

Spring Block 3

# Decimals and percentages

## Small steps

Step 1

Decimals up to 2 decimal places

Step 2

Equivalent fractions and decimals (tenths)

Step 3

Equivalent fractions and decimals (hundredths)

Step 4

Equivalent fractions and decimals

Step 5

Thousandths as fractions

Step 6

Thousandths as decimals

Step 7

Thousandths on a place value chart

Step 8

Order and compare decimals (same number of decimal places)

## Small steps

**Step 9** Order and compare any decimals with up to 3 decimal places

**Step 10** Round to the nearest whole number

**Step 11** Round to 1 decimal place

**Step 12** Understand percentages

**Step 13** Percentages as fractions

**Step 14** Percentages as decimals

**Step 15** Equivalent fractions, decimals and percentages

# Decimals up to 2 decimal places

## Notes and guidance

In Year 4, children represented tenths and hundredths as decimals and fractions. By the end of this small step, children will be more familiar with numbers with up to 2 decimal places, with thousandths being introduced later in the block.

Using a hundred piece of base 10 as 1 whole, a ten piece as a tenth and a one piece as a hundredth shows children that they can exchange, for example, 10 tenths for 1 whole, or 10 hundredths for 1 tenth. A hundred square where each part represents 1 hundredth, or 0.01, can also help children to see the relationship between a hundredth, a tenth and a whole.

Children make decimal numbers using place value counters in a place value chart and read and write the numbers, as well as working out the value of each digit in the number. They also explore partitioning decimal numbers in a variety of ways.

## Things to look out for

- When reading or writing a number, children may say “one point thirty-five” instead of “one point three five”.
- When there are hundredths but no tenths in a number, children may forget to include the zero placeholder in the tenths column.

## Key questions

- How can you represent this number using a place value chart?
- What is the same and what is different about a tenth and a hundredth?
- What is the value of the digit \_\_\_\_\_ in the number \_\_\_\_\_?
- Can you partition the decimal number \_\_\_\_\_ in different ways?
- How many tens are there in 100?  
How many ones are there in 10/100?
- How many 0.1s are there there are in 1?  
How many 0.01s are there in 0.1/1?

## Possible sentence stems

- \_\_\_\_\_ tenths/hundredths are equivalent to \_\_\_\_\_ wholes/tenths.
- The value of the digit \_\_\_\_\_ in the number \_\_\_\_\_ is \_\_\_\_\_

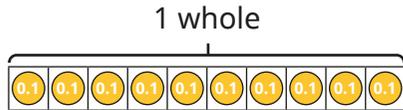
## National Curriculum links

- Read, write, order and compare numbers with up to 3 decimal places

# Decimals up to 2 decimal places

## Key learning

- Whitney shares 1 whole into 10 equal parts.

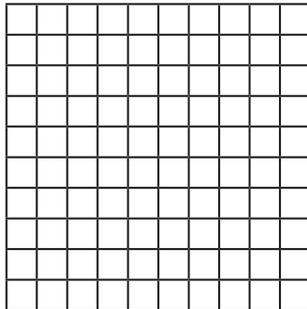


Use the bar model to complete the sentences.

- ▶ One part is worth \_\_\_\_\_ tenth, which is written as \_\_\_\_\_
- ▶ Seven parts are worth \_\_\_\_\_ tenths, which is written as \_\_\_\_\_

- Jack uses a hundred square to represent 1 whole.

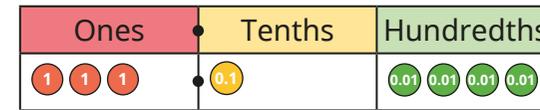
Each part represents 0.01



Use the hundred square to complete the sentences.

- ▶ One part is worth \_\_\_\_\_ hundredth, which is written as \_\_\_\_\_
- ▶ Five parts are worth \_\_\_\_\_ hundredths, which is written as \_\_\_\_\_
- ▶ The whole square is worth \_\_\_\_\_ hundredths, which is written as \_\_\_\_\_

- Huan uses place value counters to make the number 3.14



Use place value counters to make the numbers.



- Complete the sentence to describe the underlined digit in each number.



The value of the digit \_\_\_\_\_ in the number \_\_\_\_\_ is \_\_\_\_\_

- Fill in the missing numbers.
  - ▶  $0.83 = \underline{\quad} + 0.03 = \underline{\quad}$  tenths and 3 hundredths
  - ▶  $0.83 = 0.7 + \underline{\quad} = 7$  tenths and \_\_\_\_\_ hundredths

How many other ways can you partition 0.83?

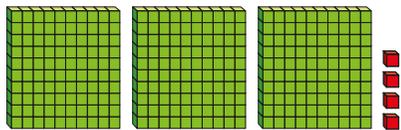
# Decimals up to 2 decimal places

## Reasoning and problem solving

Filip is using base 10 to make decimal numbers.

He uses a hundred piece to represent 1, a ten piece to represent 0.1 and a one piece to represent 0.01

He makes this number.



Filip has made the number 3.4

Do you agree with Tiny?

Explain your answer.



No

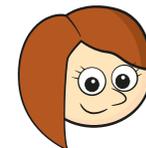


Match the numbers to the children.



Teddy

My number has the same amount of tens and tenths.



Rosie

My number has 2 hundredths.



46.2

2.64

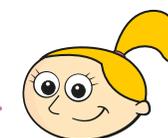
46.02

40.46



Amir

My number has one decimal place.



Eva

My number has 6 tenths.

Teddy: 40.46

Amir: 46.2

Rosie: 46.02

Eva: 2.64

# Equivalent fractions and decimals (tenths)

## Notes and guidance

In Year 4, children learnt about tenths as fractions as well as decimals. In this small step, children consolidate their understanding of equivalent fractions and decimals when working with tenths.

Children start by exploring equivalent fractions and decimals within 1, before extending this to numbers greater than 1. Place value counters, bead strings, straws and number lines are all good representations for tenths. Remind children that when 1 is split into 10 equal parts, then one of those parts is called a tenth, which could also be written as 0.1, making  $\frac{1}{10}$  and 0.1 equivalent.

It is important children practise counting up in 0.1s and crossing 1 whole, making sure they do not say “zero point nine, zero point ten, zero point eleven ...”. For numbers greater than 1, for example 1.2, children should see this written as 1.2,  $1\frac{2}{10}$  and  $\frac{12}{10}$ .

## Things to look out for

- Children may count up in 0.1s to 0.10 (“zero point ten”).
- Children may confuse the words “tens” and “tenths”.
- With numbers greater than 1, children may find mixed numbers easier than improper fractions, or vice versa.

## Key questions

- What is the same/different about fractions and decimals?
- If a whole is split into 10 equal parts, what is each part worth?
- What does “equivalent” mean?
- What decimal is equivalent to the fraction \_\_\_\_\_?
- What fraction is equivalent to \_\_\_\_\_ 0.1s?
- When counting up in  $\frac{1}{10}$ s/0.1s, what happens after  $\frac{9}{10}$ /0.9?
- How many tenths are there in the number \_\_\_\_\_?

## Possible sentence stems

- The fraction \_\_\_\_\_ is equivalent to the decimal \_\_\_\_\_
- The decimal \_\_\_\_\_ is equivalent to the fraction \_\_\_\_\_
- There are ten \_\_\_\_\_ in 1 whole.

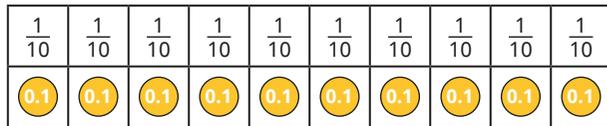
## National Curriculum links

- Read and write decimal numbers as fractions

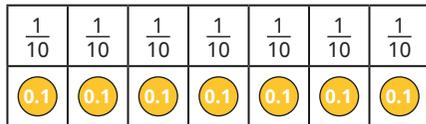
# Equivalent fractions and decimals (tenths)

## Key learning

- Kim uses a bar model to show the equivalence of 0.1 and  $\frac{1}{10}$



She then uses a bar model to make a number.



Complete the sentences to describe Kim's number.

- ▶ The fraction represented is \_\_\_\_\_
  - ▶ The decimal represented is \_\_\_\_\_
  - ▶ The fraction \_\_\_\_\_ is equivalent to the decimal \_\_\_\_\_
- Ron uses a bead string to represent 1 whole.



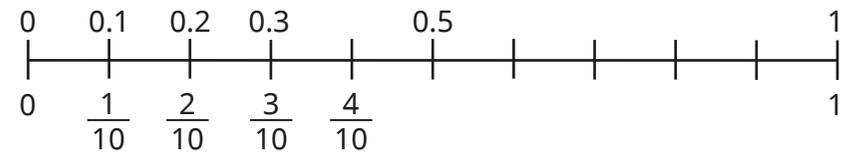
Then he uses the bead string to represent another number.



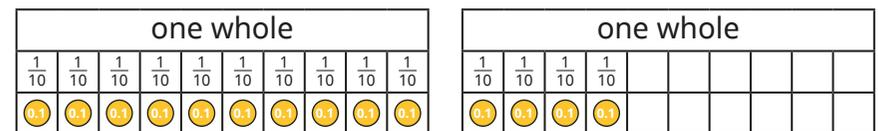
Write the number that Ron has represented.

Give your answer as a fraction and as a decimal.

- Complete the number line.

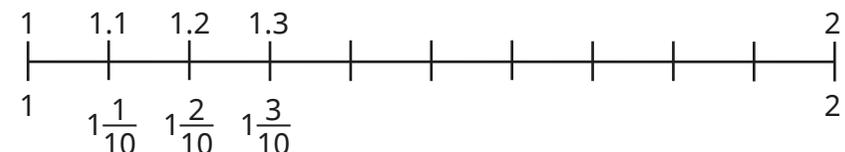


- The bar models show that  $1\frac{4}{10}$  is equal to 1.4



Draw your own bar models to help complete the statements.

- ▶  $1\frac{3}{10} =$  \_\_\_\_\_
  - ▶  $2.6 =$  \_\_\_\_\_
  - ▶  $\frac{32}{10} =$  \_\_\_\_\_
- Complete the number line.



# Equivalent fractions and decimals (tenths)

## Reasoning and problem solving

Dora, Annie and Dexter are describing the same number.



I think it is  $\frac{17}{10}$

Dora



I think it is 1.7

Annie



I think it is 1 and  $\frac{7}{10}$

Dexter

They have all said different numbers, so someone must be wrong.

