Spring Block 3

Decimals and percentages

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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)

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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

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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

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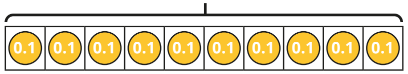
Decimals up to 2 decimal places

Key learning

- Whitney shares 1 whole into 10 equal parts.

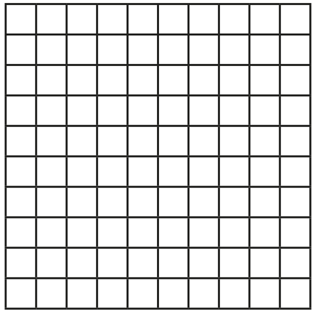


  Use the bar model to complete the sentences.

  - 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

Ones	Tenths	Hundredths
1 1 1	0.1	0.01 0.01 0.01 0.01

  Use place value counters to make the numbers.

4.35	2.86	4.06	0.19

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

$3.\underline{6}5$	$\underline{1}.78$	$4.\underline{0}7$	$0.8\underline{9}$

  The value of the digit ______ in the number ______ is ______

- Fill in the missing numbers.

  - 0.83 = ______ + 0.03 = ______ tenths and 3 hundredths
  - 0.83 = 0.7 + ______ = 7 tenths and ______ hundredths

  How many other ways can you partition 0.83?

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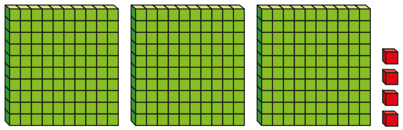
Decimals up to 2 decimal places

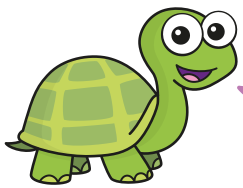
Reasoning and problem solving

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.





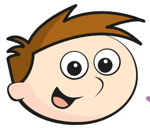
Filip has made the number 3.4

Do you agree with Tiny?

Explain your answer.

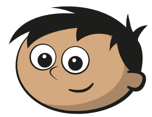
No

Match the numbers to the children.



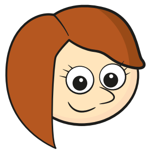
Teddy

My number has the same amount of tens and tenths.



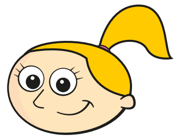
Amir

My number has one decimal place.



Rosie

My number has 2 hundredths.



Eva

My number has 6 tenths.

46.2	2.64	46.02	40.46

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

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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

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Equivalent fractions and decimals (tenths)

Key learning

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

$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$
0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

She then uses a bar model to make a number.

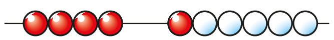
$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$
0.1	0.1	0.1	0.1	0.1	0.1	0.1

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.

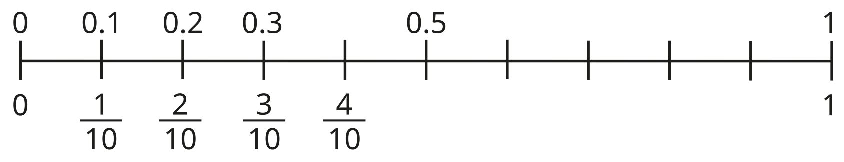
Then he uses the bead string to represent another number.



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

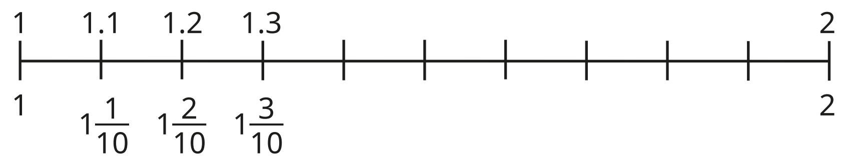
one whole									
$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$
0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

one whole									
$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$						
0.1	0.1	0.1	0.1						

Draw your own bar models to help complete the statements.

- ▶ $1\frac{3}{10}$ = ______
- ▶ 2.6 = ______
- ▶ $\frac{32}{10}$ = ______

- Complete the number line.



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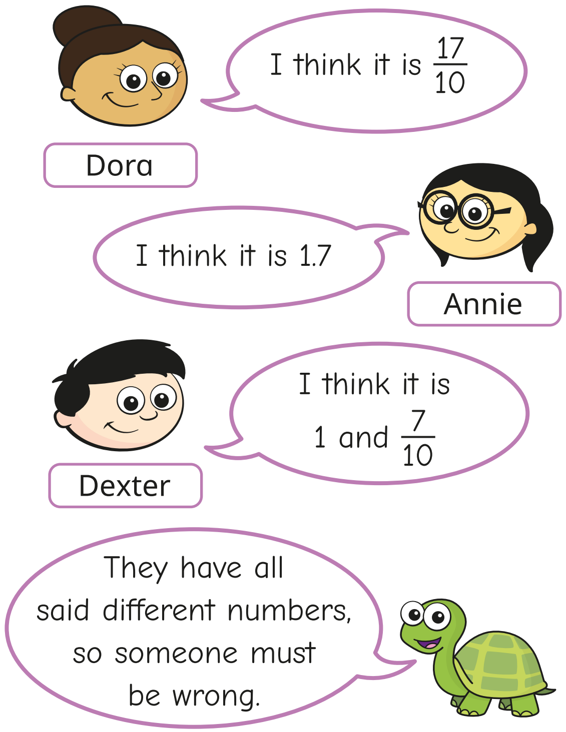
Equivalent fractions and decimals (tenths)

Reasoning and problem solving

Dora, Annie and Dexter are describing the same number.

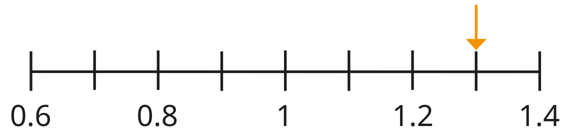


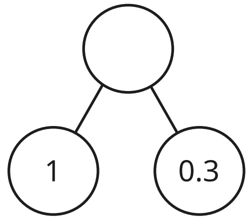
Do you agree with Tiny?

Explain your answer.

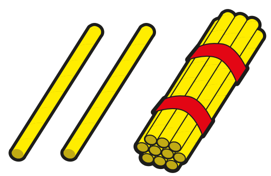
No

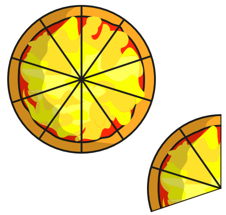
Which representation is the odd one out?





Ones	Tenths
1	0.1 0.1 0.1





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 $1\frac{3}{10}$

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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

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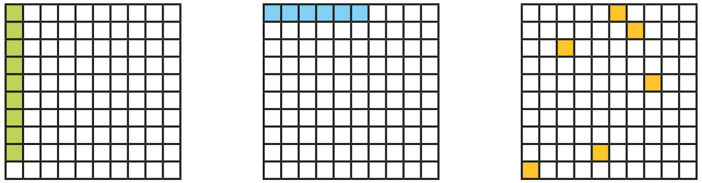
Equivalent fractions and decimals (hundredths)

Key learning

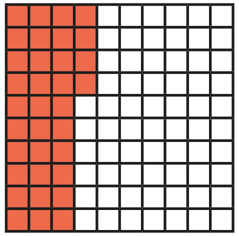
- Each square in the hundred grid represents 1 hundredth.

  What fraction and what decimal of each hundred square is shaded?



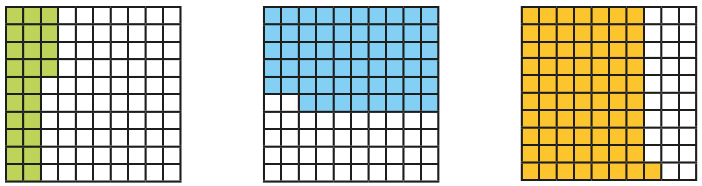
- Esther knows that each column in the hundred square is worth $\frac{1}{10}$

  She shades some squares and describes the number.

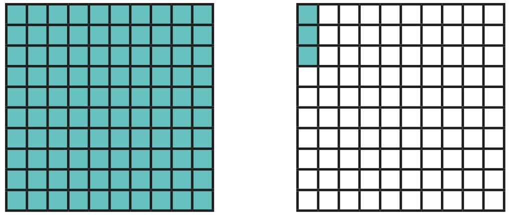


> There are $\frac{3}{10}$ and $\frac{4}{100}$ shaded.
>
> This shows the decimals 0.3 + 0.04
>
> $\frac{34}{100} = 0.34$

  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.

$2\frac{3}{100}$	1.08	1.3	$1\frac{89}{100}$

- 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.

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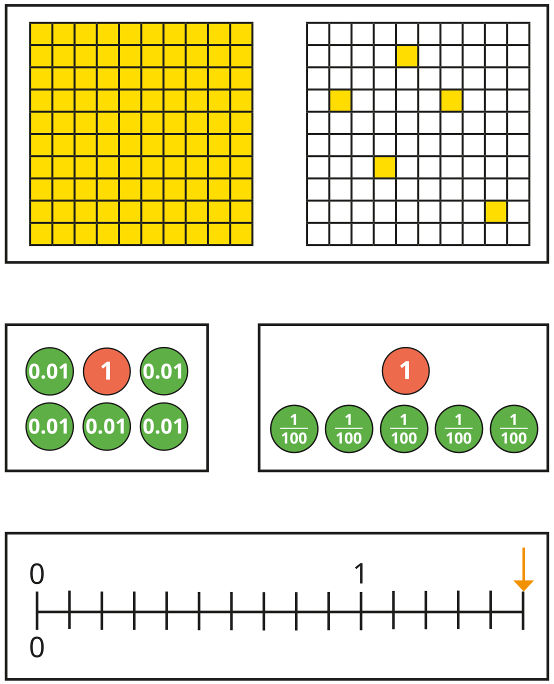
Equivalent fractions and decimals (hundredths)

Reasoning and problem solving

Which representation is the odd one out?



Explain your answer.

The number line is the odd one out.

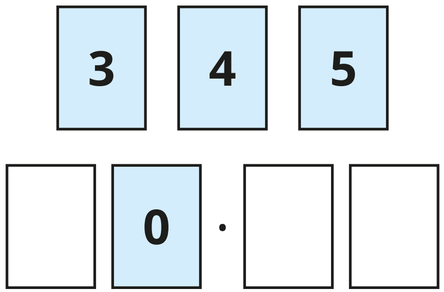
Is the statement true or false?

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

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

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

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

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

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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

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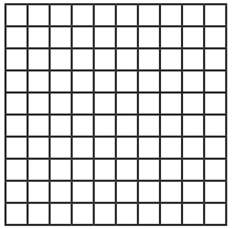
Equivalent fractions and decimals

Key learning

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



Use the hundred square to complete the equivalent fraction.

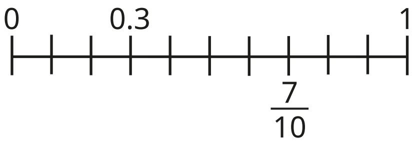
$$\frac{1}{2} = \frac{\square}{100}$$

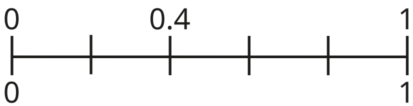
Write the fraction as a decimal.

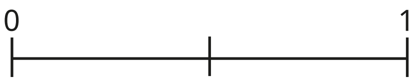
- Shade hundred squares to represent the fractions and write the equivalent fractions and decimals.

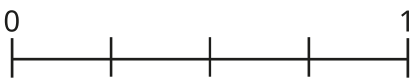
  ▸ $\frac{1}{10}$ ▸ $\frac{1}{4}$ ▸ $\frac{1}{5}$

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

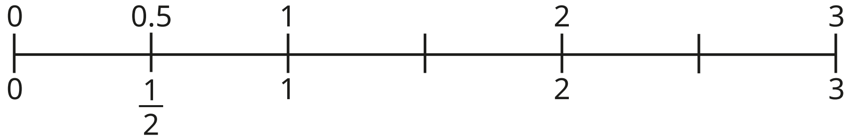






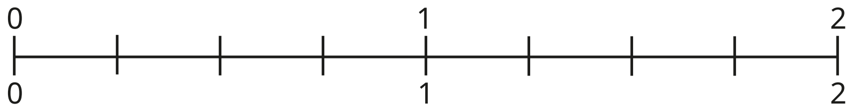


- Ron has started counting in halves on a number line.



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

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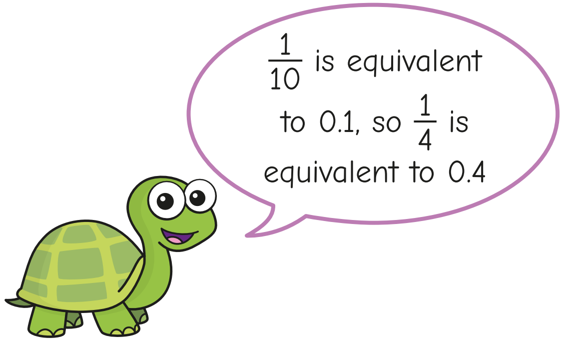
Equivalent fractions and decimals

Reasoning and problem solving



Do you agree with Tiny?

Explain your answer.

No

Is the statement true or false?

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

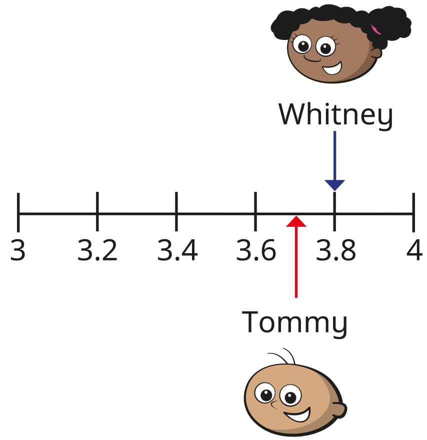
Explain your answer.

