals |
|---|---|---|---|
|  | 56 hundredths | | |
|  | | $\frac{17}{100}$ | |
|  | | | 0.2 |
|  | | | |

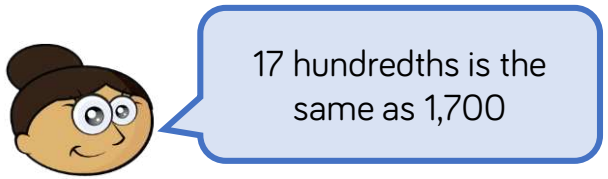
Write the number as a fraction and as a decimal.


How else could you represent this number?

# Hundredths as Decimals

## Reasoning and Problem Solving

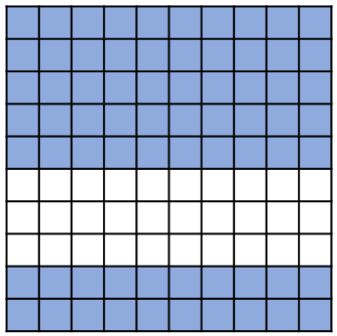
Dora says,




Is she correct?
Explain your answer.

Dora is wrong as she has mistaken hundredths for hundreds.

Alex and Eva have been asked to write the decimal shaded on the 100 grid.



Alex says the grid shows 0.70

Eva says the grid shows 0.7

Who do you agree with?

Explain your answer.

They are both correct.
The grid shows 70 hundredths or 7 tenths and this is what Alex and Eva have given as their answers.
In Alex's answer the 0 in the hundredths column isn't needed as it is not a place holder and doesn't change the value of the number.

# Hundredths on a Place Value Grid

## Notes and Guidance

Children read and represent hundredths on a place value grid. They see that the hundredths column is to the right of the decimal point and the tenths column.

Children use concrete representations to make numbers with tenths and hundredths on a place value grid and write the number they have made as a decimal.

## Mathematical Talk

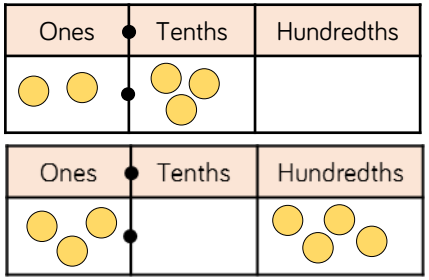
What is a hundredth?

How many hundredths are equivalent to one tenth?

Look at the decimals you have represented on the place value grid and in the part whole models.
What's the same about the numbers? What's different?

## Varied Fluency

Write the decimal represented in each place value grid.




There are ___ ones.

There are ___ tenths.

There are ___ hundredths.

The decimal represented is ___

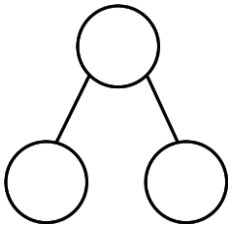
Make the decimals on a place value grid.

| 0.34 | 2.15 | 0.03 | 1.01 |
|---|---|---|---|

Use the sentence stems to describe each number.

Represent the decimals on a place value grid and in a part whole model.
How many ways can you partition each number?

| 0.27 | 0.72 | 0.62 |
|---|---|---|



# Hundredths on a Place Value Grid

## Reasoning and Problem Solving

Use four counters and a place value grid. Place all four counters in either the ones, tenths or hundredths column.

How many different numbers can you make?

Describe the numbers you have made by completing the sentences.

There are ☐ ones, ☐ tenths and ☐ hundredths.