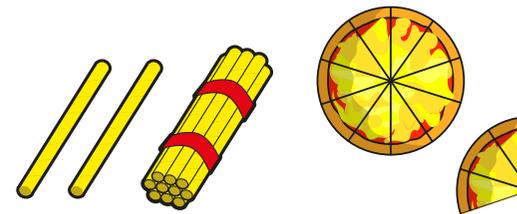
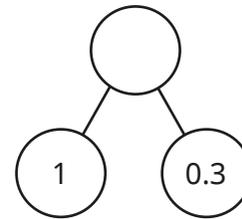
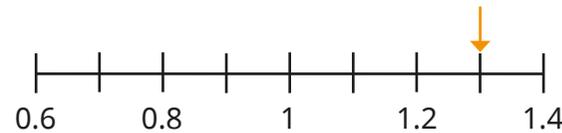


Do you agree with Tiny?

Explain your answer.

No

Which representation is the odd one out?



Explain your answer.

The straws are the odd one out.

They represent 1.2 or  $1\frac{2}{10}$

The other models all represent 1.3 or  $1\frac{3}{10}$

# Equivalent fractions and decimals (hundredths)

## Notes and guidance

In this small step, children extend the learning of the previous step to explore equivalent fractions and decimals when looking at hundredths.

Using a hundred square with a value of 1, and each part worth  $\frac{1}{100}$  or 0.01, helps children's understanding of hundredths in relation to the whole. They also see that because  $\frac{10}{100}$  is equivalent to  $\frac{1}{10}$ , decimal numbers with 2 decimal places can be partitioned into tenths and hundredths, for example  $\frac{32}{100} = \frac{3}{10} + \frac{2}{100}$  and  $0.32 = 0.3 + 0.02$ . Learning then extends to decimals and fractions greater than 1. Children see fractions greater than 1 whole as both mixed numbers and improper fractions, for example  $1.03 = 1\frac{3}{100} = \frac{103}{100}$

### Things to look out for

- Children may confuse the words “hundreds” and “hundredths”.
- When converting a decimal into tenths and hundredths, children may confuse the two, for example  $0.23 = \frac{2}{100} + \frac{3}{10}$
- When counting up in 0.01s or  $\frac{1}{100}$ s, at 1 whole, children may incorrectly say, for example, 0.23 as “zero point twenty-three”.

## Key questions

- What is the same/different about fractions/decimals?
- What fraction is the decimal \_\_\_\_\_ equivalent to?
- What decimal is the fraction \_\_\_\_\_ equivalent to?
- What is the value of the digit \_\_\_\_\_ in \_\_\_\_\_?
- What fractions can the decimal \_\_\_\_\_ be partitioned into?
- How many tenths are equal to 1 whole?
- How many hundredths are equal to 1 whole?
- How many hundredths are equal to 1 tenth?

## Possible sentence stems

- The fraction/decimal \_\_\_\_\_ is equivalent to the decimal/fraction \_\_\_\_\_
- There are \_\_\_\_\_ tenths and \_\_\_\_\_ hundredths in \_\_\_\_\_
- \_\_\_\_\_ hundredths is equivalent to \_\_\_\_\_ tenths.

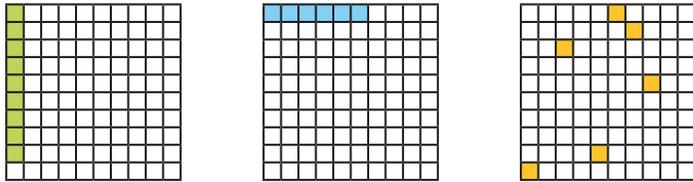
## National Curriculum links

- Identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths
- Read and write decimal numbers as fractions

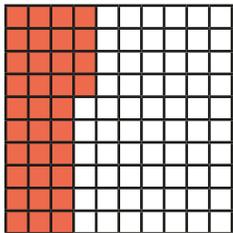
# Equivalent fractions and decimals (hundredths)

## Key learning

- Each square in the hundred grid represents 1 hundredth. What fraction and what decimal of each hundred square is shaded?



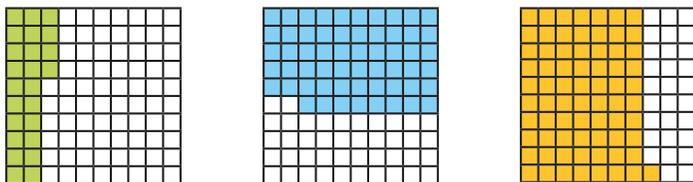
- Esther knows that each column in the hundred square is worth  $\frac{1}{10}$ . She shades some squares and describes the number.



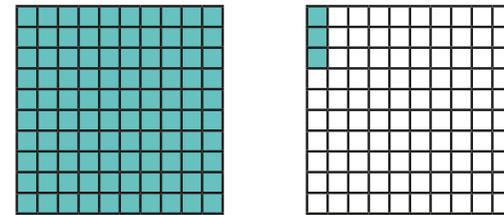
There are  $\frac{3}{10}$  and  $\frac{4}{100}$  shaded.  
This shows the decimals  $0.3 + 0.04$

$$\frac{34}{100} = 0.34$$

Write the equivalent fractions and decimals shown by each hundred square.



- Nijah shades two hundred squares to make a number greater than 1



Write Nijah's number as a fraction and as a decimal.  
Shade hundred squares to show each number.

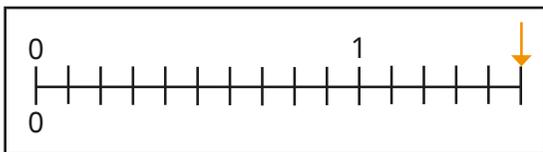
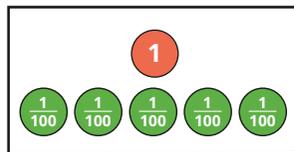
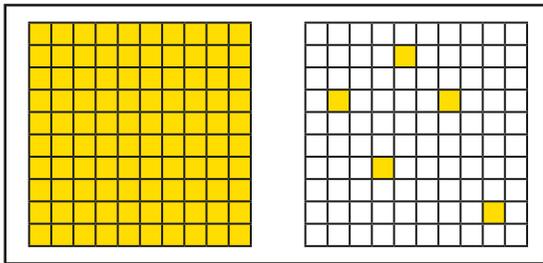


- Shade hundred squares to show 1.4 and 1.04  
Discuss with a partner what is the same and what is different about the two numbers.
- Write  $\frac{117}{100}$  as a mixed number and as a decimal number.

# Equivalent fractions and decimals (hundredths)

## Reasoning and problem solving

Which representation is the odd one out?



Explain your answer.

The number line is the odd one out.

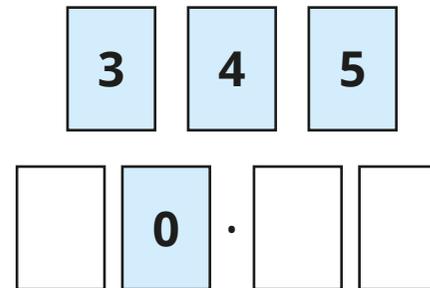
Is the statement true or false?

$$2\frac{9}{100} > 2.3$$

Explain your answer.

False

Use the digit cards to complete the decimal number.



List all the possible numbers you can make.

Write each decimal as a mixed number.

30.45, 30.54, 40.35,  
40.53, 50.34, 50.43

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

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

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

# Equivalent fractions and decimals

## Notes and guidance

In this small step, children look at equivalent fractions and decimals, specifically focusing on halves, quarters, fifths and tenths. They relate this to earlier learning from Key Stage 2, when they divided 100 into 2, 4, 5 and 10 equal parts. By seeing 1 whole divided into 2, 4, 5 and 10 equal parts on a number line, children will see the value of these fractions.

They also apply their understanding of equivalent fractions/decimals from previous learning to this step. Once confident with unit fraction equivalents, children can then explore non-unit fractions such as  $\frac{3}{4}$  and  $\frac{2}{5}$ . Fraction walls can be used to remind children of equivalent fractions such as  $\frac{4}{10} = \frac{2}{5}$ , which will help with their understanding.

### Things to look out for

- Children may not count the intervals on a number line correctly and confuse the number of divisions with the number of intervals.
- Children may misinterpret numerators and denominators, for example writing  $\frac{1}{5}$  as 1.5 or  $\frac{3}{4}$  as 3.4

## Key questions

- What is 1 whole shared equally into 2/4/5/10 equal parts?
- How can you tell what each interval on the number line is worth?
- What decimal is equivalent to the fraction \_\_\_\_\_?
- What fraction is the decimal \_\_\_\_\_ equivalent to?
- What is the same and what is different about the fraction \_\_\_\_\_ and the decimal \_\_\_\_\_?

## Possible sentence stems

- The decimal \_\_\_\_\_ is equivalent to the fraction \_\_\_\_\_
- \_\_\_\_\_ hundredths is equivalent to \_\_\_\_\_
- If I know that \_\_\_\_\_ is equivalent to \_\_\_\_\_, then I also know that \_\_\_\_\_ is equivalent to \_\_\_\_\_

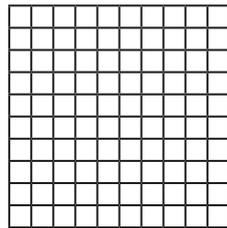
## National Curriculum links

- Read and write decimal numbers as fractions
- 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

# Equivalent fractions and decimals

## Key learning

- Shade  $\frac{1}{2}$  of the hundred square.



Use the hundred square to complete the equivalent fraction.

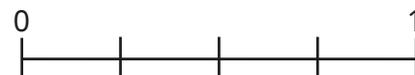
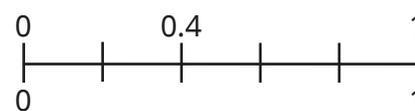
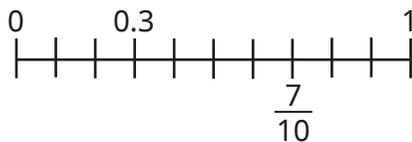
$$\frac{1}{2} = \frac{\square}{100}$$

Write the fraction as a decimal.