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

$3\frac{3}{4}$

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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

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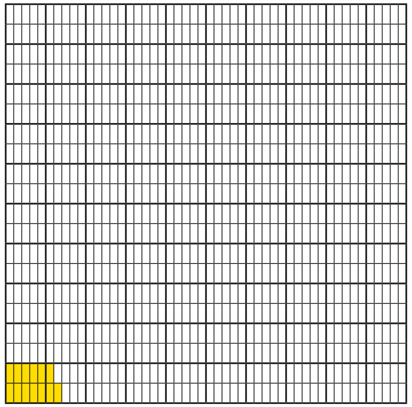
Thousandths as fractions

Key learning

- Here is a thousand square.



13 parts are shaded.

This represents $\frac{13}{1000}$

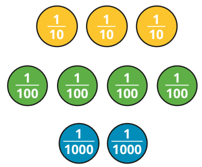
What fractions are represented by these amounts?

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 $\frac{342}{1000}$

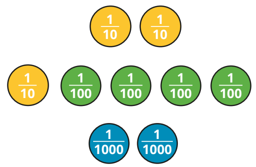


$$\frac{342}{1000} = \frac{3}{10} + \frac{4}{100} + \frac{2}{1000}$$

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.

  $\frac{9}{1000} \bigcirc \frac{8}{100}$ $\frac{1}{10} \bigcirc \frac{2}{100}$ $\frac{1}{10} \bigcirc \frac{100}{1000}$

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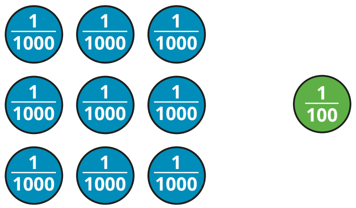
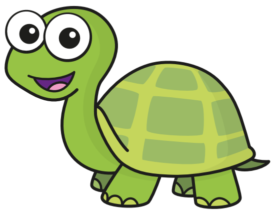
Thousandths as fractions

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



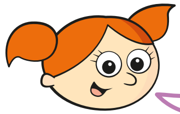
Do you agree with Tiny?

Explain your answer.

No

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

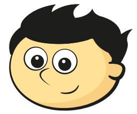
Alex, Jack and Whitney are partitioning $\frac{367}{1000}$



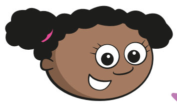
Alex

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

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



Jack



Whitney

It can be partitioned into 3 tenths and 67 thousandths.

Who do you agree with?

Explain your answer.

All three children are correct.

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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

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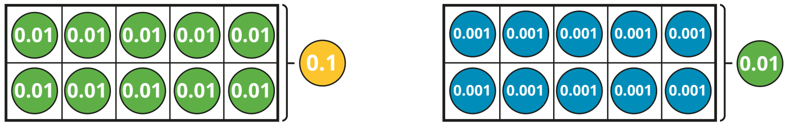
Thousandths as decimals

Key learning

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



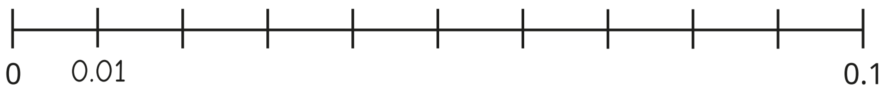
Complete the sentences in as many ways as possible.

_______ is one-tenth the size of _______

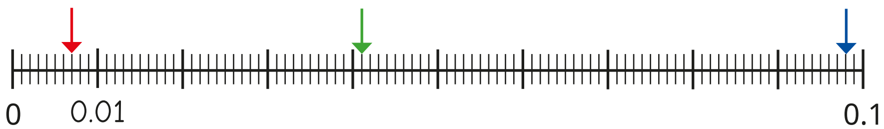
_______ is 10 times the size of _______

- 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.



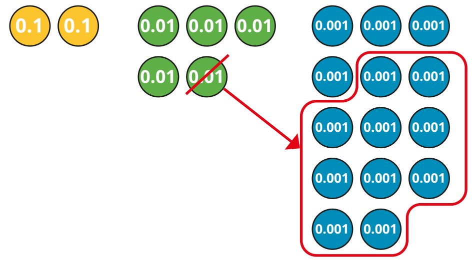
The first arrow is pointing to 0.07

What numbers are the other arrows pointing to?

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

0.254 = 0.2 + 0.05 + 0.004

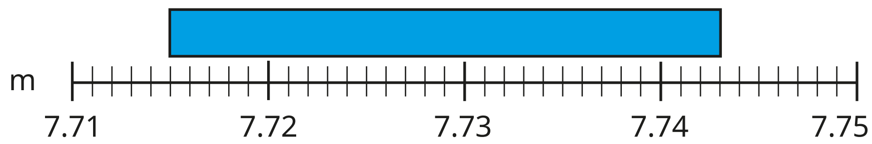
The same number can also be made like this, by exchanging 1 hundredth for 10 thousandths.



0.254 = 0.2 + 0.04 + 0.014

Partition the number 0.428 in three different ways.

- How long is the rectangle?



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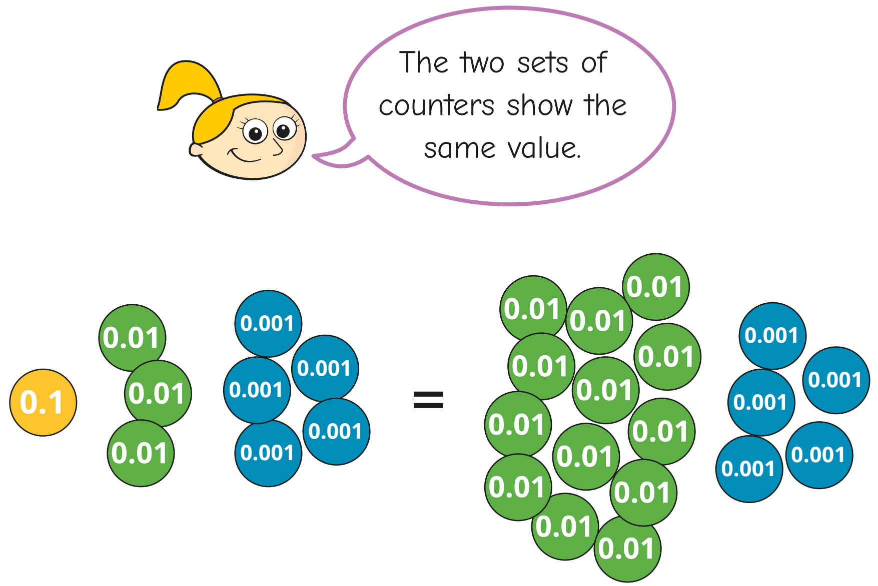
Thousandths as decimals

Reasoning and problem solving



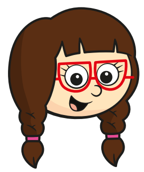
Do you agree with Eva?

Explain your answer.

Write this value as a decimal and as a fraction.

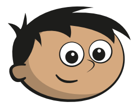
Yes | 0.135, $\frac{135}{1000}$

Three children are partitioning the number 0.504



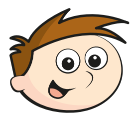
Jo

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.

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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

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Thousandths on a place value chart

Key learning

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

O	Tth	Hth	Thth
1	$\frac{1}{10}$ $\frac{1}{10}$	$\frac{1}{100}$ $\frac{1}{100}$ $\frac{1}{100}$	$\frac{1}{1000}$ $\frac{1}{1000}$ $\frac{1}{1000}$ $\frac{1}{1000}$

O	Tth	Hth	Thth
1	0.1 0.1	0.01 0.01 0.01	0.001 0.001 0.001 0.001

- Complete the sentences to describe each number.

O	Tth	Hth	Thth
	0.1 0.1 0.1 0.1	0.01 0.01 0.01	0.001 0.001 0.001 0.001 0.001 0.001 0.001

O	Tth	Hth	Thth
1 1	$\frac{1}{10}$ $\frac{1}{10}$		$\frac{1}{1000}$ $\frac{1}{1000}$ $\frac{1}{1000}$ $\frac{1}{1000}$ $\frac{1}{1000}$

There are ______ ones.

There are ______ tenths.

There are ______ hundredths.

There are ______ thousandths.

The number represented is ______

- Make each number on a place value chart.

0.253 0.508 1.057

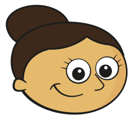
- $\frac{12}{1000}$ can be partitioned into $\frac{1}{100}$ and $\frac{2}{1000}$

Partition these numbers into hundredths and thousandths.

Use a place value chart to help you.

$\frac{42}{1000}$ $\frac{83}{1000}$ $\frac{16}{1000}$ $\frac{99}{1000}$

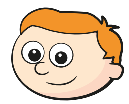
- Dora and Ron have partitioned 0.132 in different ways.



Dora

0.132 = 0.1 + 0.03 + 0.002

0.132 = 0.1 + 0.02 + 0.012



Ron

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.

0.235 0.347 1.579

Compare answers with a partner.

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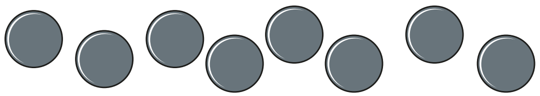
Thousandths on a place value chart

Reasoning and problem solving

Brett has eight plain counters.



He makes numbers using the place value chart.

O	Tth	Hth	Thth

At least three columns contain counters.

What is the greatest number he can make?

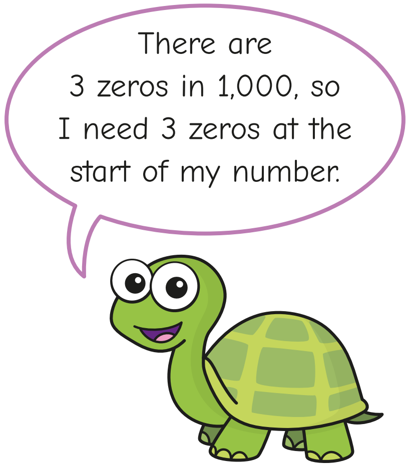
What is the smallest number he can make?

6.11

0.116

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

O	Tth	Hth	Thth	
0	0	0	4	5



Do you agree with Tiny?

Explain your answer.

No

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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

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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 ◯ 0.913   0.067 ◯ 0.029

  1.546 ◯ 0.894   0.071 ◯ 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.

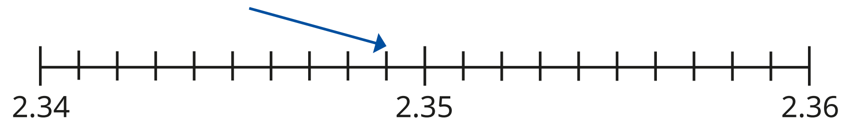
  Use a place value chart to help you.

  0.756 ◯ 0.719   0.658 ◯ 0.659

  0.021 ◯ 0.022   1.036 ◯ 1.035

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

  2.349   2.351   2.343   2.355

  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

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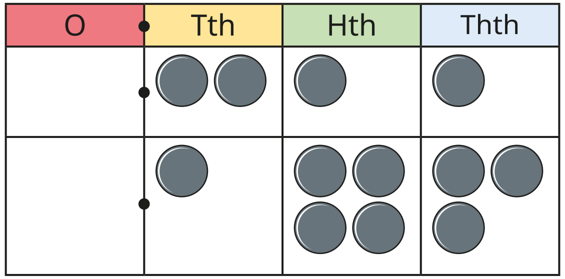
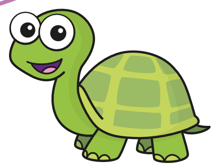
Order and compare decimals (same number of decimal places)

Reasoning and problem solving

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



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

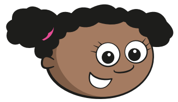


Do you agree with Tiny?

Explain your answer.

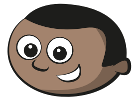
No

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



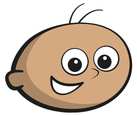
Whitney

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

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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

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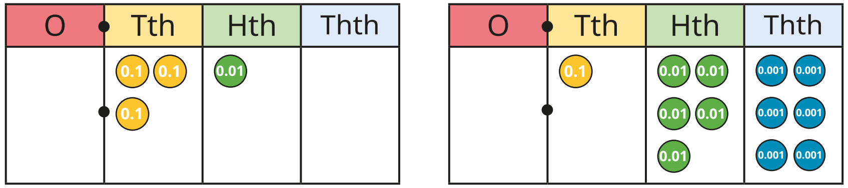
Order and compare any decimals with up to 3 decimal places

Key learning

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



Which number is greater? How do you know?

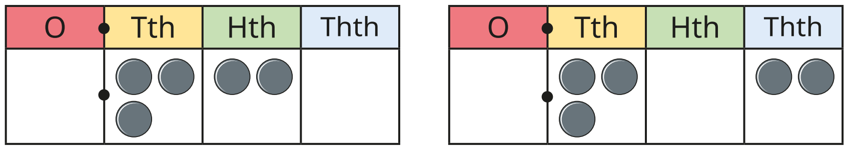
- Write > or < to compare the numbers.

Use a place value chart and counters to help you.

0.65 ◯ 0.7　　1.5 ◯ 0.988

0.406 ◯ 0.32　　0.9 ◯ 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.