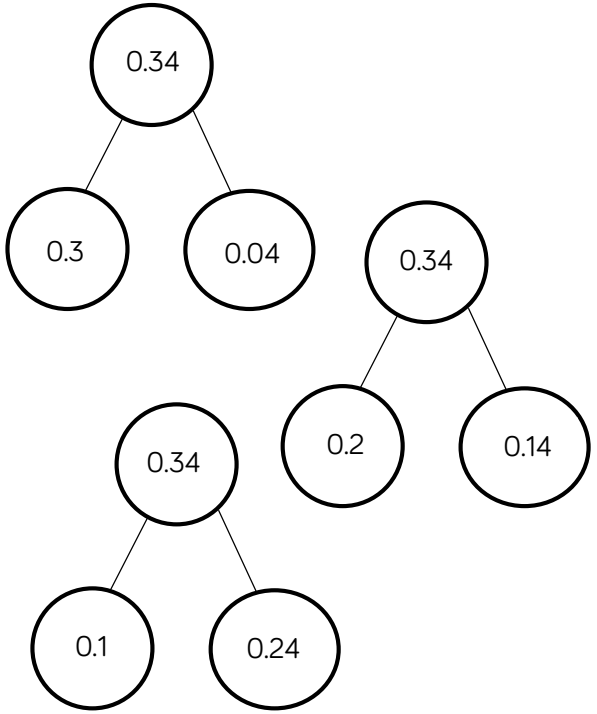
☐ ones + ☐ tenths + ☐ hundredths = ☐

Children can either make:
4, 3.1, 3.01, 2.2, 2.11, 2.02, 1.3, 1.21, 1.12, 1.03, 0.4, 0.31, 0.22, 0.13, 0.04

e.g. There are 2 ones, 0 tenths and 2 hundredths.

2 ones + 0 tenths + 2 hundredths = 2.02

Ron says he can partition 0.34 in more than one way.




Use Ron's method to partition 0.45 in more than one way.

Children may partition 0.45 into:
0 tenths and 45 hundredths
1 tenth and 35 hundredths
2 tenths and 25 hundredths
3 tenths and 15 hundredths
4 tenths and 5 hundredths

Other ways of partitioning are possible.

# Divide 1 or 2-digits by 100

## Notes and Guidance

Children need to understand when dividing by 100 the number is being split into 100 equal parts and is 100 times smaller. Children use counters on a place value chart to see how the digits move when dividing by 100. Children should make links between the understanding of dividing by 100 and this more efficient method.
Emphasise the importance of 0 as a place holder.

## Mathematical Talk

What number is represented on the place value chart?
Why is 0 important when dividing a one or two-digit number by 100?
What is the same and what is different when dividing by 100 on a Gattegno chart compared to a place value chart?
What happens to the value of each digit when you divide by 10 and 100?

## Varied Fluency

Dexter uses counters to make a 1-digit number.

| Tens | Ones | Tenths | Hundredths |
|---|---|---|---|
| |  | | |

To divide the number by 100, we move the counters two columns to the right.
What is the value of the counters now?

Use this method to solve:

$4 \div 100 = \square$ $\quad 5 \div 100 = \square$ $\quad \square = 6 \div 100$

Here is a two-digit number on a place value chart.

| Tens | Ones | Tenths | Hundredths |
|---|---|---|---|
| 7 | 2 | | |

When dividing by 100, we move the digits 2 places to the _____.

$72 \div 100 = \square$

Use this method to solve:

$82 \div 100 = \square$ $\quad \square = 93 \div 100$ $\quad 0.23 = \square \div 100$

# Divide 1 or 2-digits by 100

## Reasoning and Problem Solving

Describe the pattern.

$$7{,}000 \div 100 = 70$$
$$700 \div 100 = 7$$
$$70 \div 100 = 0.7$$
$$7 \div 100 = 0.07$$

Can you complete the pattern starting with 5,300 divided by 100?

Children will describe the pattern they see e.g. 7,000 is 10 times bigger than 700, therefore the answer has to be 10 times bigger as the divisor has remained the same.

For 5,300:
$5{,}300 \div 100 = 53$
$530 \div 100 = 5.3$
$53 \div 100 = 0.53$
$5.3 \div 100 = 0.053$

Teddy says,

> 45 divided by 100 is 0.45 so I know 0.45 is 100 times smaller than 45

Mo says,

> 45 divided by 100 is 0.45 so I know 45 is 100 times bigger than 0.45

Who is correct?
Explain your answer.

Teddy and Mo are both correct. Children may use a place value chart to help them explain their answer.