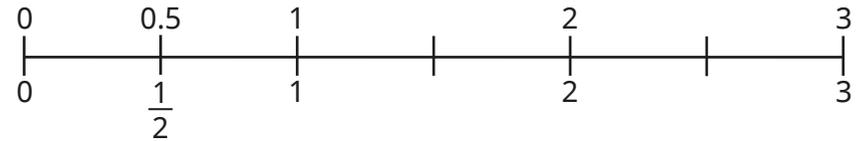
- Shade hundred squares to represent the fractions and write the equivalent fractions and decimals.

▶  $\frac{1}{10}$       ▶  $\frac{1}{4}$       ▶  $\frac{1}{5}$

- Label the missing decimals and fractions on the number lines.



- Ron has started counting in halves on a number line.

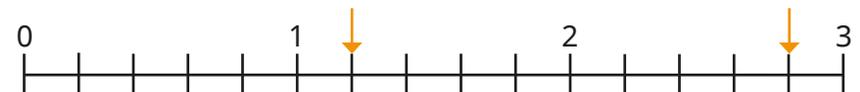


Complete Ron's number line.

- Fill in the missing fractions and decimals on the number line.



- What decimals and fractions are the arrows pointing to?



- Work out the equivalent fraction or decimal for each number.

Give fraction answers as both mixed numbers and improper fractions.

▶  $\frac{2}{5}$       ▶ 1.1      ▶  $\frac{13}{10}$       ▶  $1\frac{3}{4}$       ▶ 2.5

# Equivalent fractions and decimals

## Reasoning and problem solving



$\frac{1}{10}$  is equivalent to 0.1, so  $\frac{1}{4}$  is equivalent to 0.4

Do you agree with Tiny?  
Explain your answer.

No

Is the statement true or false?

2.5 as a fraction is  $\frac{2}{5}$

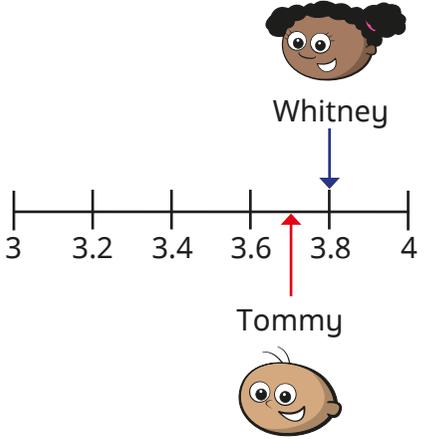
Explain your answer.

False

Tommy and Whitney are working on the same number line.

Tommy draws an arrow halfway between 3.6 and 3.8

Whitney draws an arrow to 3.8



What decimal is halfway between Tommy and Whitney's arrows?  
Write the decimal as a mixed number.

3.75

$3\frac{3}{4}$

# Thousandths as fractions

## Notes and guidance

In this small step, children encounter the idea of thousandths for the first time.

Begin by reminding children that a tenth is 1 whole split into 10 equal parts, a hundredth is 1 whole split into 100 equal parts, and therefore a thousandth is 1 whole split into 1,000 equal parts. Different representations can be used to model this idea, such as a thousand piece of base 10 representing the whole and a one piece representing a thousandth.

Once children are familiar with the idea of a thousandth, they use place value counters to represent them. Exchanging counters helps children to see that there are 10 thousandths in a hundredth, meaning 9 thousandths is smaller than 1 hundredth. Finally, they partition thousandths into tenths, hundredths and thousandths, for example  $\frac{342}{1000} = \frac{3}{10} + \frac{4}{100} + \frac{2}{1000}$

### Things to look out for

- Children may confuse the words “thousand” and “thousandth”.
- As 1,000 is greater than 100, children may think that  $\frac{1}{1000}$  is greater than  $\frac{1}{100}$

## Key questions

- What is a thousandth?
- How are thousandths similar to/different from tenths/hundredths?
- How many thousandths are there in 1 whole?
- How many thousandths are there in 1 hundredth?
- How many thousandths are there in 1 tenth?
- How can you partition \_\_\_\_\_ thousandths?
- What fraction is made up of \_\_\_\_\_ tenths, \_\_\_\_\_ hundredths and \_\_\_\_\_ thousandths?
- Which is greater, 1 hundredth or 9 thousandths? How do you know?

## Possible sentence stems

- There are \_\_\_\_\_ thousandths in \_\_\_\_\_
- $\frac{\square}{1000}$  is equivalent to  $\frac{\square}{10} + \frac{\square}{100} + \frac{\square}{1000}$

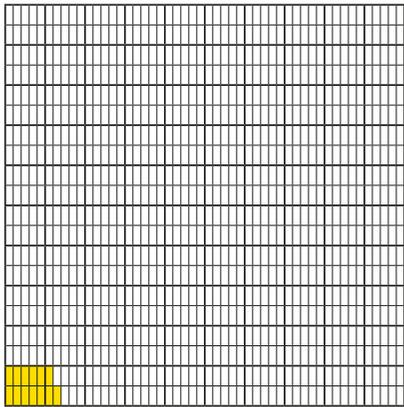
## National Curriculum links

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

# Thousandths as fractions

## Key learning

- Here is a thousand square.



13 parts are shaded.  
This represents  $\frac{13}{1000}$

What fractions are represented by these amounts?

22 shaded parts

150 shaded parts

1 shaded part

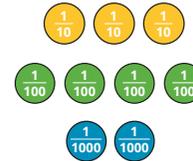
- Use the fact that  $\frac{1}{10} = \frac{10}{100}$  and  $\frac{1}{100} = \frac{10}{1000}$  to complete the equivalent fractions.

▶  $\frac{1}{10} = \frac{\square}{1000}$

▶  $\frac{4}{100} = \frac{\square}{1000}$

▶  $\frac{800}{1000} = \frac{\square}{100} = \frac{\square}{10}$

- Scott uses place value counters to partition  $\frac{342}{1000}$

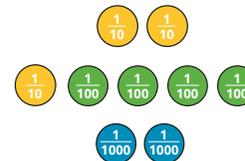


$$\frac{342}{1000} = \frac{3}{10} + \frac{4}{100} + \frac{2}{1000}$$

Use Scott's method to partition the fractions.

▶  $\frac{267}{1000}$     ▶  $\frac{607}{1000}$     ▶  $\frac{53}{1000}$

- Sam uses place value counters to partition  $\frac{342}{1000}$  flexibly.



$$\frac{342}{1000} = \frac{2}{10} + \frac{14}{100} + \frac{2}{1000}$$

Use Sam's method to partition the fractions flexibly.

▶  $\frac{267}{1000}$     ▶  $\frac{607}{1000}$     ▶  $\frac{53}{1000}$

- Write <, > or = to complete the statements.

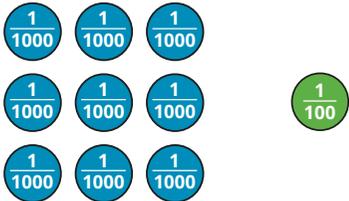
$\frac{9}{1000} \bigcirc \frac{8}{100}$

$\frac{1}{10} \bigcirc \frac{2}{100}$

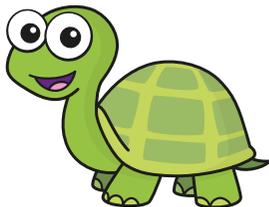
$\frac{1}{10} \bigcirc \frac{100}{1000}$

# Thousandths as fractions

## Reasoning and problem solving



$\frac{9}{1000}$  is greater than  $\frac{1}{100}$  because 9 is greater than 1 and 1,000 is greater than 100

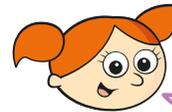


Do you agree with Tiny?  
Explain your answer.

No

$\frac{1}{100}$  is equivalent to  $\frac{10}{1000}$ , which is greater than  $\frac{9}{1000}$

Alex, Jack and Whitney are partitioning  $\frac{367}{1000}$



Alex

It can be partitioned into 3 tenths, 6 hundredths and 7 thousandths.



Jack

It can be partitioned into 2 tenths, 16 hundredths and 7 thousandths.



Whitney

It can be partitioned into 3 tenths and 67 thousandths.

All three children are correct.

Who do you agree with?  
Explain your answer.

# Thousandths as decimals

## Notes and guidance

In this small step, children continue to explore the idea of thousandths, by representing them in decimal form.

Children learn that  $0.001 = \frac{1}{1000}$  is a tenth the size of  $0.01 = \frac{1}{100}$ .

Exchanging place value decimal counters from 1 down to 0.001 helps them to understand the relationship between the different decimals. They use number lines labelled in hundredths and see that by splitting each section into 10 equal parts, the number line now shows thousandths.

Children flexibly partition decimal numbers with 3 decimal places. Using place value counters and exchanging between the values will help them to understand this concept.

### Things to look out for

- Children may confuse the words “thousand” and “thousandth”.
- Children may use the incorrect number of placeholders, leading to the incorrect number being written.
- Children may think that, for example,  $0.01 + 0.004 = 0.0005$  because they just add the non-zero digits.

## Key questions

- What does each digit in a decimal number represent?
- How are 0.001s similar to  $\frac{1}{1000}$ s? How are they different?
- How many 0.001s are there in 1 whole?
- How many 0.001s are there in 0.01?
- How many 0.001s are there in 0.1?
- How can you represent 0.001s on a number line?

## Possible sentence stems

- \_\_\_\_\_ is 10 times greater than \_\_\_\_\_
- \_\_\_\_\_ is one-tenth the size of \_\_\_\_\_
- There are \_\_\_\_\_ \_\_\_\_\_ in \_\_\_\_\_

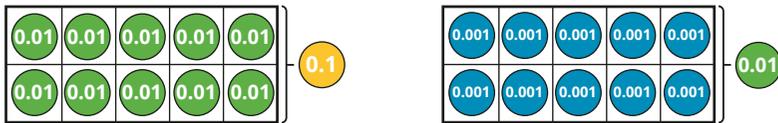
## National Curriculum links

- Recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents
- Read, write, order and compare numbers with up to 3 decimal places

# Thousandths as decimals

## Key learning

- The diagram shows the relationship between tenths, hundredths and thousandths.



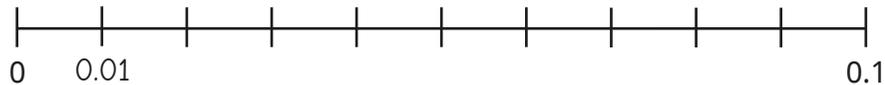
Complete the sentences in as many ways as possible.