O	Tth	Hth	Thth
2	1	1	3

O	Tth	Hth	Thth
2	1	3	0

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 ◯ 2.38　　1.865 ◯ 1.87　　3.079 ◯ 3.7

- Write the numbers in ascending order.

1.564	1.57	1.6	0.985	2.6

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

1.45 m	0.98 m	1.6 m	2.1 m	1.405 m	1.61 m

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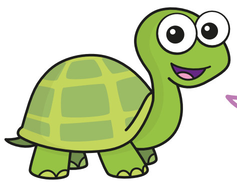
Order and compare any decimals with up to 3 decimal places

Reasoning and problem solving



Do you agree with Tiny?

Explain why.

No

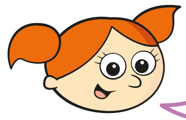
Amir is thinking of two numbers.

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



3.015

$3\frac{51}{1000}$

$\boxed{}$

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

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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

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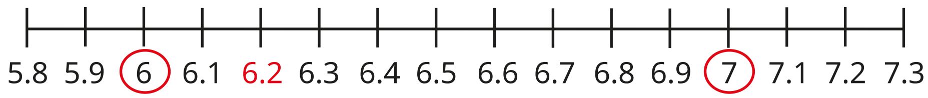
Round to the nearest whole number

Key learning

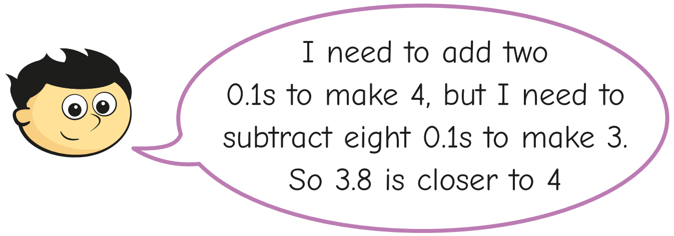
- Huan has used a number line to find that the whole numbers either side of 6.2 are 6 and 7



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

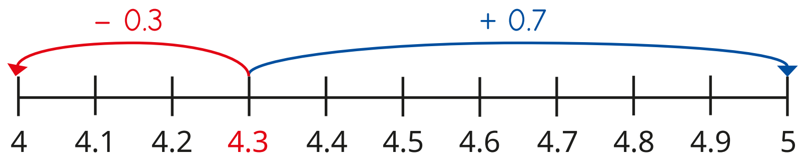
- Jack makes the number 3.8 using place value counters.



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

3.3	5.2	6.9	14.2	28.7

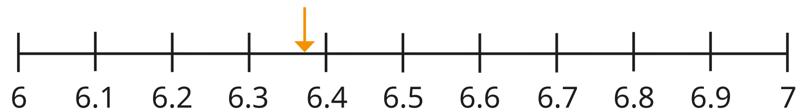
- Dani is rounding 4.3 to the nearest whole number using a number line.



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

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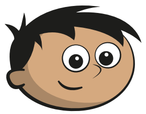
Round to the nearest whole number

Reasoning and problem solving

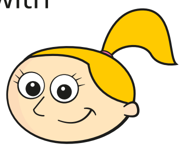
Amir is thinking of a number with 2 decimal places.



Amir

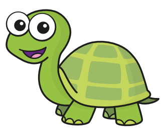
Rounded to the nearest whole number, my number is 5

Eva is thinking of a number with 1 decimal place.



Eva

Rounded to the nearest whole number, my number is 6



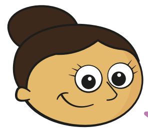
Eva's number must be greater than Amir's number.

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

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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 one 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

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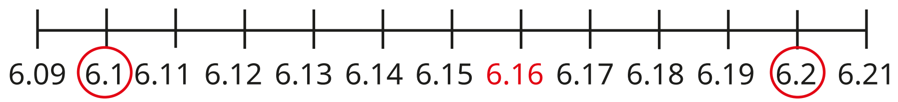
Round to 1 decimal place

Key learning

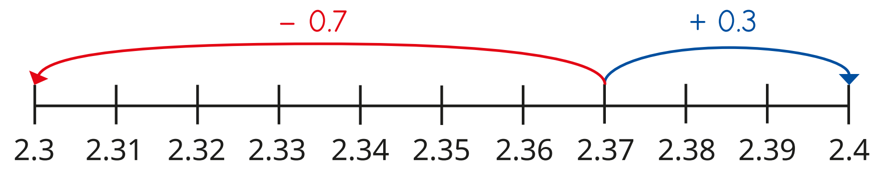
- Aisha has used a number line to find which numbers with 1 decimal place lie either side of 6.16



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

4.83 | 12.46 | 9.91 | 2.22 | 6.08

- 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.

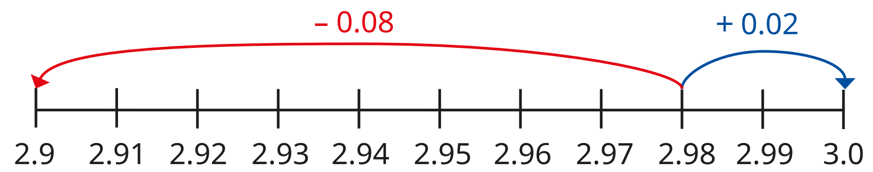
4.83 | 12.46 | 9.91 | 2.22 | 6.08

- 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.

6.89 | 4.71 | 0.15 | 7.04

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



Round the numbers to 1 decimal place.

6.96 | 4.03 | 9.99 | 0.95

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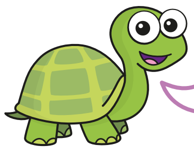
Round to 1 decimal place

Reasoning and problem solving



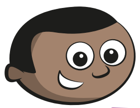
Rounding to 1 decimal place is the same as rounding to the nearest tenth.

Do you agree with Tiny?

Explain your answer.

Yes

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

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

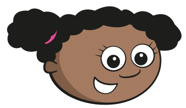
multiple possible answers, e.g.

3.75, 3.79, 3.81, 3.84

Some children may include answers such as 3.845

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

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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

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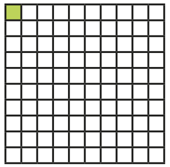
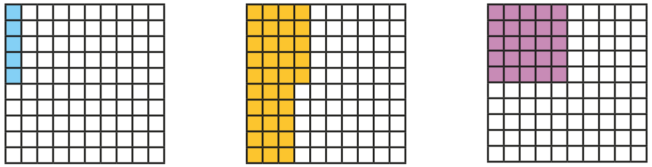
Understand percentages

Key learning

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



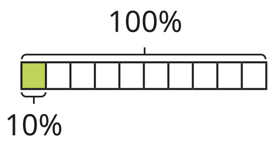
  How many parts of each hundred square are shaded?



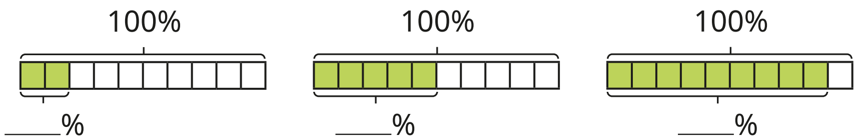
  What percentage of each hundred square is shaded?

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

  This is 10%:

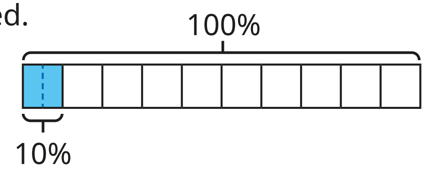


  What percentage of each bar model is shaded?



- 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.

  15% 95% 75% 25% 55%

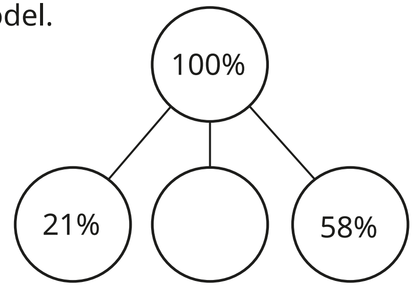
- There are 100 children in a school.

  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.



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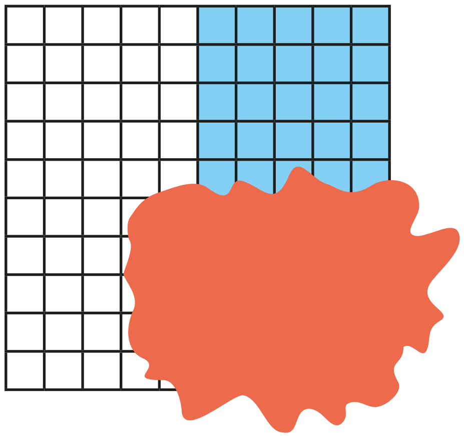
Understand percentages

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 ______%.

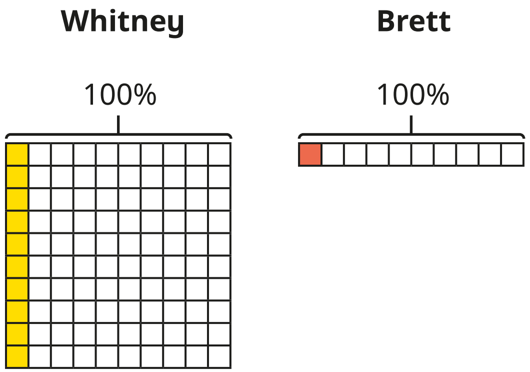
multiple possible answers, e.g.

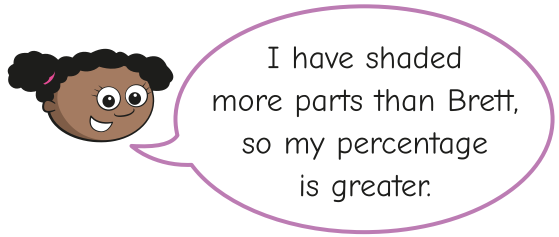
It could be 25%.

It must be less than 55%.

It cannot be 100%.

Whitney and Brett have drawn diagrams showing percentages.





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

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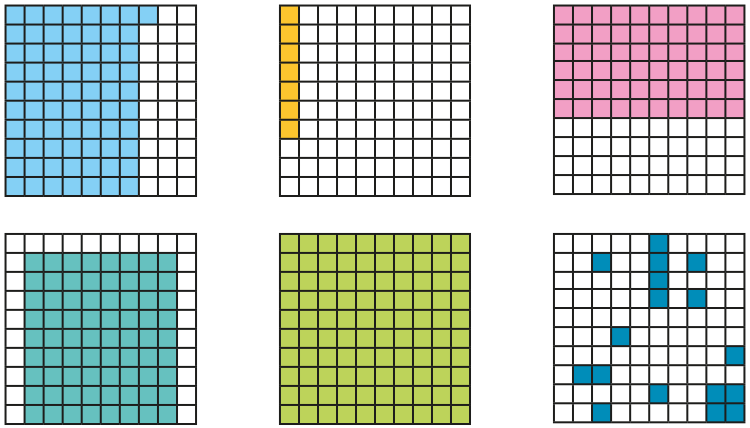
Percentages as fractions

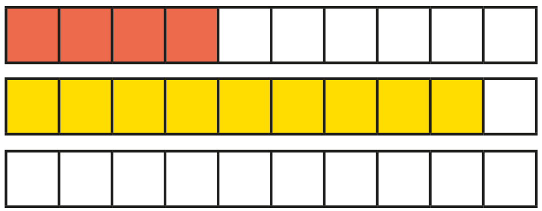
Key learning

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

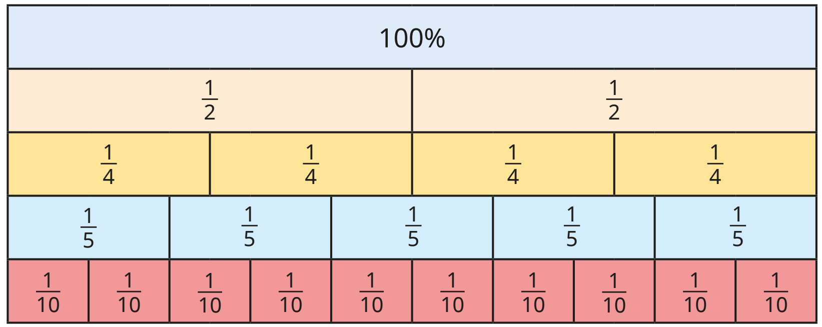


_____ parts out of 100 = $\frac{\square}{100}$ = _____%

- 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%

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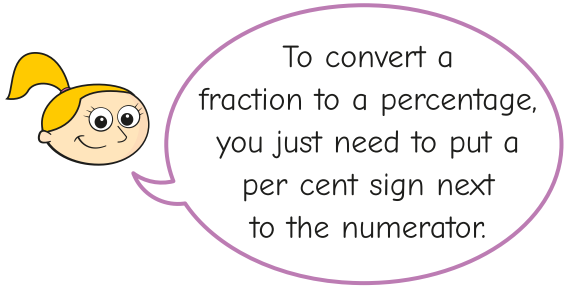
Percentages as fractions

Reasoning and problem solving



Is Eva correct?

Explain your answer.

No

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

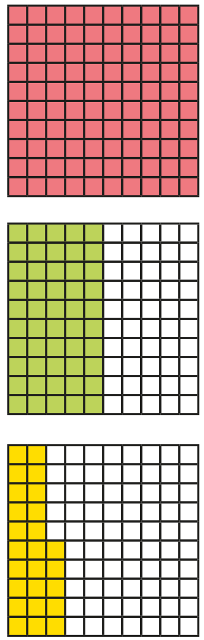
At a cinema, $\frac{4}{10}$ of the audience are adults.

