Summer
Scheme of learning

Year 4

White Rose MATHS

#MathsEveryoneCan

Summer Block 1

Decimals B

Small steps

Step 1	Make a whole with tenths
Step 2	Make a whole with hundredths
Step 3	Partition decimals
Step 4	Flexibly partition decimals
Step 5	Compare decimals
Step 6	Order decimals
Step 7	Round to the nearest whole number
Step 8	Halves and quarters as decimals

Make a whole with tenths

Notes and guidance

In this small step, children explore different ways of making 1 whole by combining tenths. Encourage children to use number bonds to 10 to support them, for example using 6 + 4 when finding the missing number in 0.6 + ______ = 1

Representations such as ten frames, place value counters, double-sided counters, hundred squares, bead strings and Rekenreks support children to visually see the connections to 1 whole. Part-whole models and bar models can also be used.

It is important that children recognise that, for example, $\frac{2}{10}$ is equal to 0.2, so they can write $\frac{2}{10} + \frac{8}{10}$ or $\frac{2}{10}$ + 0.8. They could be challenged to find the whole from more than two parts, for example 1 = 0.3 + 0.4 + 0.3

Things to look out for

- When finding 1 whole, children may confuse tenths and hundredths by incorrectly using a zero as a placeholder, for example 0.06 + 0.04 = 1
- Children may not realise that it is possible to make 1 whole by adding a fraction and a decimal, for example $\frac{1}{10}$ + 0.9 = 1

Key questions

- How many tenths make 1 whole?
- How many equal parts is 1 whole split into for one tenth to be one of the parts?
- What is the number bond of ______ to 10?
- What is the number bond of ______ tenths to 1 whole?
- What is the same/different about 7 + 3 and 7 tenths + 3 tenths?
- If you have ______ tenths, how many more tenths do you need to make 1 whole?

Possible sentence stems

- ______ + ______ = 10,

  so ______ tenths + ______ tenths = 1 whole
- $\frac{\square}{10}$ = 0.______

National Curriculum links

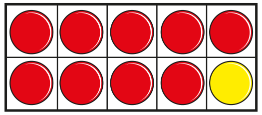
- Recognise and write decimal equivalents of any number of tenths or hundredths
- Solve simple measure and money problems involving fractions and decimals to 2 decimal places

Make a whole with tenths

White Rose MATHS

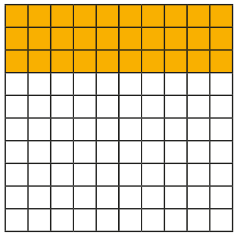
Key learning

- Aisha uses a ten frame and counters to show the addition 0.9 + 0.1 = 1



Use a ten frame and counters to find different ways to make 1 whole.

- The hundred square represents 1 whole.



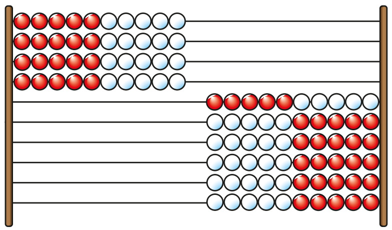
How many tenths are shaded?

How many more tenths need to be shaded so that the whole hundred square is shaded?

_______ tenths + _______ tenths = 1 whole

- Here is a Rekenrek with 100 beads.

Each row of beads is equal to one tenth of the whole.