\_\_\_\_\_ is one-tenth the size of \_\_\_\_\_

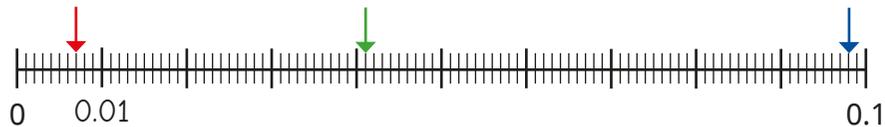
\_\_\_\_\_ is 10 times the size of \_\_\_\_\_

- Rosie is counting up from 0 to 0.1 in hundredths on a number line.

Finish labelling her number line.



She then splits each section into 10 equal parts.



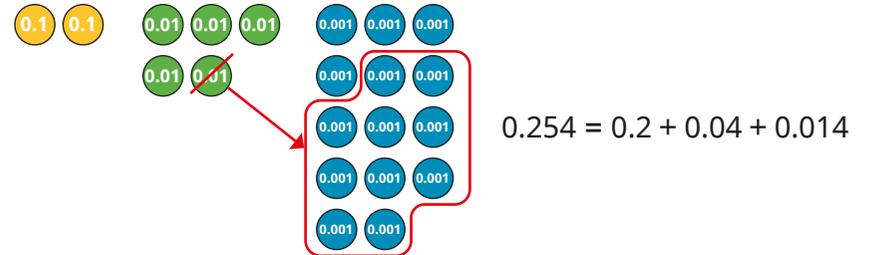
The first arrow is pointing to 0.007

What numbers are the other arrows pointing to?

- The number 0.254 is made up of 2 tenths, 5 hundredths and 4 thousandths.

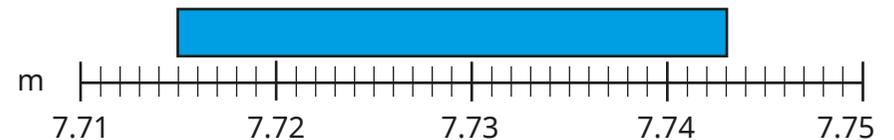


The same number can also be made like this, by exchanging 1 hundredth for 10 thousandths.



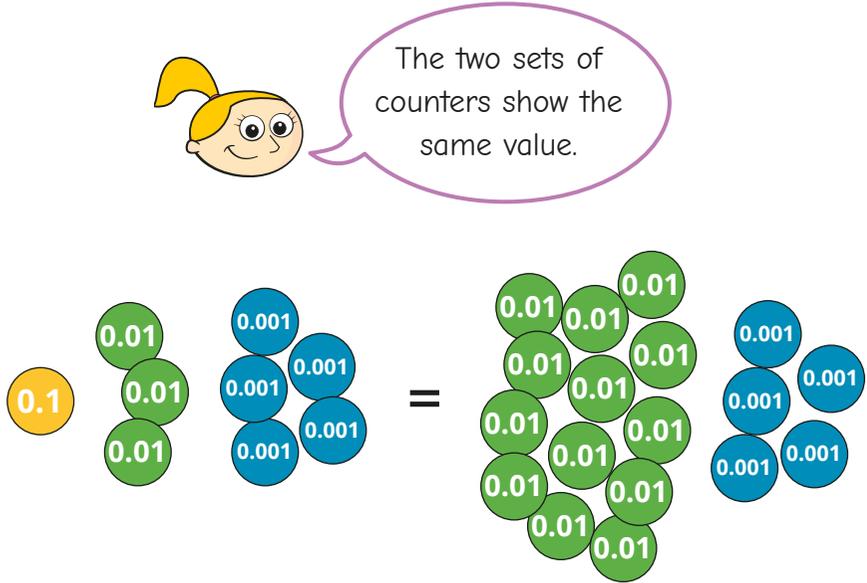
Partition the number 0.428 in three different ways.

- How long is the rectangle?



# Thousandths as decimals

## Reasoning and problem solving



The two sets of counters show the same value.

Do you agree with Eva?  
Explain your answer.  
Write this value as a decimal and as a fraction.

Yes | 0.135,  $\frac{135}{1000}$

Three children are partitioning the number 0.504



Jo

$$0.504 = 0.5 + 0.004$$


Amir

$$0.504 = 0.3 + 0.2 + 0.004$$


Teddy

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

Who is correct?  
Explain your answer.

They are all correct. Jo has partitioned the number as decimals. Amir has partitioned the number as decimals in a different way. Teddy has partitioned the number as fractions.

# Thousandths on a place value chart

## Notes and guidance

In this small step, children continue to explore the idea of thousandths, by representing numbers with up to 3 decimal places on a place value chart. This is the first time this column of the chart will have been shown to the children and some recap work on the place value chart may be needed.

Show children decimal numbers represented on the place value chart with place value counters and ask what decimal number has been made. Then provide children with numbers for them to make using place value counters. They should see that a decimal such as 0.012 is shown on a place value chart as one 0.01 counter in the tenths column and two 0.001 counters in the thousandths column.

Children partition decimal numbers in a variety of ways. Making the number first with place value counters and then exchanging for different values will help them flexibly partition decimals.

### Things to look out for

- Children may be unsure how to use placeholders if there is an empty column, for example 5 tenths and 7 thousandths = 0.507
- Children may see, for example,  $\frac{23}{1000}$  and start by putting 2 in the thousandths column and then 3 in the ten-thousandths column (0.0023).

## Key questions

- What is a thousandth?
- How many thousandths are equivalent to 1 hundredth?
- How can you represent this decimal number on a place value chart?
- What is the value of the digit \_\_\_\_\_ in \_\_\_\_\_?  
How does a place value chart help you?
- What do you need to do when there are no counters in a column?

## Possible sentence stems

- \_\_\_\_\_ ones, \_\_\_\_\_ tenths, \_\_\_\_\_ hundredths and \_\_\_\_\_ thousandths make the decimal number \_\_\_\_\_
- \_\_\_\_\_ can be partitioned into \_\_\_\_\_ + \_\_\_\_\_ + \_\_\_\_\_
- I know that \_\_\_\_\_ is equivalent to \_\_\_\_\_ because ...

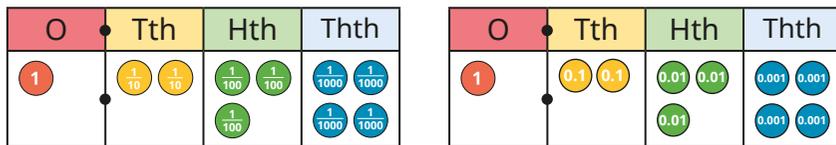
## National Curriculum links

- Read, write, order and compare numbers with up to 3 decimal places
- Solve problems involving numbers up to 3 decimal places

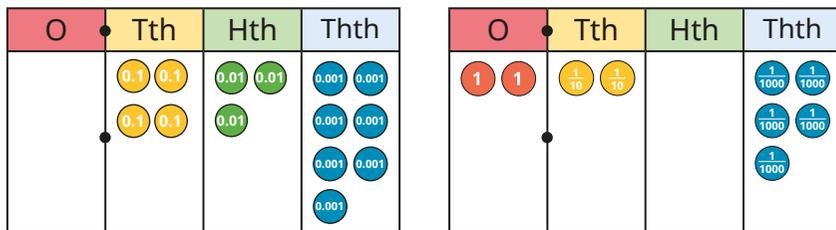
# Thousandths on a place value chart

## Key learning

- What is the same and what is different about these place value charts?



- Complete the sentences to describe each number.



There are \_\_\_\_\_ ones.

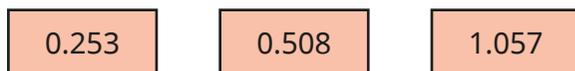
There are \_\_\_\_\_ tenths.

There are \_\_\_\_\_ hundredths.

There are \_\_\_\_\_ thousandths.

The number represented is \_\_\_\_\_

- Make each number on a place value chart.



- $\frac{12}{1000}$  can be partitioned into  $\frac{1}{100}$  and  $\frac{2}{1000}$

Partition these numbers into hundredths and thousandths.

Use a place value chart to help you.



- Dora and Ron have partitioned 0.132 in different ways.



Dora

$$0.132 = 0.1 + 0.03 + 0.002$$

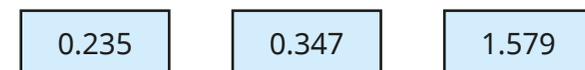


Ron

$$0.132 = 0.1 + 0.02 + 0.012$$

Use a place value chart and counters to show that both children are correct.

- Use a place value chart to help you partition the numbers in different ways.

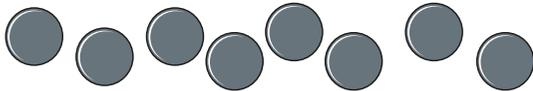


Compare answers with a partner.

# Thousandths on a place value chart

## Reasoning and problem solving

Brett has eight plain counters.



He makes numbers using the place value chart.

O	Tth	Hth	Thth

6.11

0.116

At least three columns contain counters.

What is the greatest number he can make?

What is the smallest number he can make?

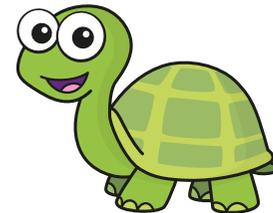
Tiny puts the fraction  $\frac{45}{1000}$  into a place value chart.



O	Tth	Hth	Thth
0	0	0	4

5

There are 3 zeros in 1,000, so I need 3 zeros at the start of my number.



Do you agree with Tiny?

Explain your answer.



No

# Order and compare decimals (same number of decimal places)

## Notes and guidance

In Year 4, children ordered and compared decimal numbers with up to 2 decimal places. In this small step, that learning is extended to include numbers with 3 decimal places. For this step, the number of decimal places in each number will be the same.

Representations such as place value charts and counters and number lines can be used to support children's understanding.

To begin with, the numbers will have different digits in the column with the greatest value. Children identify the column with the greatest value in each number and identify which number has the greater digit in this column. They then order numbers in a similar way. They progress to two numbers with the same digit in the column with the greatest value so that they use the next column (or the next) to determine which number has the greater value.

## Things to look out for

- Children may not appreciate that they must start with the column with the greatest value, leading to misconceptions such as thinking 0.299 is greater than 0.312
- Children may have forgotten the terms “ascending” and “descending”.