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?

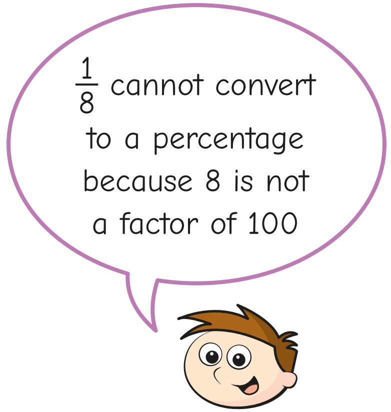
40%



100% = 1

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

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



Do you agree with Teddy?

Explain your answer.

No

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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

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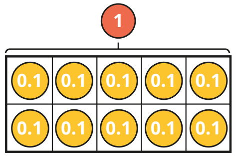
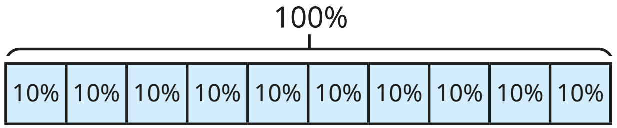
Percentages as decimals

Key learning

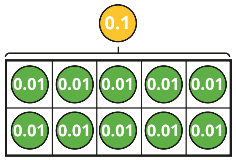
- Use the models to complete the statements.

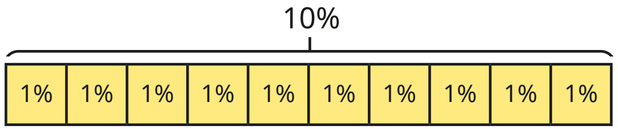




  - 0.1 = ______%
  - ______ = 30%
  - 0.8 = ______%
  - ______ = 100%

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

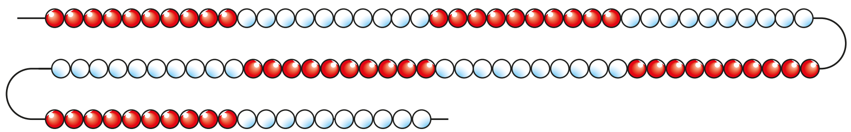




Use Dora's fact to complete the statements.

  - 0.01 = ______%
  - ______ = 7%
  - 0.05 = ______%
  - ______ = 9%

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



Complete the statements.

  - 3 beads = ______ = ______%
  - 13 beads = ______ = ______%
  - 97 beads = ______ = ______%
  - ______ beads = ______ = 21%

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

90% ◯ 0.9   8.5 ◯ 85%

1% ◯ 0.1   50% ◯ 0.5

- Write the decimals and percentages in ascending order.

80%	0.08	0.88	18%	81%

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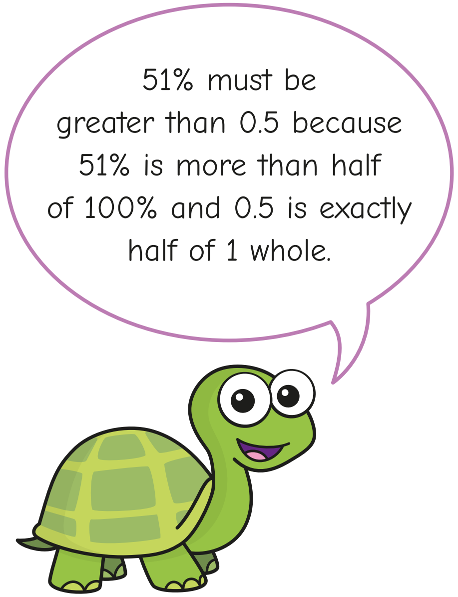
Percentages as decimals

Reasoning and problem solving

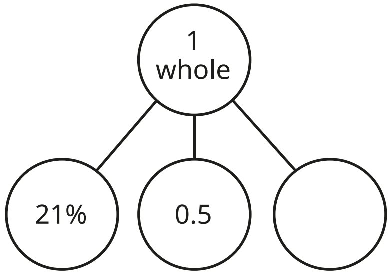
Tiny is comparing a percentage with a decimal.



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.

3	4	5	6	7

0.______ < ______% < $\frac{3}{5}$

Compare answers with a partner.

multiple possible answers, e.g.

0.3 and 45%

0.46 and 53%

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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 $\frac{3}{4}$, $\frac{1}{2}$ 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

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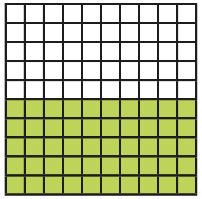
Equivalent fractions, decimals and percentages

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.

- ▸ $\frac{1}{5}$
- ▸ $\frac{1}{10}$

$\frac{\square}{100}$ is shaded.

_______ is shaded.

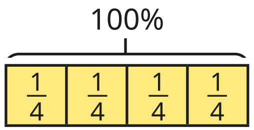
_______% is shaded.

Compare answers with a partner.

- What are the fraction and decimal equivalents of 92%?

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

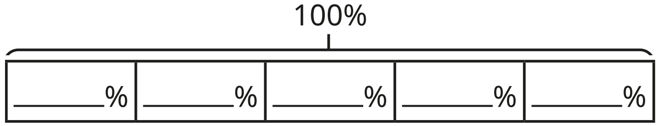
- Use the bar model to help you complete the equivalence statements.



▸ $\frac{1}{4}$ = _______% = _______

▸ $\frac{\square}{\square}$ = 75% = _______

- Complete the bar model to help find the equivalents.



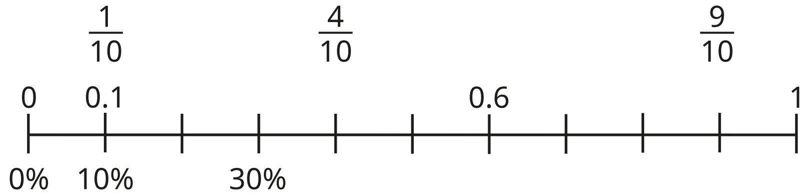
▸ $\frac{3}{5}$ = _______% = _______

▸ $\frac{\square}{\square}$ = 40% = _______

▸ $\frac{\square}{\square}$ = _______% = 0.8

▸ $\frac{\square}{\square}$ = _______% = 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?

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Equivalent fractions, decimals and percentages

Reasoning and problem solving

Are the statements true or false?

$\frac{1}{10} = 10\%$, so $\frac{1}{5} = 5\%$
0.5 < 25% because 5 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

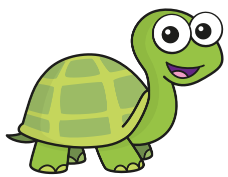
$\frac{1}{4}$ of the children in a class have brown hair.

$\frac{3}{5}$ 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%

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Spring Block 4

Perimeter and area

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Small steps

Step 1	Perimeter of rectangles
Step 2	Perimeter of rectilinear shapes
Step 3	Perimeter of polygons
Step 4	Area of rectangles
Step 5	Area of compound shapes
Step 6	Estimate area

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Perimeter of rectangles

Notes and guidance

In this small step, children build on learning from earlier years to find the perimeters of rectangles by measuring the sides and by calculation.

Children know that the perimeter is the distance around the outside of a two-dimensional shape. They recap measuring skills and recognise that they need to use a ruler accurately in order to get the correct answer. A common mistake is to measure from the end of the ruler rather than from the zero mark.

Children then explore different methods of finding the perimeter, for example adding all four sides separately, adding the length to the width and then doubling, or doubling the length and the width and then adding the results, before deciding which they find most efficient. Children use their understanding of perimeter to calculate missing lengths.

Things to look out for

- Children may line up the object they are measuring with the end of the ruler rather than the zero mark.
- When given the length and width of a rectangle, children may just add the two amounts.
- When measuring sides on a rectangle, children may get different dimensions for sides that should be equal.

Key questions

- What does "perimeter" mean?
- If a rectangle has a perimeter of 16 cm, could its length be 10 cm? Why or why not?
- Once you have measured the sides, how do you work out the perimeter?
- If you know the length and width of a rectangle, do you need to measure the other two sides?
- Which method do you think is more efficient?

Possible sentence stems

- The length is ______ and the width is ______, so the perimeter is ______
- ______ + ______ + ______ + ______ = 2 × ______ + 2 × ______
- The perimieter of the rectangle is ______

National Curriculum links

- Measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres

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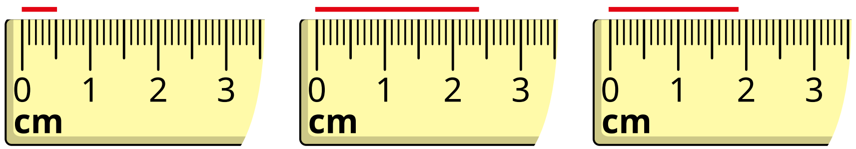
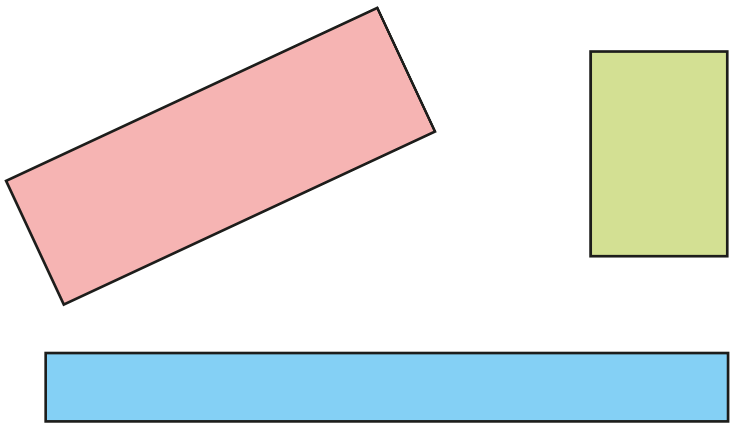
Perimeter of rectangles

Key learning

- What is the length of each line?



- Measure the sides of the rectangles to work out their perimeters.

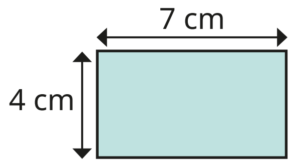


______ cm + ______ cm + ______ cm + ______ cm = ______ cm

- Draw a rectangle with a perimeter of 20 cm.

  Compare your rectangle with a partner's.

- Rosie and Eva are finding the perimeter of this rectangle.



Rosie $7 \text{ cm} + 4 \text{ cm} + 7 \text{ cm} + 4 \text{ cm} = 22 \text{ cm}$

Eva $7 \text{ cm} + 4 \text{ cm} = 11 \text{ cm}$ $11 \text{ cm} \times 2 = 22 \text{ cm}$

  What is the same about the methods? What is different?

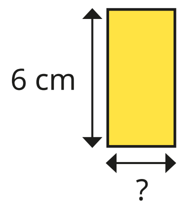
  Use both methods to find the perimeter of the rectangle.

- The perimeter of a square is 16 cm.

  What is the length of each side?

- The perimeter of this rectangle is 18 cm.

  What is the width of the rectangle?



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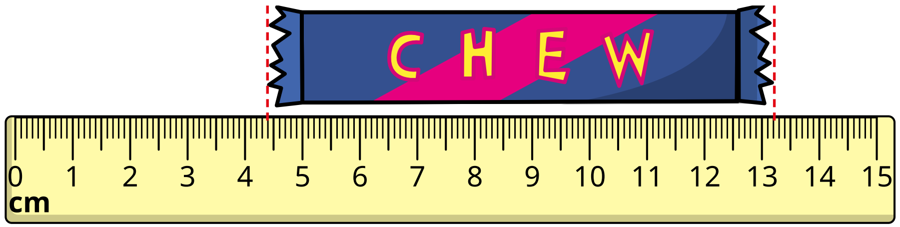
Perimeter of rectangles

Reasoning and problem solving

Teddy thinks this chew bar is 13.2 cm long.



Do you agree?

Explain your answer.

No

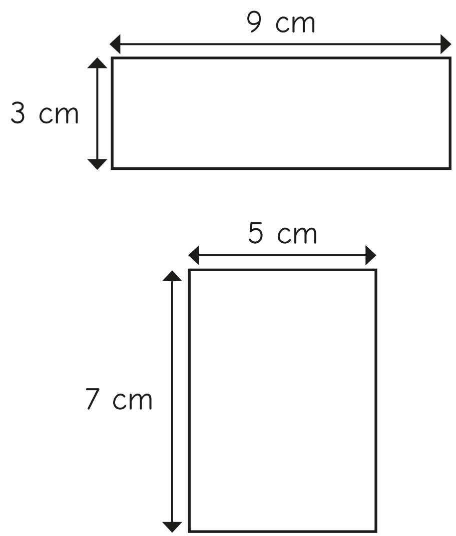
Is the statement always true, sometimes true or never true?

When the sides of a rectangle are all odd numbers, the perimeter is even.

Explain your answer.

always true

Esther thinks that she has drawn all the possible rectangles with a perimeter of 24 cm.



Do you agree with Esther?

Explain your answer.

No

multiple possible answers, e.g.
A rectangle that is 11 cm by 1 cm has a perimeter of 24 cm.

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Perimeter of rectilinear shapes

Notes and guidance

In this small step, children build on their Year 4 learning to calculate the perimeters of rectilinear shapes.

A rectilinear shape is a shape that has only straight sides and right angles. This can look like two or more rectangles that have been joined together and is sometimes referred to as a compound shape. Children should be familiar with both terms. When calculating the perimeter of a rectilinear shape, encourage children to mark sides that they have already included in their total, to avoid counting sides more than once.