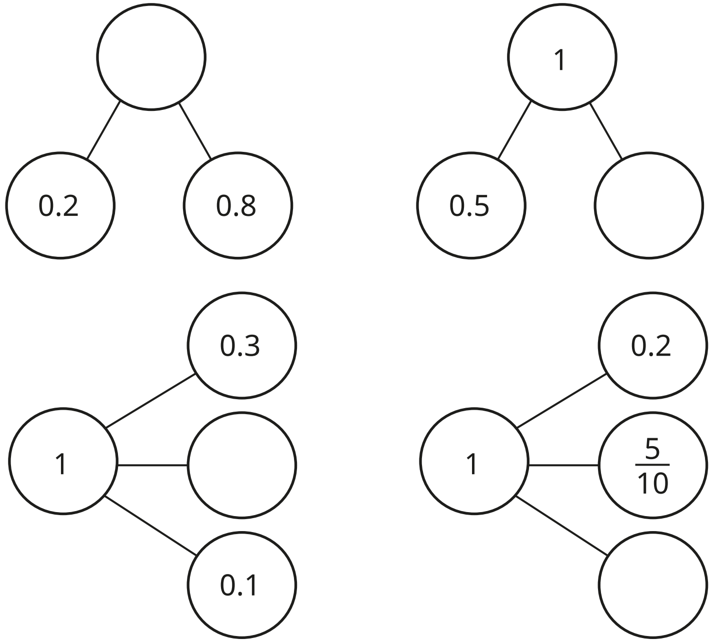


_______ tenths are on the left.

_______ tenths are on the right.

_______ + _______ = 1 whole

- Complete the part-whole models.

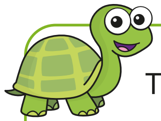


- Complete the number sentences.
  - 0.1 + _______ = 1
  - 1 = 0.2 + _______
  - 0.7 + 0.3 = _______
  - _______ + 0.5 = 1
  - $\frac{2}{10}$ + 0.8 = _______
  - 1 = $\frac{6}{10}$ + _______
  - 1 = _______ + 0.5 + 0.1
  - $\frac{3}{10}$ + 0.4 + _______ = 1

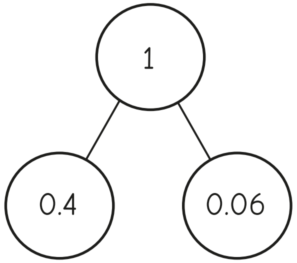
Make a whole with tenths

White Rose MATHS

Reasoning and problem solving



Tiny draws a part-whole model.



Is Tiny's part-whole model correct?

Explain how you know.

No

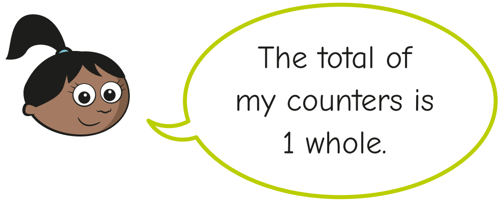
Which calculation is the odd one out?

0.5 + 0.5	0.3 + 0.5 + 0.2
0.08 + 0.02	0.1 + 0.9

Explain your answer.

any with correct justification, e.g. 0.08 + 0.02 is not a bond to 1

Sam has some 0.1 counters and some $\frac{1}{10}$ counters.



She gives 3 of her 0.1 counters to Ron.

She gives 2 of her $\frac{1}{10}$ counters to Dora.

What counters could she have left?

How many answers can you find?

multiple possible answers, e.g.

1×0.1 and $4 \times \frac{1}{10}$

Find four different ways to complete the number sentence.

☐ + 0.1 + ☐ = 1

0.1 and 0.8, 0.2 and 0.7, 0.3 and 0.6, 0.4 and 0.5

The numbers can be either way round.

Make a whole with hundredths

Notes and guidance

This small step builds on the previous step, as children now explore different ways of making 1 whole from hundredths.

This step requires children to use their number bonds to 100. Initially, they may need to practise finding number bonds to 100 that are multiples of 10, such as 60 + ______ = 100. Then they can move on to the number bond to 100 for any 2-digit number, such as 63 + ______ = 100

Using a familiar context, such as measurements involving centimetres and metres, can support children to make a whole from hundredths, using the fact that 1 cm = $\frac{1}{100}$ m.