## Key questions

- How do you compare two numbers?
- Which column in the place value chart do you need to look at first?
- How can you compare two numbers that have the same number of tenths/hundredths?
- Which number is greater, \_\_\_\_\_ or \_\_\_\_\_?
- What does “ascending”/“descending” mean?

## Possible sentence stems

- I need to start by looking at the column with the \_\_\_\_\_ place value.
- To compare \_\_\_\_\_ and \_\_\_\_\_, I need to first look at the \_\_\_\_\_ column.
- If the digits in the \_\_\_\_\_ column are the same, I need to look at the \_\_\_\_\_ column.

## National Curriculum links

- Read, write, order and compare numbers with up to 3 decimal places
- Solve problems involving numbers up to 3 decimal places

# Order and compare decimals (same number of decimal places)

## Key learning

- Which is the greater number, 0.6 or 0.4?

How do you know?

Which is the greater number, 0.14 or 0.17?

How do you know?

- Make the numbers 0.452 and 0.364 on a place value chart.

How do your place value charts show that 0.452 is greater than 0.364?

Talk about it with a partner.

- Write  $>$  or  $<$  to compare the numbers.

Use a place value chart and counters to help you.

$$0.465 \bigcirc 0.913 \quad 0.067 \bigcirc 0.029$$

$$1.546 \bigcirc 0.894 \quad 0.071 \bigcirc 0.007$$

- Write the numbers in ascending order.

0.379    0.209    0.693    0.895    0.172

- Use place value charts to make the numbers 0.569 and 0.571

How do your place value charts show that 0.569 is less than 0.571?

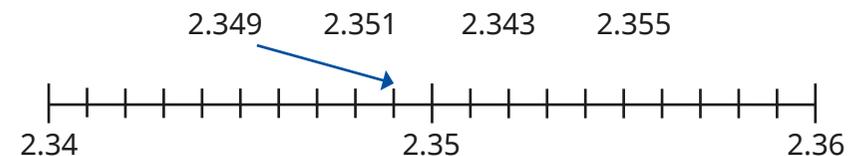
- Write  $>$  or  $<$  to compare the numbers.

Use a place value chart to help you.

$$0.756 \bigcirc 0.719 \quad 0.658 \bigcirc 0.659$$

$$0.021 \bigcirc 0.022 \quad 1.036 \bigcirc 1.035$$

- Eva is using a number line to order some numbers.



Draw arrows to show the positions of the other numbers.

Then write the numbers in ascending order.

- Write the numbers in ascending order.

65.394    65.309    63.999    65.493

# Order and compare decimals (same number of decimal places)

## Reasoning and problem solving

Esther uses counters and a place value chart to make two numbers.

O	Tth	Hth	Thth
	● ●	●	●
	●	● ● ● ●	● ● ●

The second number has 8 counters in it and the first only has 4, so the second number is greater.



Do you agree with Tiny?  
Explain your answer.

No

Whitney, Mo and Tommy are each thinking of a number.



Whitney

My number is 3.465

My number is 3.455



Mo



Tommy

My number is between Whitney and Mo's numbers.

What number could Tommy be thinking of?

3.456, 3.457, 3.458,  
3.459, 3.46, 3.461,  
3.462, 3.463, 3.464

# Order and compare any decimals with up to 3 decimal places

## Notes and guidance

In this small step, children compare decimal numbers that have a different number of decimal places.

A common misconception with this learning is thinking that numbers with more decimal places are greater, for example  $0.365 > 0.41$ .

Using place value counters on a place value chart to build numbers supports children in developing their understanding. They should recognise that 0.41 has more tenths than 0.365 – it does not matter that it has fewer decimal places.

Using place value charts supports children to recognise that they need to start comparing the numbers from the place value column that has the highest value, and that if this is the same, they need to look at the next column.

When progressing to ordering sets of numbers, encourage children to work systematically through the list, starting by comparing the place value column that has the greatest value, then working their way down.

### Things to look out for

- Children may read 1.234 as “one point two hundred and thirty-four” and therefore assume it is greater than 1.3
- When ordering decimals, children may not write all of the numbers from the question in their answer.

## Key questions

- What is the same and what is different about 1.4 and 1.305?
- What are the digits in each number worth?
- How can you represent these numbers on a place value chart?
- Which place value column in the chart has the greatest value? Which has the next greatest value?
- How can a place value chart help to show you which number is greater?
- How can you work systematically to order numbers in a list?

## Possible sentence stems

- \_\_\_\_\_ is greater/smaller than \_\_\_\_\_ because ...
- The decimal \_\_\_\_\_ has a greater value than the decimal \_\_\_\_\_
- \_\_\_\_\_ tenths/hundredths/thousandths are greater than \_\_\_\_\_ tenths/hundredths/thousandths, so \_\_\_\_\_ is greater than \_\_\_\_\_

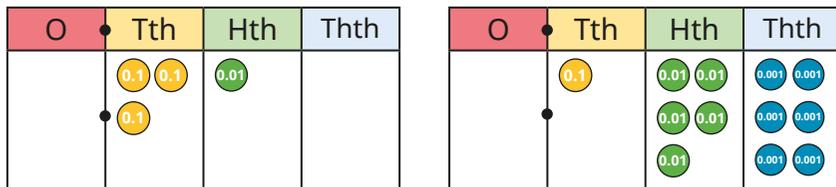
## National Curriculum links

- Read, write, order and compare numbers with up to 3 decimal places
- Solve problems involving numbers up to 3 decimal places

# Order and compare any decimals with up to 3 decimal places

## Key learning

- Rosie has made the numbers 0.31 and 0.156 on place value charts.



Which number is greater? How do you know?

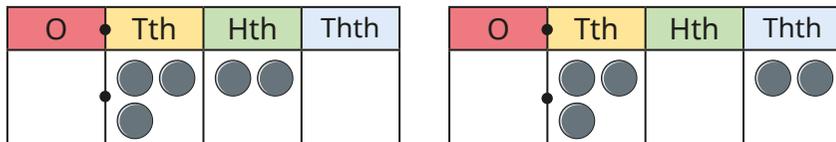
- Write  $>$  or  $<$  to compare the numbers.

Use a place value chart and counters to help you.

$$0.65 \bigcirc 0.7 \qquad 1.5 \bigcirc 0.988$$

$$0.406 \bigcirc 0.32 \qquad 0.9 \bigcirc 0.769$$

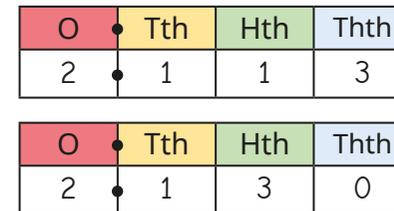
- The place value charts show the numbers 0.32 and 0.302



What is the same and what is different about the numbers?

Which number is greater? How do you know?

- Max has written the numbers 2.113 and 2.13 in place value charts.



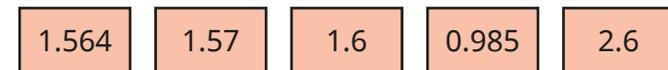
Which of the numbers is greater? How do you know?

Which place value column did you need to compare?

- Write  $>$  or  $<$  to compare the numbers.

$$2.4 \bigcirc 2.38 \qquad 1.865 \bigcirc 1.87 \qquad 3.079 \bigcirc 3.7$$

- Write the numbers in ascending order.

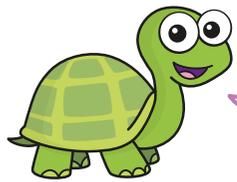


- Put these lengths in order, from longest to shortest.



# Order and compare any decimals with up to 3 decimal places

## Reasoning and problem solving



5.35 is greater than 5.4 because 35 is greater than 4

Do you agree with Tiny?

Explain why.



No

Amir is thinking of two numbers.

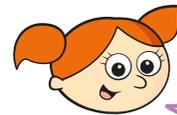
Use the clues to work out what his numbers could be.

- The greater number has 2 decimal places.
- The smaller number has 3 decimal places.
- You need to look at the hundredths column to compare them.

How many answers can you find?



multiple possible answers, e.g. 0.23 and 0.219



I have put some numbers in ascending order.

3.015

$3\frac{51}{1000}$



3.105

$3\frac{51}{100}$

Alex has missed one number out.

What could the number be?

What could the number **not** be?

multiple possible answers, e.g. 3.052, 3.053, 3.054, 3.104

less than or equal to 3.051 or greater than or equal to 3.105

# Round to the nearest whole number

## Notes and guidance

Earlier in Year 5, children rounded whole numbers within 1,000,000. In Year 4, they rounded decimal numbers to the nearest whole number. In this small step, children round numbers with 1 and 2 decimal places to the nearest whole number. This extends to rounding to 1 decimal place in the next step.

Begin by recapping what whole numbers are and which integers are either side of a decimal number. Place value charts and counters allow children to explore how far away each integer is on either side of the decimal number. Using a number line supports understanding of rounding and helps determine which whole number is closer. Children decide whether the number is greater or smaller than the halfway point between the integers. When the number is exactly halfway between two whole numbers, explain that the convention is to round to the greater of the two, for example 6.5 rounds to 7

### Things to look out for

- Children may see 6.15 as “six point fifteen” and round to 7 because 15 is greater than 5
- Children may not think of zero as a whole number.
- The words “round down” can result in children rounding incorrectly, for example rounding 7.2 to 6 rather than 7

## Key questions

- Which integers (whole numbers) lie either side of this decimal number?
- Where would the decimal \_\_\_\_\_ go on this number line?
- How can you work out which whole number a decimal number is closer to?
- Which whole number is the decimal \_\_\_\_\_ closer to? How do you know?
- What is halfway between these two whole numbers?
- When a decimal number has fewer than 5 tenths, does it round to the next or previous whole number? How do you know?

## Possible sentence stems

- The whole numbers either side of \_\_\_\_\_ are \_\_\_\_\_ and \_\_\_\_\_
- \_\_\_\_\_ is closer to \_\_\_\_\_ than \_\_\_\_\_
- \_\_\_\_\_ rounded to the nearest whole number is \_\_\_\_\_

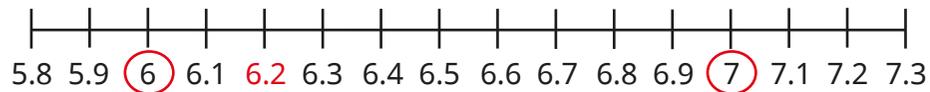
## National Curriculum links

- Round decimals with 2 decimal places to the nearest whole number and to 1 decimal place

# Round to the nearest whole number

## Key learning

- Huan has used a number line to find that the whole numbers either side of 6.2 are 6 and 7



Use a number line to find the whole numbers that are either side of each decimal number.