Children may notice the connection between the perimeter of some rectilinear shapes and the rectangle that can be drawn around the shape.

Things to look out for

- Children may miscount when adding the sides of rectilinear shapes.
- If children do not have a secure understanding of addition and subtraction, they may struggle when finding missing sides.
- Children may find it difficult to see that the two shorter sides are equal to the longer opposite side on the rectilinear shape.

Key questions

- What does "perimeter" mean?
- What are the properties of a square/rectangle?
- Why is this a rectilinear shape?
- How can you use the labelled sides to find the unknown side of the rectilinear shape? Do you need to add or subtract?
- What strategies can you use to work out the perimeter?
- How do you know that you have included all the sides?
- What is the perimeter of the shape?

Possible sentence stems

- ______ + ______ = ______, so the longer side = ______
- ______ – ______ = ______, so the other shorter side = ______
- The perimeter of the shape is ______

National Curriculum links

- Measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres

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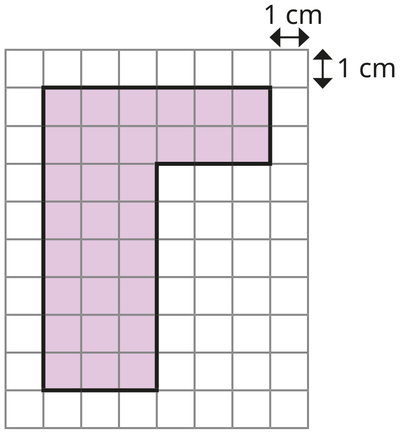
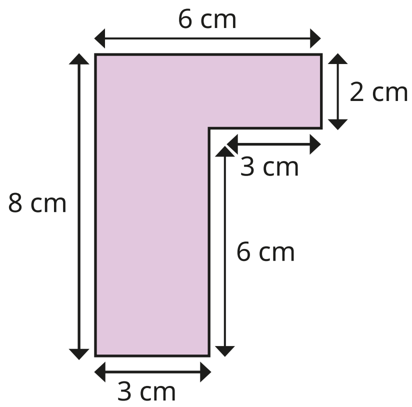
Perimeter of rectilinear shapes

Key learning

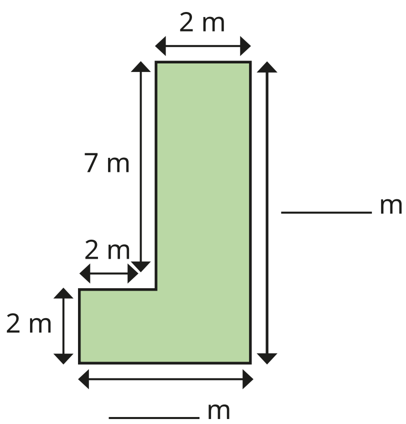
- Work out the perimeters of the shapes.

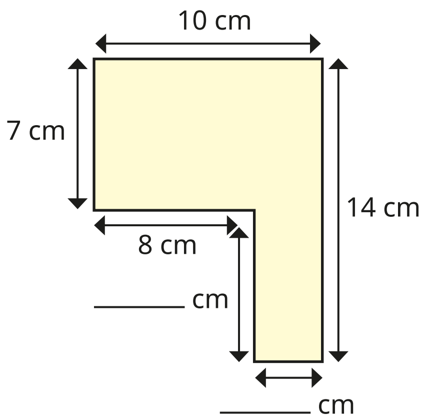




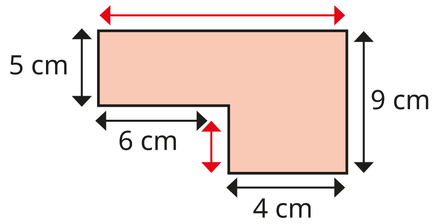
What do you notice?

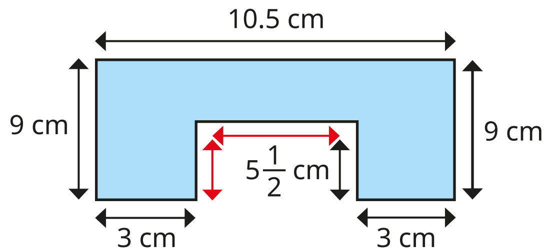
- Work out the unknown lengths on each rectilinear shape.



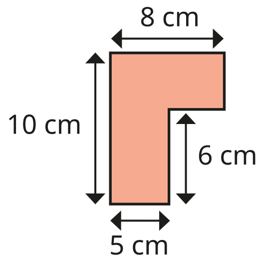


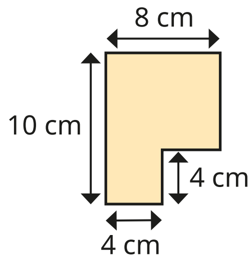
- Find the unknown lengths (shown in red) and then the perimeter of each shape.





- Work out the perimeters of the shapes.





What do you notice?

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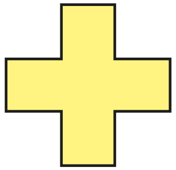
Perimeter of rectilinear shapes

Reasoning and problem solving

Here is a rectilinear shape.

All the sides are the same length and are a whole number of centimetres.



Which of these lengths could be the perimeter of the shape?

48 cm | 36 cm | 80 cm | 120 cm | 66 cm

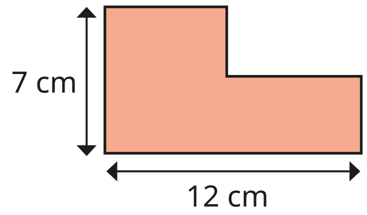
Explain your reasoning.

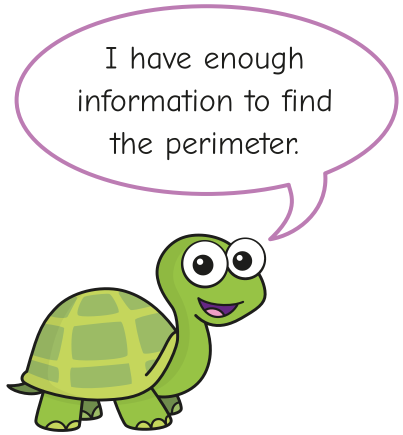
Can you think of any other possible perimeters?

48 cm, 36 cm, 120 cm

any multiple of 12, e.g. 24 cm, 72 cm

Tiny is finding the perimeter of this shape.





Do you agree with Tiny?

Explain your answer.

Yes

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Perimeter of polygons

Notes and guidance

In this small step, children apply their knowledge of perimeter to find the perimeters of polygons and to solve word problems.

A polygon is a closed two-dimensional shape with straight sides. The difference between regular and irregular shapes could be a good discussion point during this step. A regular shape is a two-dimensional shape with equal sides and angles, so a square is a regular rectangle. When given the length of one side, children use their knowledge of regular shapes to find the perimeter by multiplying by the number of sides.

Children use the perimeter of a shape to find a missing side. Using pictorial representations, such as drawing the shape and adding the known values, will support children when problem solving.

Things to look out for

- Children may not be able to identify the relationship between the given length, width or perimeter in the problems.
- Children may confuse the terms "regular" and "straight" and think that all rectangles are regular.

Key questions

- What is a regular shape?
- What is the difference between a square and a rectangle?
- Are all rectangles regular?
- How many sides does the shape have? What calculation will give you its perimeter?
- Would drawing the shape help you to solve the problem?
- What operation are you going to use? Why?

Possible sentence stems

- A ______ shape has equal sides and angles.
- The regular shape has ______ sides and each side is ______
  Therefore, the perimeter is ______ × ______ = ______
- To find the perimeter of the shape, I need to…
- The perimeter of the shape is ______

National Curriculum links

- Measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres

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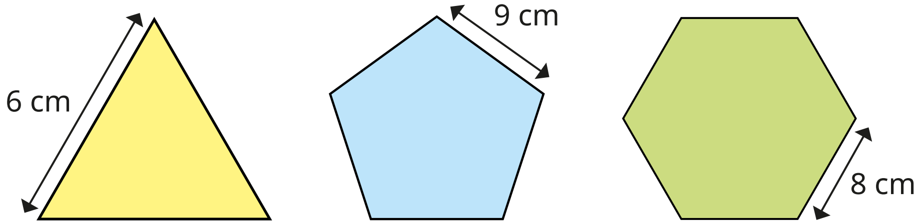
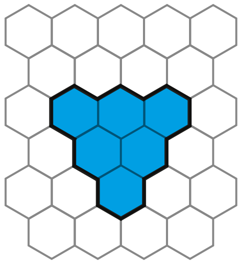
Perimeter of polygons

Key learning

- Work out the perimeter of each regular shape.



- Each regular hexagon on the grid has a side length of 2 cm.

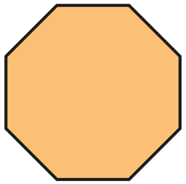


  What is the perimeter of the shaded shape?

- Mo measures three sides of this regular octagon.

  The total length of the three sides is 21 cm.

  What is the perimeter of the octagon?



- The perimeter of a tennis court is approximately 70 m.

  Its width is 11 m.

  What is the length of the tennis court?

- A kitchen is 9 m long and 9 m wide.

  A living room has a perimeter of 38 m.

  Which room has the greater perimeter?

  What could the living room's length and width be?

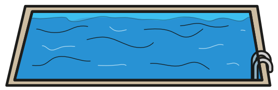
- Tom wants to find the perimeter of a swimming pool.

  The length of the pool is three times the width.

  The width is 16 m.

  What is the length of the swimming pool?

  What is the perimeter of the swimming pool?



- The perimeter of a regular hexagon is 222 cm.

  Work out the length of one side of the hexagon.

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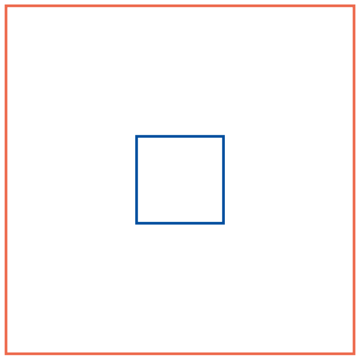
Perimeter of polygons

Reasoning and problem solving

Here is a square inside another square.



One side of the inner square is 4 cm long.

The perimeter of the outer square is four times the perimeter of the inner square.

What is the length of one side of the **outer** square?

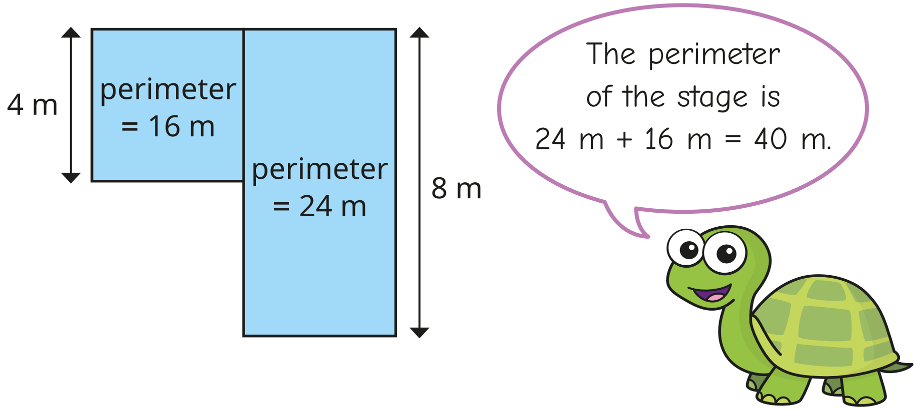
Show your workings.

16 cm

A school stage is made up of two parts.

The larger part has a perimeter of 24 m and a length of 8 m.

The smaller part has a perimeter of 16 m and a length of 4 m.



Explain why Tiny is wrong.

Find the actual perimeter of the stage.

Tiny's total includes sides that are inside the shape.

32 m

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Area of rectangles

Notes and guidance

In Year 4, children learnt that area was the space inside a two-dimensional shape. In this small step, they recap this key concept by making a visual comparison of two shapes without having to work out the area. They then go on to find the areas of shapes by counting squares, and are introduced to the square centimetre (cm^2) by counting squares on a centimetre squared grid. Highlight the difference between 1 cm and 1 cm^2, to ensure children understand that cm is a measure of length and cm^2 is a measure of area.

Arrays can help children understand why they can multiply the length by the width to calculate the area of a rectangle, which they can then use to find the area of shapes not drawn on a centimetre squared grid. Children should be made aware that cm^2 is not the only unit used to measure area, and other units such as mm^2, m^2 and km^2 are also examples of units of area.

Things to look out for

- When counting squares, children may count a square twice or miss a square out when counting.
- Children may rely on counting squares to find area, instead of multiplying the length by the width.
- Children may confuse the concepts of area and perimeter.

Key questions

- What is area?
- What is the difference between 1 cm and 1 cm^2?
- Which shape has the greater/greatest area? Can you tell just by looking?
- How can you work out area in a more efficient way?
- Will multiplying the length by the width calculate the area of any shape? Why/why not?

Possible sentence stems

- There are ______ squares inside the shape, so the area of the shape is ______ squares.
- Area = ______ × ______
- ______ × ______ = ______ , so the area of the shape is ______

National Curriculum links

- Measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres
- Calculate and compare the area of rectangles (including squares), including using standard units, square centimetres (cm^2) and square metres (m^2), and estimate the area of irregular shapes

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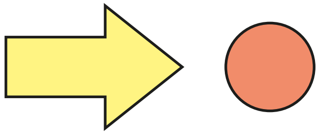
Area of rectangles

Key learning

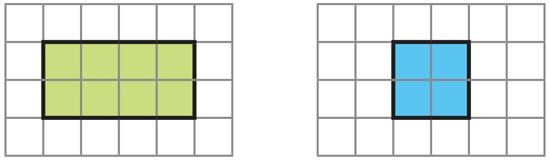
- Which shape has the greater area?

  How do you know?

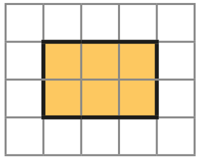


- On the grid, the area of each square is 1 cm²

  Find the area of each shape.



- Complete the sentences to find the area of the rectangle.



  - There are ______ rows of ______ squares.

    There are ______ squares altogether.

    ______ × ______ = ______

  - There are ______ columns of ______ squares.

    There are ______ squares altogether.

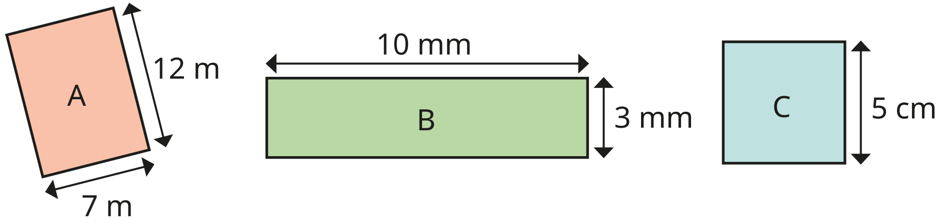
    ______ × ______ = ______

  What do you notice?

- Shapes A and B are rectangles.

  Shape C is a square.

  Work out the area of each shape.



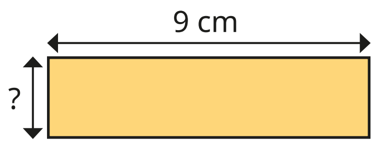
- Draw a rectangle with an area of 12 cm² and label the lengths.

  How many different rectangles can you find?

  They do not have to be drawn to scale.

  Compare rectangles with a partner.

- The area of the rectangle is 18 cm²



  What is the width of the rectangle?

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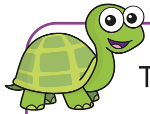
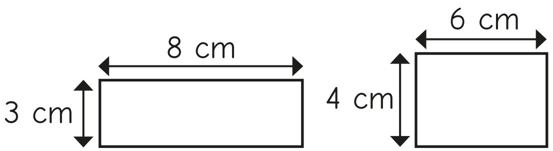
Area of rectangles

Reasoning and problem solving



Tiny thinks that these are the only rectangles that you can draw with an area of 24 cm^2



Do you agree with Tiny?

Explain your answer.

No

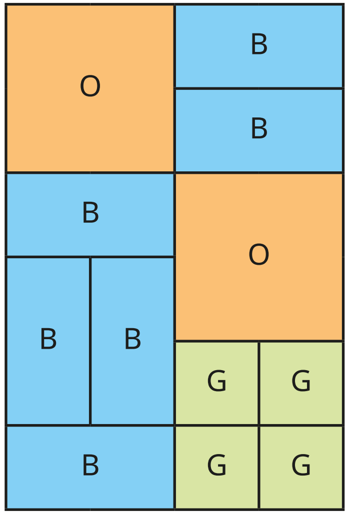
Is the statement always true, sometimes true or never true?

A rectangle's area is always greater than its perimeter.

Give examples to support your answer.

sometimes true

Each orange square (O) has an area of 24 cm^2



Calculate the total orange area.

Calculate the blue (B) area.

Calculate the green (G) area.

What is the total area of the whole shape?

48 cm^2

72 cm^2

24 cm^2

144 cm^2

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Area of compound shapes

Notes and guidance

In this small step, children learn to calculate the areas of compound shapes, which are shapes made up of two or more other shapes. The focus is on rectilinear shapes.

To support their understanding, give children compound shapes for them to physically cut or split. They could find the area of each rectangle and deduce the total area of the shape. Some children will split their compound shape differently from others. This will highlight that a compound shape is made up from other shapes and that the area of the compound shape remains the same, whichever way the shape is split.

Children apply their learning from earlier steps to find missing lengths on the shape to support finding the area.

Things to look out for

- Children may rely on counting squares to find area, instead of multiplying the length by the width for the area of each rectangle.
- Children need to be secure in finding missing lengths of shapes by adding or subtracting known lengths.
- Children need to be careful when splitting up compound shapes to make sure they know which lengths correspond to which shape.

Key questions

- How do you work out the area of a rectangle?
- Are there any rectangles within the shape?
- How can you split the shape?
- Is there more than one way to split the shape?
- Do you get a different total area if you split the shape differently?

Possible sentence stems

- To find the area of the compound shape, I need to split it into ______ and then …
- Area of rectangle A = ______

  Area of rectangle B = ______

  Total area = ______ + ______ = ______

National Curriculum links

- Measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres
- Calculate and compare the area of rectangles (including squares), including using standard units, square centimetres (cm^2) and square metres (m^2), and estimate the area of irregular shapes

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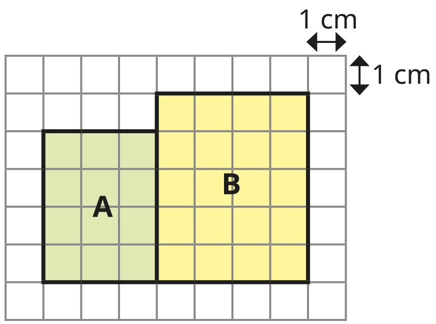
Area of compound shapes

Key learning

- A compound shape is made up of two rectangles, A and B.

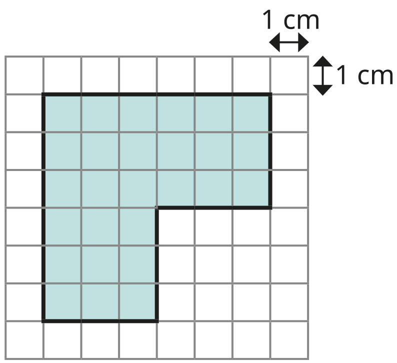


  - What is the area of A?
  - What is the area of B?
  - What is the area of the compound shape?

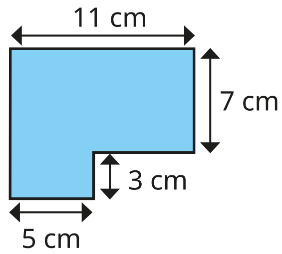
- Find the area of the compound shape.

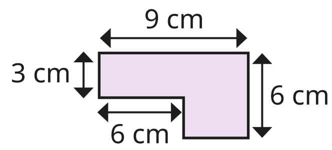
  How many ways can you split the compound shape in order to work out the area?

  Compare methods with a partner.

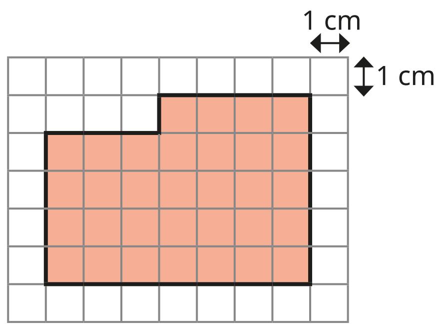


- Find the areas of the compound shapes.





- Whitney has found the area of this compound shape.



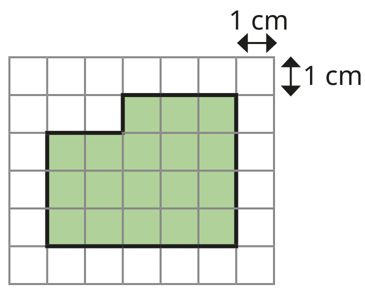
$7 \times 5 = 35$

$35 - 3 = 32$

The area is 32 cm^2

  Explain why Whitney's method works.

  Use Whitney's method to find the area of the shape.



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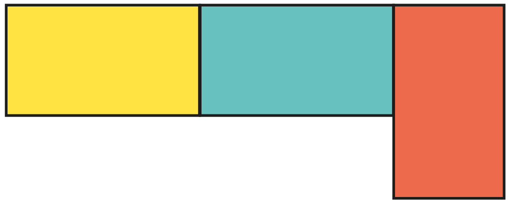
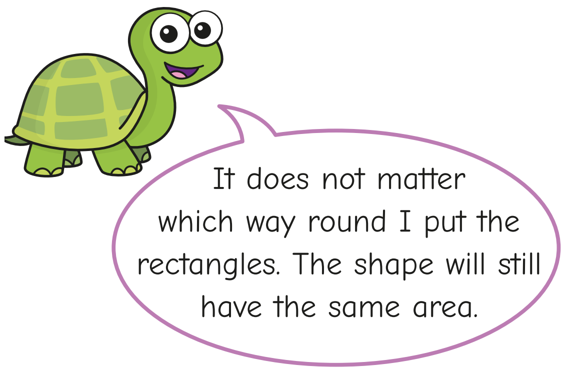
Area of compound shapes

Reasoning and problem solving

Tiny puts three 7 cm by 4 cm rectangles next to each other.



What is the area of the compound shape?



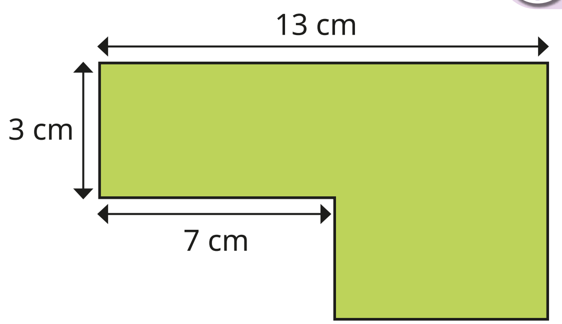
Do you agree with Tiny?

Explain your reasoning.

84 cm^2

Yes

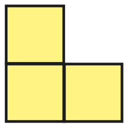
The area of the shape is 69 cm^2



Work out the perimeter of the shape.

42 cm

The compound shape is made up of three squares.



The area of each square is 25 cm^2

What is the perimeter of the compound shape?

40 cm

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Estimate area

Notes and guidance

In this small step, children use their knowledge of counting squares to estimate the areas of non-rectilinear shapes.

Children should be aware that the estimate is not exact and other people may find a different estimate. One way to obtain an estimate is to find the total number of complete squares, then include a square if more than half of it is coloured, but not if less than half is coloured. Children use their knowledge of fractions to estimate how much of a square is covered.

For larger shapes, the areas of rectangles within them can be found by multiplying the length by the width, rather than counting all the squares individually.

To avoid repetition or miscounting, children can physically annotate when counting squares. An alternative method is to match up part-covered squares to create wholes, but this is more demanding and time consuming.

Things to look out for

- Children may struggle to identify which part-covered squares are more than half covered.
- Children may miscount or include the same square twice.

Key questions

- What does “approximate” mean?
- What does “estimate” mean?
- How many whole squares are covered?
- How many part squares are more than half covered?
- Are there any part-covered squares that you could combine to make a full square?
- Does it matter if your answer is not exactly the same as a partner’s? Why/why not?

Possible sentence stems

- ______ whole squares are covered.
- ______ squares are more than half covered.
- Estimate of the total area = ______ + ______ = ______ cm^2

National Curriculum links

- Calculate and compare the area of rectangles (including squares), including using standard units, square centimetres (cm^2) and square metres (m^2), and estimate the area of irregular shapes

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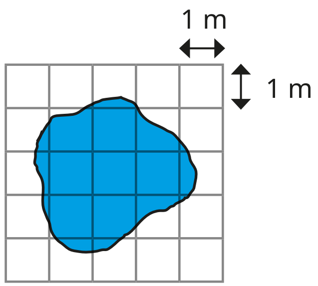
Estimate area

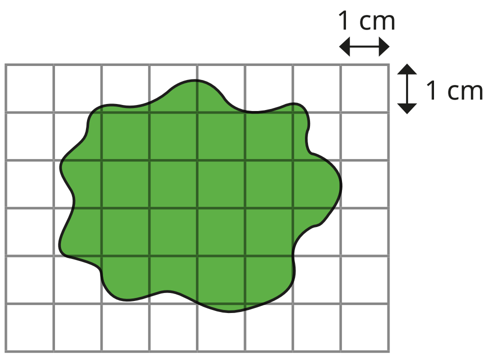
Key learning

- Jack estimates the size of the pond as 8 m^2



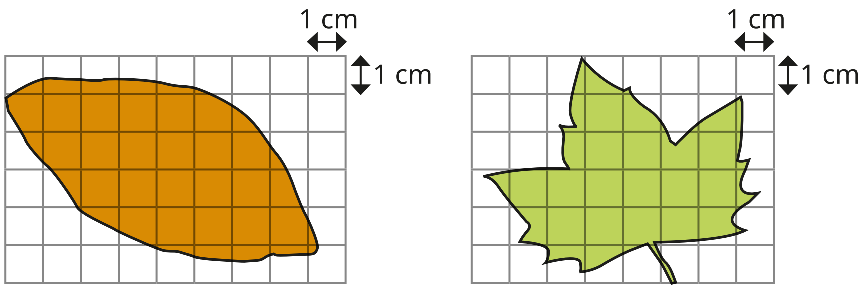
How do you think Jack made his estimate?

- Here is a shape on a centimetre squared grid.



  - How many full squares are covered?
  - How many squares are more than half covered?
  - Estimate the area of the shape.

- Estimate the area of each leaf.



Which area was easier to estimate? Why?

Compare answers with a partner.

- Draw a circle on centimetre squared paper.

  Estimate the area of your circle.

  Ask a partner to estimate the area of your circle.

  Compare your estimates.