4.8	12.4	9.9	2.21	6.78	0.74
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- Jack makes the number 3.8 using place value counters.

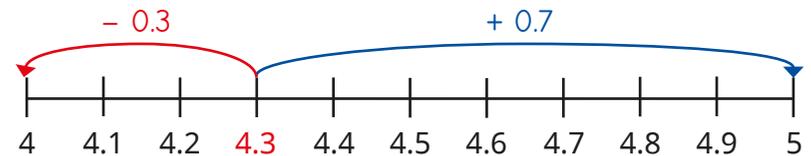


I need to add two 0.1s to make 4, but I need to subtract eight 0.1s to make 3. So 3.8 is closer to 4

Use Jack's method to decide what integer each number is closest to.

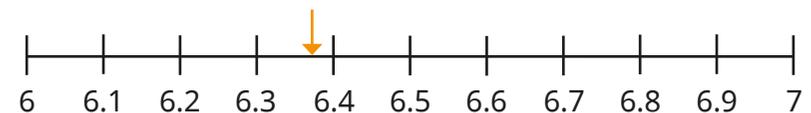
3.3	5.2	6.9	14.2	28.7
-----	-----	-----	------	------

- Dani is rounding 4.3 to the nearest whole number using a number line.



4.3 rounded to the nearest whole number is 4

- Use the number line to round 4.9, 4.1 and 4.6 to the nearest whole number.
- Which integer does 4.5 round to? Why?
- The number line shows that 6.37 is less than 6.5, so rounds to 6 to the nearest whole number.



Use a number line to round the numbers to the nearest whole number.

- ▶ 6.71    ▶ 3.81    ▶ 5.59    ▶ 10.05    ▶ 7.49

# Round to the nearest whole number

## Reasoning and problem solving

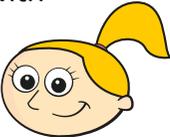
Amir is thinking of a number with 2 decimal places.



Rounded to the nearest whole number, my number is 5

Amir

Eva is thinking of a number with 1 decimal place.



Rounded to the nearest whole number, my number is 6

Eva

Eva's number must be greater than Amir's number.



Do you agree with Tiny?  
Explain your answer.

Yes

Dora is thinking of a number with 1 decimal place.



Rounded to the nearest whole number, my number is 10

What is the difference between the greatest and smallest possible numbers Dora could be thinking of?

0.9 (10.4 – 9.5)

Scott is thinking of a number with 2 decimal places.

When he rounds the number to the nearest whole number, the answer is zero.

What is the greatest number Scott could be thinking of?

0.49

# Round to 1 decimal place

## Notes and guidance

In this small step, children build on the previous step by rounding to 1 decimal place.

They see which numbers with 1 decimal place are either side of a number with 2 decimal places. From here, they work out which number with 1 decimal place is closer. As with rounding to the nearest whole number, a number line is a useful visual aid. When rounding to 1 decimal place, if the digit in the hundredths column is 5, children learn that the number rounds to the greater of the two numbers with 1 decimal place. It is important that children understand that integers, including zero, can also be written as numbers with 1 decimal place, for example  $3 = 3.0$

For this step, only numbers with up to 2 decimal places will be rounded, as rounding numbers with 3 decimal places is covered in Year 6

## Things to look out for

- Children may not think of zero as a whole number.
- Children may round to the whole number rather than 1 decimal place.
- The phrase “round down” can lead children to round too low, for example rounding 6.91 down to 6.8 rather than 6.9

## Key questions

- How can you work out what numbers with 1 decimal place are either side of a number with two decimal places?
- Which number with 1 decimal place is your number closer to? How do you know?
- What number is halfway between the two numbers to 1 decimal place?
- How do you round a number that is halfway between the two numbers to 1 decimal place?

## Possible sentence stems

- The numbers with 1 decimal place either side of \_\_\_\_\_ are \_\_\_\_\_ and \_\_\_\_\_  
\_\_\_\_\_ is closer to \_\_\_\_\_ than \_\_\_\_\_  
\_\_\_\_\_ rounded to 1 decimal place is \_\_\_\_\_
- Halfway between \_\_\_\_\_ and \_\_\_\_\_ is \_\_\_\_\_

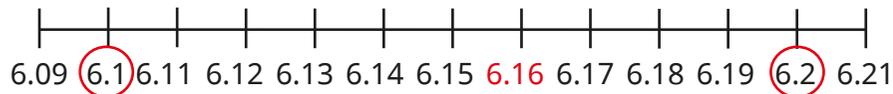
## National Curriculum links

- Round decimals with 2 decimal places to the nearest whole number and to 1 decimal place

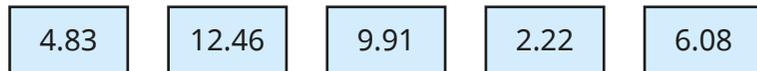
# Round to 1 decimal place

## Key learning

- Aisha has used a number line to find which numbers with 1 decimal place lie either side of 6.16



Use a number line to find the numbers with 1 decimal place that lie either side of each number.



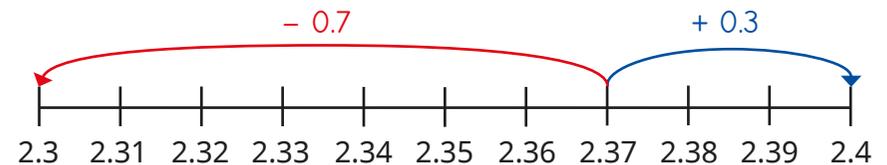
- Here is the number 3.43



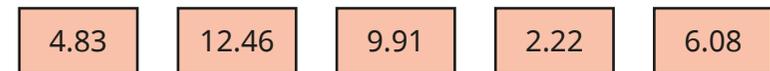
- ▶ How can you use the place value counters to show that 3.43 rounds to 3.4 to 1 decimal place?
- ▶ Use place value counters to round the numbers to 1 decimal place.



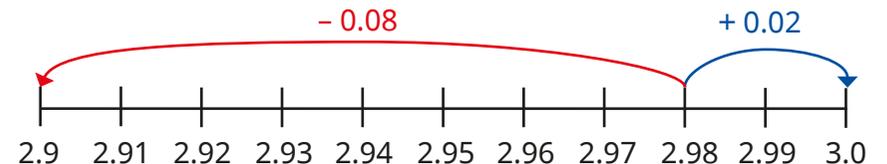
- Teddy has used a number line to find that 2.37 rounded to 1 decimal place is 2.4



Use Teddy's method to round the numbers to 1 decimal place.



- How does the number line show that 2.98 rounds to 3.0 to 1 decimal place?



Round the numbers to 1 decimal place.



# Round to 1 decimal place

## Reasoning and problem solving



Rounding to 1 decimal place is the same as rounding to the nearest tenth.

Yes

Do you agree with Tiny?

Explain your answer.



Mo is thinking of a number.



Rounded to the nearest whole number, my number is 4  
Rounded to the nearest tenth, my number is 3.8

multiple possible answers, e.g.  
3.75, 3.79, 3.81, 3.84  
Some children may include answers such as 3.845

Write at least four different numbers that Mo could be thinking of.

Whitney is thinking of a number between 11 and 20



My number has 2 decimal places.  
When I round it to 1 decimal place, I get the same answer as when I round it to the nearest whole number.



What could Whitney's number be?

Is there more than one possible answer?

Talk about it with a partner.



multiple possible answers, e.g.  
14.95, 17.97, 19.04

# Understand percentages

## Notes and guidance

In this small step, children are introduced to percentages for the first time.

Children learn that “per cent” relates to “number of parts per 100”. If the whole is split into 100 equal parts, then each part is worth 1%. Hundred squares and 100-piece bead strings or Rekenreks are useful representations for exploring this concept. This idea can also be linked to previous learning by comparing to hundredths being 1 part out of a whole that is split into 100 equal parts; this will be covered in greater detail in the following steps.

Using bar models, the learning extends to 1 whole being split into 10 equal parts, allowing children to explore multiples of 10%. Children then estimate 5% on a bar model split into 10 equal parts by splitting a section in half, for example 35% is three full sections and half of the next section.

### Things to look out for

- Children may think that 1% means 1 part, regardless of whether there are 100 parts in total or not.
- Children may forget to write the % symbol.
- When seeing 1 part out of a whole that has been split into 10 parts, children may believe this is 1% rather than 10%.

## Key questions

- How many parts is the square split into?
- How many parts per hundred are shaded/not shaded?
- What percentage of the square is shaded/not shaded?
- What does “100%” mean?
- How many parts is the bar model split into?
- If the whole bar represents 100%, what is each part worth?

## Possible sentence stems

- If the whole is shared into 100 equal parts, then each part represents \_\_\_\_\_%.
- If the whole is shared into 10 equal parts, then each part represents \_\_\_\_\_%.
- \_\_\_\_\_ out of \_\_\_\_\_ equal parts are shaded.  
The percentage shaded is \_\_\_\_\_%.

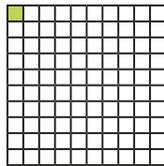
## National Curriculum links

- Recognise the per cent symbol (%) and understand that per cent relates to “number of parts per 100”, and write percentages as a fraction with denominator 100, and as a decimal fraction

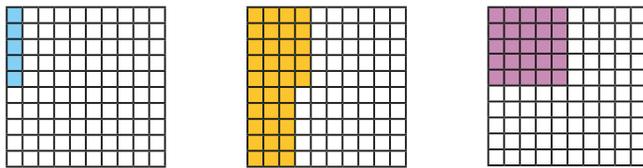
# Understand percentages

## Key learning

- The hundred square has 1 part shaded. This is 1%.



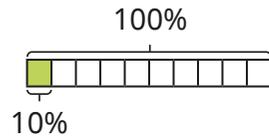
How many parts of each hundred square are shaded?



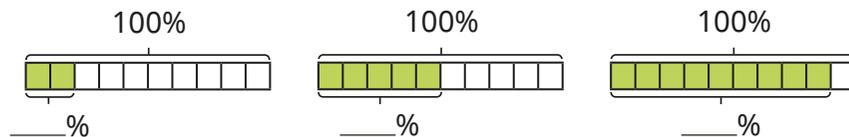
What percentage of each hundred square is shaded?

- The bar model has been split into 10 equal parts and 1 part is shaded.

This is 10%:

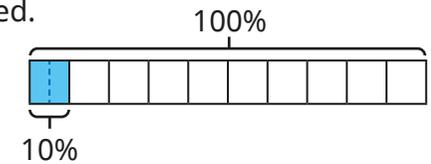


What percentage of each bar model is shaded?



- Esther's bar model has 10% shaded.

She draws a line to split the shaded part into two equal parts.



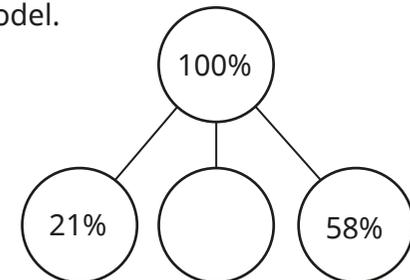
What is each of the smaller parts worth?

- Draw bar models to show the percentages.



- There are 100 children in a school. All the children have either a school dinner or a packed lunch. 47 children have a packed lunch. What percentage of children in the school have a school dinner?

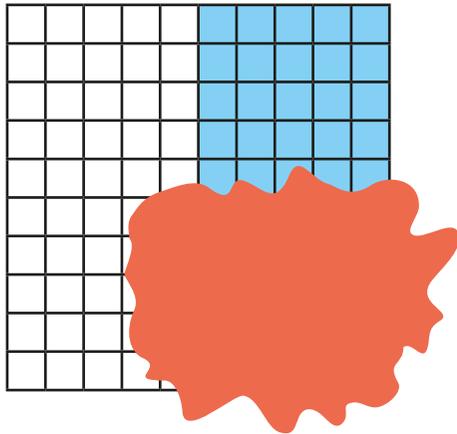
- Complete the part-whole model.



# Understand percentages

## Reasoning and problem solving

Filip has spilt paint on his hundred square.



Complete the sentences to describe what percentage is shaded.

It could be \_\_\_\_\_%.

It must be \_\_\_\_\_%.

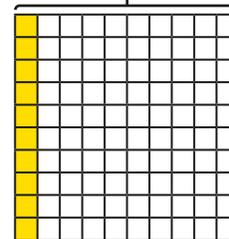
It cannot be \_\_\_\_\_%.

multiple possible answers, e.g.  
It could be 25%.  
It must be less than 55%.  
It cannot be 100%.

Whitney and Brett have drawn diagrams showing percentages.

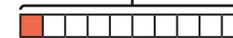
**Whitney**

100%



**Brett**

100%



I have shaded more parts than Brett, so my percentage is greater.

Do you agree with Whitney?

Explain your answer.

No

# Percentages as fractions

## Notes and guidance

In this small step, children continue to explore percentages by comparing them to fractions.

In the previous step, children saw that a percentage was a number of parts per hundred. This links to seeing a percentage as a fraction with a denominator of 100. This learning extends to 10% being equivalent to  $\frac{1}{10}$  and therefore 20% equivalent to  $\frac{2}{10}$  and so on. Children use a fraction wall to split 100% into different-sized groups and so work out the percentage equivalents of fractions, for example  $\frac{1}{4}$  is 100% split into 4 groups,  $100 \div 4 = 25$ , so  $\frac{1}{4} = 25\%$ .

The focus of this step is percentages and fractions within 1 whole only. Decimal equivalents will be introduced in the next step.

## Things to look out for

- Children may think that the numerator of any fraction is the same as the percentage, for example  $\frac{9}{10} = 9\%$ .
- Not knowing common equivalent fractions to those with a denominator of 100 will make finding those percentages hard, for example not knowing  $\frac{1}{4} = \frac{25}{100}$  will make finding  $\frac{1}{4} = 25\%$  difficult.

## Key questions

- What is a percentage?
- If the whole is split into 100 equal parts, then what percentage is \_\_\_\_\_ parts equivalent to?
- How are percentages and fractions similar? How are they different?
- What is 100 divided by 2/4/5/10?
- What is \_\_\_\_\_ as a percentage?
- What is one half of 100? What is  $\frac{1}{2}$  as a percentage?

## Possible sentence stems

- \_\_\_\_\_% is equivalent to  $\frac{\square}{100}$
- The fraction \_\_\_\_\_ is equivalent to \_\_\_\_\_%.

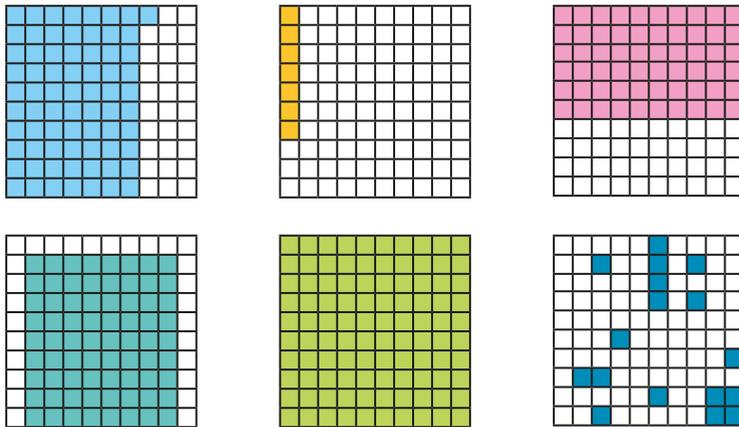
## National Curriculum links

- Recognise the per cent symbol (%) and understand that per cent relates to “number of parts per 100”, and write percentages as a fraction with denominator 100, and as a decimal fraction
- 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

# Percentages as fractions

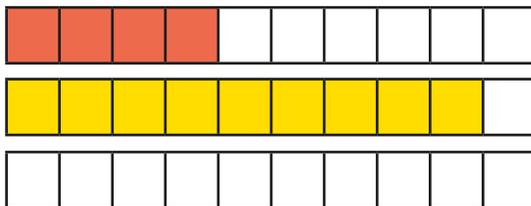
## Key learning

- Complete the sentence to find what fraction and what percentage of each hundred square has been shaded.

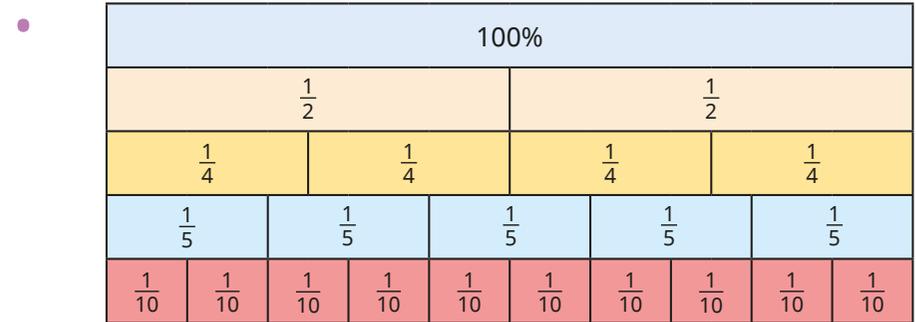


\_\_\_\_\_ parts out of 100 =  $\frac{\square}{100}$  = \_\_\_\_\_%

- Complete the sentence to find what fraction and what percentage of each bar model has been shaded.



\_\_\_\_\_ parts out of 10 =  $\frac{\square}{10}$  = \_\_\_\_\_%



Complete the sentences to convert each fraction to a percentage.

Use the fraction wall to help you.

▶  $\frac{1}{2}$     ▶  $\frac{1}{4}$     ▶  $\frac{1}{5}$     ▶  $\frac{1}{10}$

$\frac{\square}{\square}$  = 100% split into \_\_\_\_\_ equal groups.

100 ÷ \_\_\_\_\_ = \_\_\_\_\_

So  $\frac{\square}{\square}$  = \_\_\_\_\_%

- $\frac{1}{5}$  is equal to 20%.

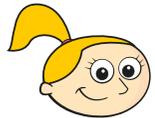
This means that  $\frac{2}{5}$  is equal to 40%.

Complete the statements.

▶  $\frac{3}{5}$  = \_\_\_\_\_%    ▶  $\frac{\square}{4}$  = 75%    ▶  $\frac{7}{10}$  = \_\_\_\_\_%    ▶  $\frac{\square}{5}$  = 80%

# Percentages as fractions

## Reasoning and problem solving



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

Is Eva correct?

Explain your answer.

No

This only works when the denominator is 100, because "per cent" means parts per hundred.

At a cinema,  $\frac{4}{10}$  of the audience are adults.

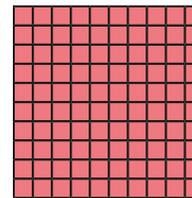


The rest of the audience is made up of boys and girls.

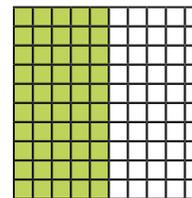
There are twice as many girls as boys.

What percentage of the audience are girls?

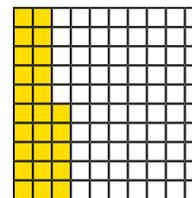
40%



$$100\% = 1$$



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



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

$\frac{1}{8}$  cannot convert to a percentage because 8 is not a factor of 100



Do you agree with Teddy?

Explain your answer.

No

# Percentages as decimals

## Notes and guidance

In the previous step, children began looking at the relationship between percentages and fractions. In this small step, they find decimal equivalents to percentages.

Use place value counters, bead strings and straws to recap that when 1 whole is split into 10 equal parts, each part is equal to 0.1 and when it is split into 100 equal parts, each part is equal to 0.01. Children relate this understanding to percentages, comparing 0.1 and 10%, and 0.01 and 1%. If  $10\% = 0.1$  and  $1\% = 0.01$ , then  $11\% = 0.1 + 0.01 = 0.11$

Children may begin to see a “trick” of writing “zero point” in front of the percentage to make a decimal, but this will cause confusion when converting single-digit percentages into decimals or, later, percentages greater than 100%. Exploring the equivalence of 0.01 and 1% using a variety of representations will help children avoid this misconception.