- Trace some other non-rectilinear shapes onto centimetre squared paper and estimate their areas.

  Does where you put the shape on the grid make a difference to your estimate?

  Compare answers with a partner.

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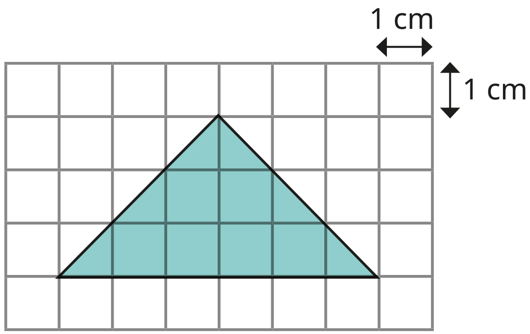
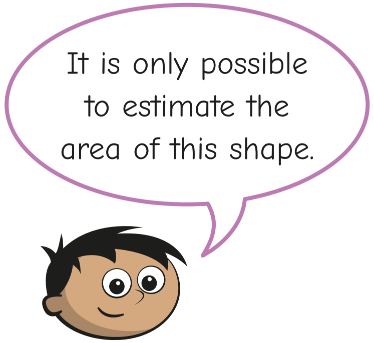
Estimate area

Reasoning and problem solving

Amir is finding the area of the shape.

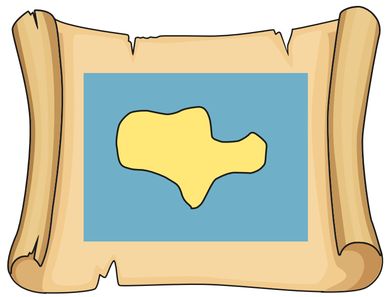




Do you agree with Amir?

Explain your answer

No



Use centimetre squared paper.

Draw a "Pirate Island" to be used as a treasure map.

Each square represents 4 m^2

The Pirate Island must have a total area of 240 m^2

The island must include these features:

- lake with a total area of 58 m^2
- forests with a total area of 86 m^2
- mountains with a total area of 92 m^2
- marshes with a total area of 12 m^2

Compare answers as a class.

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Spring Block 5

Statistics

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Small steps

Step 1	Draw line graphs
Step 2	Read and interpret line graphs
Step 3	Read and interpret tables
Step 4	Two-way tables
Step 5	Read and interpret timetables

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Draw line graphs

Notes and guidance

In Year 4, children interpreted and drew line graphs for the first time, focusing on examples where the horizontal axis was a measure of time. In this small step, they revisit this learning and build upon it by looking at other types of graph, for example conversion graphs.

Encourage children to join points using a straight dashed line and discuss the fact that this is used because they cannot be certain of exact values between the given values at two points. However, this does not apply to conversion graphs.

Explore different sets of data that call for a range of intervals on the vertical axis. Children can decide what intervals to use by looking at the greatest and lowest values and using an appropriate scale.

Things to look out for

- Children may need support in choosing appropriate intervals for the vertical axis.
- Children may begin a scale from zero even if the lowest value is considerably greater than this.
- Children may not estimate accurately between two given values.

Key questions

- What information do you want to show with your line graph?
- What does the vertical/horizontal axis on the graph represent?
- What information will go on which axis? Why?
- Will you join the points with a solid line or a dashed line? Why?
- What scale would be most appropriate for the vertical axis?
- How can you use multiples to support your choice of intervals for the vertical axis?

Possible sentence stems

- The horizontal axis shows ______
  The vertical axis shows ______
- The intervals on the vertical axis go up in ______

National Curriculum links

- Solve comparison, sum and difference problems using information presented in a line graph

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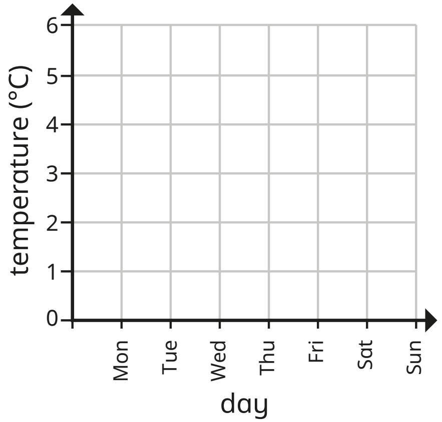
Draw line graphs

Key learning

- Scott records the temperature every day for a week.

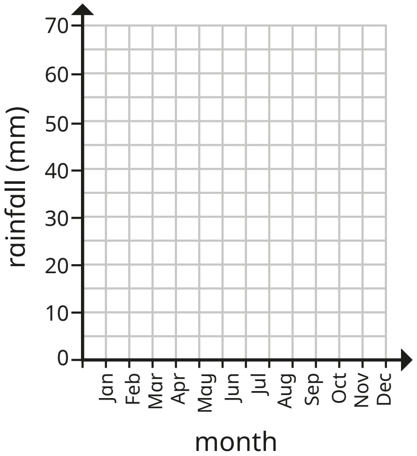
  Use his results to draw the line graph.

Day	Temperature (°C)
Monday	2
Tuesday	3
Wednesday	3
Thursday	5
Friday	4
Saturday	2
Sunday	1



- The table shows the average rainfall in Leicester over a year.

  Draw the graph using the information from the table.



Month	Rainfall (mm)	Month	Rainfall (mm)
Jan	55	Jul	69
Feb	45	Aug	64
Mar	49	Sep	58
Apr	57	Oct	63
May	60	Nov	61
Jun	66	Dec	60

- The table shows the average temperature for each month in Halifax.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature (°C)	4	4	5	8	10	15	17	16	13	11	6	5

  Draw this information as a line graph.

- Dora measures her shadow in the playground every hour and records her results.

Time	9 am	10 am	11 am	noon	1 pm	2 pm	3 pm
Length of shadow (cm)	125	113	82	53	69	108	132

  Draw the line graph for the data.
  Start the vertical axis at 50

- Here is a table showing the conversion between pounds and Indian rupees.

Pounds	1	2	3	4	5	6	7	8	9	10
Rupees	80	160	240	320	400	480	560	640	720	800

  Present the information as a line graph.

  What do you notice about the graph?

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Draw line graphs

Reasoning and problem solving

Collect your own data and present it as a line graph.

You could collect data linked to a Science investigation.

Possible investigations could be:

- measuring shadows over time
- melting and dissolving substances
- plant growth

multiple possible answers

Here is a table of data.

Time (minutes)	15	30	45	60	75
Distance (km)	25	46	67	72	98

What intervals would be most appropriate for the vertical axis of the line graph?

Explain your answer.

multiple possible answers, e.g.

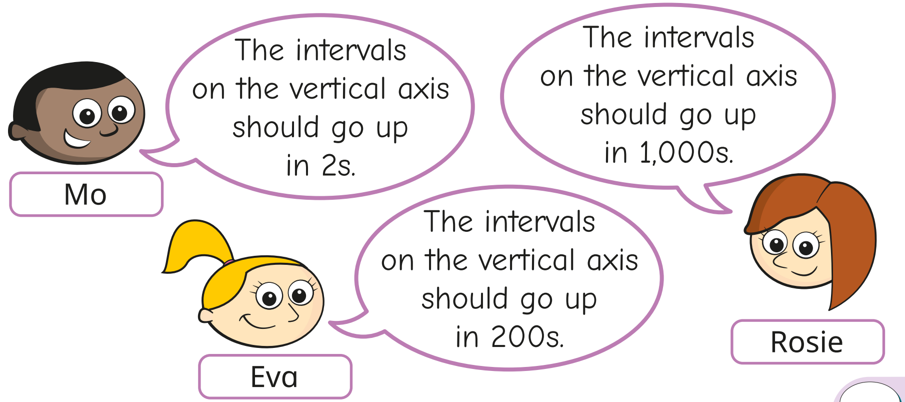
starting from zero, go up in 10s or 20s

starting from 20, go up in 10s

The chart shows the change in population of a village over 7 years.

Year	2016	2017	2018	2019	2020	2021	2022
Population	562	105	243	498	1,287	2,950	2,689

Mo, Eva and Rosie are turning the information into a line graph.



Who do you agree with? Why?

Draw the line graph.

Eva

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Read and interpret line graphs

Notes and guidance

In the previous step, children drew their own line graphs. In this small step, they interpret information that has been presented on a line graph and answer questions and solve problems using them.

Children read the graph at specific points to get information about one variable based on the other. They also find the difference between two points, the amount of time spent above/below certain points and make inferences based on information presented to them. Model questions such as the difference between two points by drawing straight lines between the graph points and the axis and then reading the scales accordingly.

Children should also explore estimating points between two intervals and should be able to explain why these are only estimates.

Things to look out for

- Children may not draw straight lines from the axis to the graph when reading off, so give inaccurate answers "by eye".
- Children may choose an inappropriate estimate when the point is between two intervals.

Key questions

- What information is being presented on the line graph?
- What does each axis on the line graph show?
- How can you summarise what the graph shows?
- What lines can you draw to help read the graph?
- Why do you think the direction of the line changes at this point in the line graph?
- Is your answer exact or an estimate?

Possible sentence stems

- The horizontal axis shows ______ and the vertical axis shows ______
- At ______, the graph reads ______
  At ______, the graph reads ______
  The difference between the two points is ______

National Curriculum links

- Solve comparison, sum and difference problems using information presented in a line graph

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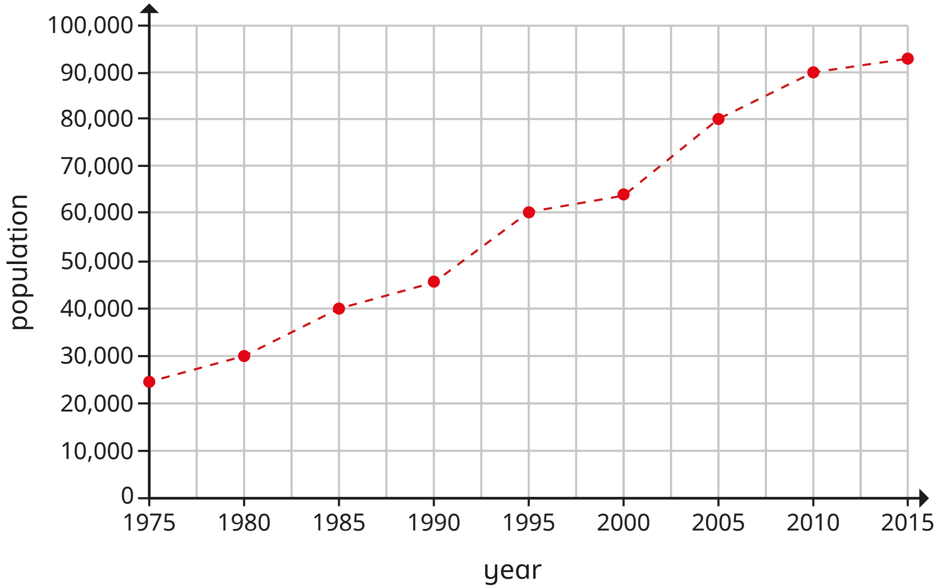
Read and interpret line graphs

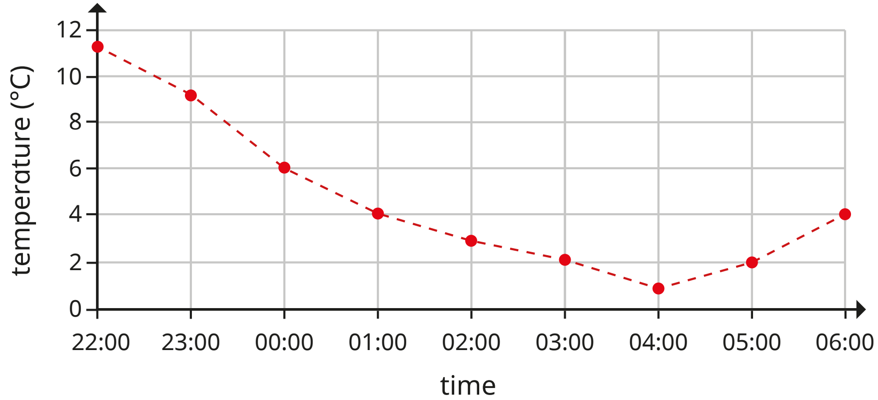
Key learning

- The line graph shows the population growth of a town.



  - In what years was the population recorded? How do you know?
  - What was the population in 1985?
  - What year did the population reach 80,000?
  - Is it possible to know the exact population in 1997? Why?
  - Estimate the year that the population reached 50,000
  - Estimate the population in 2003

- The graph shows the night-time temperatures in a garden.



  - How often was the temperature recorded? How do you know?
  - What was the temperature at midnight?
  - Is it possible to tell the exact temperature at 02:30? Why?
  - What was the highest recorded temperature? At what time did this temperature happen?
  - What was the lowest recorded temperature? At what time did this temperature happen?
  - What is the difference between the highest and the lowest temperature?
  - What else can you find out?

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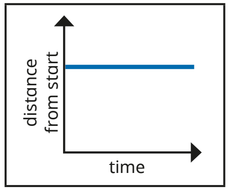
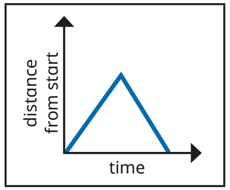
Read and interpret line graphs

Reasoning and problem solving

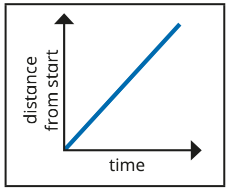
Match the graphs to the descriptions.



A car travels at a constant speed on the motorway.



A car is parked outside a house.



A car drives to the end of the road and back.

Explain your answers.

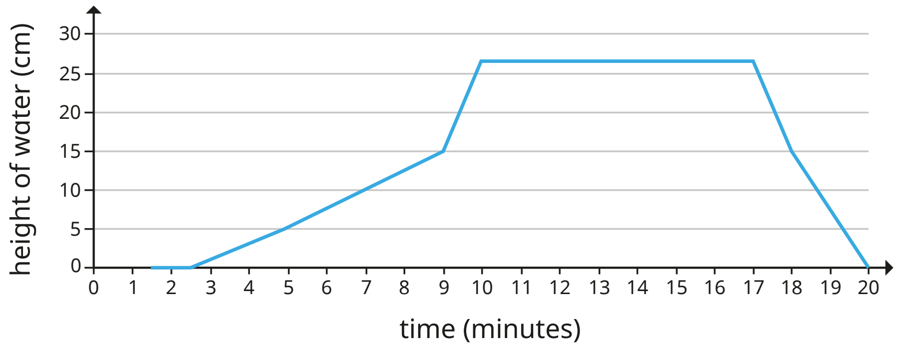
first graph, second statement

second graph, third statement

third graph, first statement

The line graph shows the level of water in a bath.

Write a story to explain what is happening in the graph.



How long did it take to fill the bath?

How long did it take to empty?

The bath does not fill at a constant rate.

How does the graph show this?

Why might this be the case?

approximately 10 minutes | approximately 3 minutes

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Read and interpret tables

Notes and guidance

In this small step, children read and interpret data presented in a table. They look at the data in a table and work out the information that they need to extract from the table to answer questions on the data. Look at a range of questions that can be asked about information in a table, beginning with simple retrieval questions and moving on to comparing amounts, inferring reasons behind information and grouping information. Encourage children to generate their own questions that can be answered using the table.

This step is a good opportunity for children to practise their addition and subtraction skills, as well as making comparisons.

This learning can be linked to Science and topic work.

Things to look out for

- Children may use the incorrect operation when answering questions about a table, especially for questions such as "How many more … ?"
- Tables with more than two categories of information can be harder to interpret.

Key questions

- What information is given in this table?
- What are the column/row headings of the table?
- Why is it important to include the units of measure in the table?
- What is the total of ______ ?
- How can you find the difference between two pieces of information given in the table?
- How is a table similar to/different from a line graph?

Possible sentence stems

- The value in ______ is ______
  The value in ______ is ______
  The difference between the values is ______
- The ______ with the most/least ______ is ______

National Curriculum links

- Complete, read and interpret information in tables, including timetables

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Read and interpret tables

Key learning

- Mo collects information from children about their favourite colour.

  He puts the information into a table.

Colour	Red	Yellow	Green	Blue	Orange	Purple
Number of children	3	7	5	17	6	7

  - How many children prefer orange?
  - What is the most popular colour?
  - What is the least popular colour?
  - How many children did Mo ask?
  - How many more children like purple than like green?

  What other questions could you ask about this table?

- Use the table to answer the questions.

City	Leeds	Wakefield	Bradford	Liverpool	Coventry
Population	720,000	316,000	467,000	440,000	305,000

  - What is the difference between the highest and lowest populations?
  - Which two cities have a combined population of 621,000?
  - How much larger is the population of Liverpool than Coventry?

- Use the table to answer the questions.

City	London	Sydney	New York	Reykjavik	Tokyo
January temperature (°C)	7	27	2	0	10
July temperature (°C)	21	17	30	13	30

  - In which city is the difference in temperature between January and July greatest?
  - How much warmer is New York in July than Reykjavik in January?

- Here is a table with information about four planets.

Planet	Time for revolution	Diameter (km)	Time for rotation
Mercury	88 days	4,878	59 days
Venus	225 days	12,104	116 days
Earth	365 days	12,756	24 hours
Mars	687 days	6,794	25 hours

  - How many of the planets take more than one day to rotate?
  - Which planet takes more than one year for one revolution?
  - Write the diameter of Venus in words.
  - What is the difference between the time for rotation of Mercury and the time for rotation of Earth?

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Read and interpret tables

Reasoning and problem solving

The table shows some results from sports day.

	100 m sprint (seconds)	Shot-put (m)	50 m sack race (seconds)	Javelin (m)
Amir	15.5	6.5	18.9	11.2
Dani	16.2	7.5	20.1	13.3
Teddy	15.8	6.9	19.3	13.9
Rosie	15.6	7.2	18.7	14.1
Ron	17.9	6.3	18.7	13.3

Ron thinks that he won the 100 m sprint, because he has the greatest number.

Do you agree with Ron?

Explain your answer.

What other questions can you ask using the table?

No

The greatest number means the longest running time, so Ron is the slowest.

The table shows the six largest football stadiums in Europe.

Stadium	City	Country	Capacity
Camp Nou	Barcelona	Spain	99,365
Wembley	London	UK	90,000
Signal Iduna Park	Dortmund	Germany	81,359
Estadio Santiago Bernabeu	Madrid	Spain	81,044
Luzhniki Stadium	Moscow	Russia	81,006
San Siro	Milan	Italy	80,018

Are the statements true or false?

The fourth largest stadium is San Siro.

There is one stadium with a capacity greater than 90,000

Three of the largest stadiums are in Spain.

False True False

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Two-way tables

Notes and guidance

In this small step, children explore two-way tables. Two-way tables show more than one piece of information about each variable, for example the number of adults and children in a school and how many do/do not wear glasses.

Start by looking at examples as a class, asking what information can be seen from the table. By generating their own questions, children will see the range of possible answers that a two-way table can show, identifying the meaning of each cell by looking at both the horizontal and vertical labels.

Children learn to find missing values in the table, such as the total number or one of the parts from given totals.

Things to look out for

- When finding the overall total, children may add the totals of the columns and the rows, and so find double the answer.
- Children may use the incorrect operation when finding missing numbers, for example adding instead of subtracting.
- Children may need support to identify the correct cell in a table that has the information they need.

Key questions

- What information is given by this table?
- What are the column/row headings of the table?
- How can you find the difference between two pieces of information given in the table?
- How can you work out missing information in the table?
- Do you need to add or subtract? How do you know?
- What conclusions can you draw from the table?

Possible sentence stems

- The columns show ______ and the rows show ______
- Where the ______ column meets the ______ row, this shows ______
- To find a missing total, I need to ______ the numbers in a ______ or ______
- To find a missing value, I need to ______ from ______

National Curriculum links

- Complete, read and interpret information in tables, including timetables

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Two-way tables

Key learning

- The two-way table shows the staff at a police station.

	No glasses	Glasses	Total
Constable	55	24	79
Sergeant	8	5	13
Inspector	2	4	6
Chief Inspector	1	1	2
Total	66	34	100

  - How many inspectors wear glasses?
  - How many sergeants do not wear glasses?
  - How many constables are there altogether?
  - How many people work at the police station?

- The table shows information about type of pet and the pet's gender.

	Male	Female	Total
Dogs		44	
Cats	38		
Total	125		245

  Fill in the missing numbers in the table.
  - How many more male dogs are there than female dogs?
  - How many more female cats are there than male cats?

- The table shows some information about how children in Key Stage 1 and Key Stage 2 travel to school each morning.

	KS1	KS2	Total
Walk		95	118
Car	45		70
Bus	9	27	
Bike		56	56
Total			

  - Complete the table.
  - Which key stage has more children in it?
  - What is the most popular method of getting to school for each key stage?

- The table shows the number of football matches won and lost by three different teams.

	Liverpool	Manchester United	Chelsea	Total
Lost	38	42	29	
Won	174	76	126	
Total				

  - Complete the table.
  - Write some questions about the information for a partner to answer.

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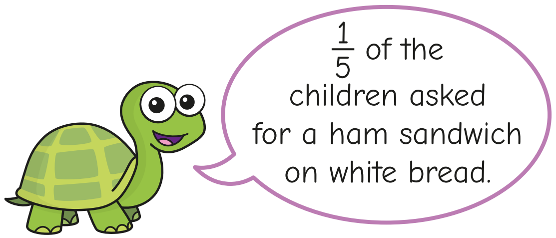
Two-way tables

Reasoning and problem solving

The table shows the types of sandwiches chosen by a group of children on a school trip.

	White bread	Brown bread	Total
Ham		15	25
Cheese	13		35
Jam		8	17
Tuna	15		23
Total			



Do you agree with Tiny?

Explain your answer.

No

120 people were asked where they went on holiday during the summer months.

Use this information to create a two-way table.

- In June, 6 people went to France and 18 went to Spain.
- In July, 10 people went to France and 19 went to Italy.
- In August, 15 went to Spain.
- Altogether, 35 people went to France and 39 went to Italy.
- 35 people went away in June and 43 in August.

	June	July	August	Total
France	6	10	19	35
Spain	18	13	15	46
Italy	11	19	9	39
Total	35	42	43	120

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Read and interpret timetables

Notes and guidance

In this small step, children explore timetables, which are a special type of two-way table.

Start by showing children a timetable they are familiar with, such as their school day. Explain why it is important to have this information available and how anyone can read the timetable to understand information they may wish to know. Move on to other timetables that may be relevant to the children's lives, such as TV guides and timetables for local buses and swimming pools.

For this step, the questions will mainly focus on interpreting timetables.

Calculations using timetables will be covered in detail later in the year.

Things to look out for

- Children may assume that blank spaces need filling in, rather than understanding that buses or trains do not stop at that stop.
- Difficulties with times presented in digital form may hamper children interpreting timetables.

Key questions

- What information does this timetable tell you?
- How is a timetable the same as/different from a two-way table?
- What is the same and what is different about each row/column of the timetable?
- What does the ______ row/column tell you?
- At what time does the ______ from ______ get to ______?
- How many ______ are there?
- What does a blank space in a timetable mean?

Possible sentence stems

- The ______ train from ______ gets to ______ at ______
- The next available ______ is at ______
- The journey/lesson/programme starts at ______ and ends at ______

National Curriculum links

- Complete, read and interpret information in tables, including timetables

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Read and interpret timetables

Key learning

- This is Alex's school timetable.

	Daily Assembly (09:00–09:15)	1 09:15–09:55	2 09:55–10:45	Break (10:45–11:05)	3 11:05–11:55	4 11:55–12:45	Lunchtime (12:45–13:45)	5 13:45–14:35	6 14:35–15:25
Mon		Literacy	English		Maths	ICT		PSHCE	Geog
Tue		English	Art		French	Science		DT	
Wed		Literacy	DT		Art	Drama		ICT	Science
Thur		PE	Maths		RE	English		History	PSHCE
Fri		Literacy	Maths		Art	Science		PE	

- How many Literacy lessons does Alex have in a week?
- Which afternoons does she only have one subject?
- How many more Maths lessons does Alex have in a week than ICT lessons?
- At what time does Alex's Science lesson on Friday start?

What other questions can you think of for Alex's timetable?

- Here is part of a train timetable.

London Euston	06:35	15:10	16:10	18:40
Watford Junction	06:50	15:25	16:25	18:55
Milton Keynes Central	07:10		16:50	
Northampton	07:15	15:55	16:55	19:25
Rugby	07:24	16:04	17:04	19:34
Coventry	07:44	16:14	17:13	19:43
Birmingham New Street	08:09	16:41	16:41	20:11

- What time does the 15:10 train from London Euston get to Coventry?
- Annie gets on the train at Northampton.

  How many stops are there before she gets to Birmingham New Street?
- Ron gets a train from Watford Junction to Rugby.

  He arrives in Rugby at 16:04

  What time did he get on the train?
- Why are some parts of the table blank?

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Read and interpret timetables

Reasoning and problem solving

Here is part of a TV guide.

<table>
<tr><th colspan="3">5 pm</th><th colspan="4">6 pm</th><th colspan="4">7 pm</th></tr>
<tr><td>NatureWatch</td><td colspan="2">News</td><td>Weather</td><td>Deep Blue</td><td colspan="2">Pampered Pets</td><td colspan="2">In the Wild</td><td colspan="2">Safari</td></tr>
<tr><td>NatureWatch + 1</td><td colspan="4">Puppy Playtime</td><td colspan="2">News</td><td>Weather</td><td>Deep Blue</td><td colspan="2">Pampered Pets</td></tr>
<tr><td>QuizTime</td><td colspan="2">Talk the Talk</td><td colspan="2">Quizdom</td><td colspan="2">What's the Q?</td><td colspan="2">aMAZEment</td><td colspan="2">Buzzed Out</td></tr>
<tr><td>CookeryPro</td><td colspan="4">Cheese Please</td><td colspan="2">Cook with Lydia</td><td>Pizza Pro</td><td>5 Minute Menu</td><td colspan="2">Budget Baker</td></tr>
</table>

Huan wants to watch *Cheese Please*, *Pampered Pets*, *aMAZEment* and *Budget Baker*.

Will Huan be able to watch all the programmes he has chosen?

Yes

Here is a bus timetable.

Bus terminal	09:32	10:02	10:22	10:32
Shopping centre	09:41	10:11	10:31	10:41
Football stadium	09:59	10:29	10:49	10:59
University campus	10:13	10:43	11:03	11:13
Library	10:16	10:46	11:06	11:16
Cinema	10:21	10:51	11:11	11:21
Museum	10:28	10:58	11:18	11:28

Sam lives a 15-minute walk from the bus terminal.

She wants to visit Whitney, who lives a 10-minute walk from the cinema.

She says she will meet Whitney at Whitney's house at 11:15

What time does Sam need to leave her house?

09:47

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