### Things to look out for

- Children may see single-digit percentages as tenths rather than hundredths, for example  $6\% = 0.6$
- Children may confuse percentages and decimals, for example  $\frac{1}{2} = 0.50\%$

## Key questions

- What is similar/different about percentages and decimals?
- How many tenths/hundredths/per cent are equal to 1 whole?
- What percentage is equal to one hundredth?  
What is one hundredth as a decimal?
- What percentage is equal to one tenth?  
What is one tenth as a decimal?

## Possible sentence stems

- \_\_\_\_\_ = \_\_\_\_\_%
- There are \_\_\_\_\_ tenths/hundredths in 1 whole.
- \_\_\_\_\_% is equivalent to 1 whole.

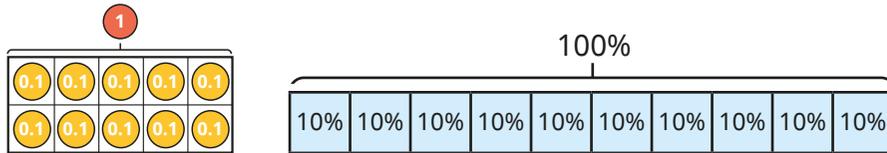
## National Curriculum links

- Recognise the per cent symbol (%) and understand that per cent relates to “number of parts per 100”, and write percentages as a fraction with denominator 100, and as a decimal fraction
- 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

# Percentages as decimals

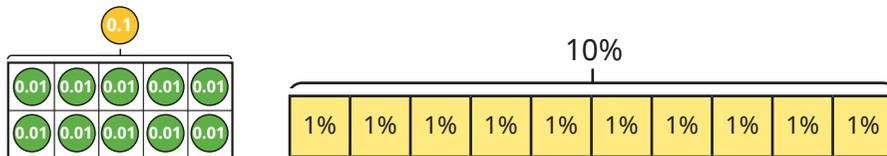
## Key learning

- Use the models to complete the statements.



- ▶  $0.1 = \underline{\quad\quad}\%$       ▶  $\underline{\quad\quad} = 30\%$
- ▶  $0.8 = \underline{\quad\quad}\%$       ▶  $\underline{\quad\quad} = 100\%$

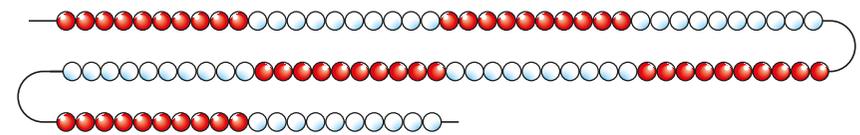
- Dora has used place value counters and a bar model to show that 0.01 is equivalent to 1%.



Use Dora's fact to complete the statements.

- ▶  $0.01 = \underline{\quad\quad}\%$       ▶  $\underline{\quad\quad} = 7\%$
- ▶  $0.05 = \underline{\quad\quad}\%$       ▶  $\underline{\quad\quad} = 9\%$

- Mo uses a 100-piece bead string to represent 100%.



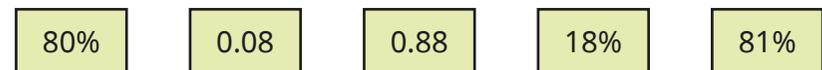
Complete the statements.

- ▶ 3 beads =  $\underline{\quad\quad}$  =  $\underline{\quad\quad}\%$
- ▶ 13 beads =  $\underline{\quad\quad}$  =  $\underline{\quad\quad}\%$
- ▶ 97 beads =  $\underline{\quad\quad}$  =  $\underline{\quad\quad}\%$
- ▶  $\underline{\quad\quad}$  beads =  $\underline{\quad\quad}$  =  $21\%$

- Write  $<$ ,  $>$  or  $=$  to complete the statements.

$90\% \bigcirc 0.9$        $8.5 \bigcirc 85\%$   
 $1\% \bigcirc 0.1$        $50\% \bigcirc 0.5$

- Write the decimals and percentages in ascending order.

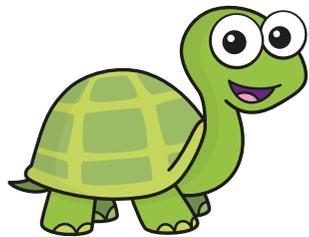


# Percentages as decimals

## Reasoning and problem solving

Tiny is comparing a percentage with a decimal.

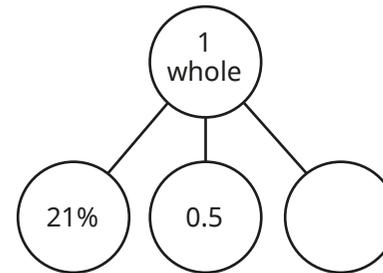
51% must be greater than 0.5 because 51% is more than half of 100% and 0.5 is exactly half of 1 whole.



Do you agree with Tiny?  
Explain your answer.



Yes



What is the missing part?

Give your answer as a decimal and as a percentage.

0.29  
29%

Using the digit cards only once for each solution, complete the comparison in as many different ways as you can.



$$0.\underline{\quad} < \underline{\quad}\% < \frac{3}{5}$$



multiple possible answers, e.g.  
0.3 and 45%  
0.46 and 53%

Compare answers with a partner.



# Equivalent fractions, decimals and percentages

## Notes and guidance

This small step builds on the previous two steps, with children now finding equivalent fractions, decimals and percentages. As this concept is covered again in Year 6, the focus at this stage should be kept quite narrow, mainly looking at the equivalents to halves, quarters, fifths and tenths. All of these equivalents can be found by splitting up a hundred square or bead string into the given equal parts and then making the link to hundredths.

Once children are confident finding the unit fraction equivalents, they explore finding the non-unit fraction equivalents, for example  $\frac{3}{4}$ ,  $\frac{2}{5}$  and  $\frac{7}{10}$ . Other representations, such as number lines and bar models, are useful for helping children to visualise the relationship between fractions, decimals and percentages. Children begin to explore less standard conversions such as 92%, which will be covered further in Year 6

### Things to look out for

- If children do not have a secure understanding of the concept that the whole can be made up of 100 parts, some common errors can occur, particularly when converting fractions to percentages, for example writing  $\frac{1}{5}$  as 5% or  $\frac{7}{10}$  as 7%.

## Key questions

- How can you find the fraction equivalent of a percentage?
- How can you find the decimal equivalent of a percentage?
- How many parts has the whole been split up into?  
So what fraction is each part worth?
- If the whole is 100%, what is  $\frac{1}{10}$ ?
- If  $\frac{1}{10}$  is equal to 10%, what is  $\frac{3}{10}$  equal to?

## Possible sentence stems

- The whole has been split into \_\_\_\_\_ equal parts, so each part is worth  $\frac{1}{\square}$
- If the whole is equal to 100%, then each part is worth \_\_\_\_\_%.

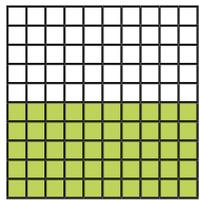
## National Curriculum links

- Recognise the per cent symbol (%) and understand that per cent relates to “number of parts per 100”, and write percentages as a fraction with denominator 100, and as a decimal fraction
- 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

# Equivalent fractions, decimals and percentages

## Key learning

- $\frac{1}{2}$  of the hundred square is shaded.



$\frac{50}{100}$  is shaded.  
0.5 is shaded.  
50% is shaded.

Shade a hundred square and complete the sentences for each fraction.

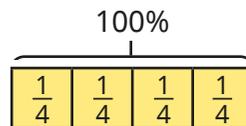
- ▶  $\frac{1}{5}$   $\frac{\square}{100}$  is shaded.
- ▶  $\frac{1}{10}$  \_\_\_\_\_ is shaded.
- \_\_\_\_\_ % is shaded.

Compare answers with a partner.

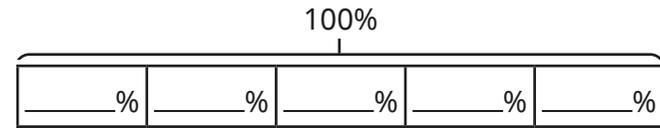
- What are the fraction and decimal equivalents of 92%?  
What are the percentage and decimal equivalents of  $\frac{28}{100}$ ?

- Use the bar model to help you complete the equivalence statements.

▶  $\frac{1}{4} = \text{_____} \% = \text{_____}$       ▶  $\frac{\square}{\square} = 75\% = \text{_____}$

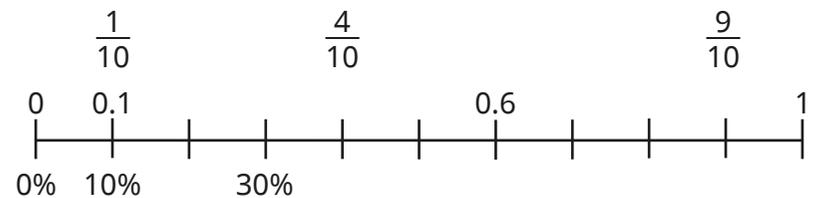


- Complete the bar model to help find the equivalents.



▶  $\frac{3}{5} = \text{_____} \% = \text{_____}$       ▶  $\frac{\square}{\square} = 40\% = \text{_____}$   
 ▶  $\frac{\square}{\square} = \text{_____} \% = 0.8$       ▶  $\frac{\square}{\square} = \text{_____} \% = 1$

- Complete the number line to show the equivalents.



- Filip buys a bag of sweets.  
He eats 70% of the sweets and gives  $\frac{1}{10}$  to his sister.  
What percentage of the sweets is left in the bag?  
What fraction is left?

# Equivalent fractions, decimals and percentages

## Reasoning and problem solving

Are the statements true or false?



$$\frac{1}{10} = 10\%, \text{ so } \frac{1}{5} = 5\%$$

$$0.5 < 25\% \text{ because } 5 \text{ is less than } 25$$

$$\frac{1}{2} = 0.5 = \frac{2}{4} = 50\% = \frac{5}{10}$$

$$\frac{2}{5} = 0.4 = 4\%$$

Explain your reasons.



False  
False  
True  
False

$\frac{1}{4}$  of the children in a class have brown hair.

$\frac{3}{5}$  have blonde hair.

15% have ginger hair.

How many children have black hair?

I cannot work out how many children have black hair because I do not know how many children are in the class altogether.



Do you agree with Tiny?

Explain your answer.

No

None of the children have black hair, because  $\frac{1}{4} = 25\%$ ,  $\frac{3}{5} = 60\%$  and  $25\% + 60\% + 15\% = 100\%$