Things to look out for

- If number bonds to 100 are not secure, children may make bridging errors such as 74 hundredths + 36 hundredths = 1 whole.
- When finding a whole, children may confuse tenths and hundredths, for example 0.09 + 0.01 = 1
- Children may not realise that it is possible to make 1 whole by adding a fraction and a decimal, for example $\frac{34}{100}$ + 0.66 = 1

Key questions

- How many hundredths make 1 whole?
- How many equal parts is 1 whole split into for one hundredth to be one of the parts?
- What is the number bond of ______ to 100?
- What is the number bond of ______ hundredths to 1 whole?
- What is the same/different about 4 + 6, 4 tenths + 6 tenths and 40 hundredths + 60 hundredths?
- If you have ______ hundredths, how many more do you need to make 1 whole?

Possible sentence stems

- ______ + ______ = 100,
  so ______ hundredths + ______ hundredths = 1 whole
- $\frac{\square}{100}$ = 0.______

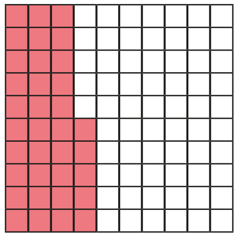
National Curriculum links

- Recognise and write decimal equivalents of any number of tenths or hundredths
- Solve simple measure and money problems involving fractions and decimals to 2 decimal places

Make a whole with hundredths

Key learning

- The hundred square represents 1 whole.



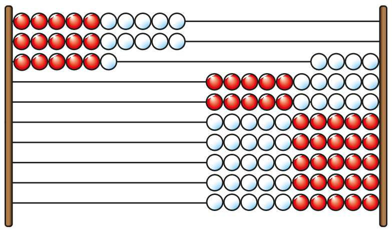
How many hundredths are shaded?

How many more hundredths need to be shaded so that the whole hundred square is shaded?

______ hundredths + ______ hundredths = 1 whole

- Here is a Rekenrek with 100 beads.

Each bead is one hundredth of the whole.

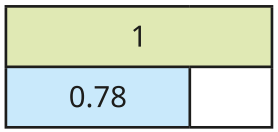


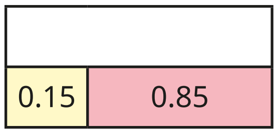
______ hundredths are on the left.

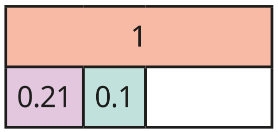
______ hundredths are on the right.

______ + ______ = 1 whole

- Complete the bar models.

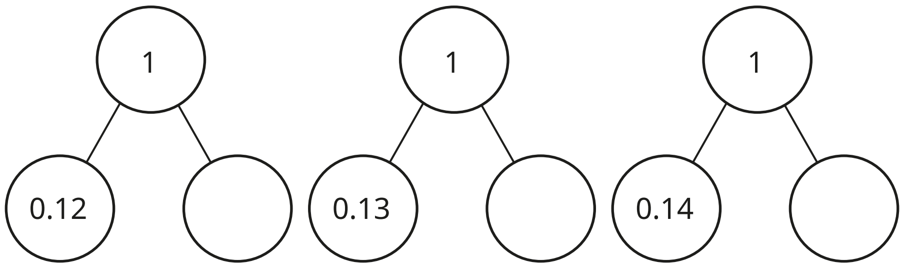






- Complete the number sentences.
  - 4 hundredths + ______ hundredths = 1
  - ______ hundredths + 83 hundredths = 1
  - ______ hundredths + 13 hundredths = 1
  - 24 hundredths + ______ hundredths + 6 tenths = 1

- Complete the part-whole models.



What do you notice?

- Which calculations **do not** sum to 1?

0.54 + 0.56	0.54 + 0.46	0.54 + 0.54
0.3 + 0.7	0.03 + 0.7	0.03 + 0.07

Make a whole with hundredths

Reasoning and problem solving

Tommy has a piece of ribbon that is less than 0.6 m long.

Rosie has a piece of ribbon that is less than 0.45 m long.

Altogether, could they have enough ribbon to measure exactly 1 m?

Explain your reasoning.

Yes

multiple possible answers, e.g.

0.56 m + 0.44 m

0.57 m + 0.43 m

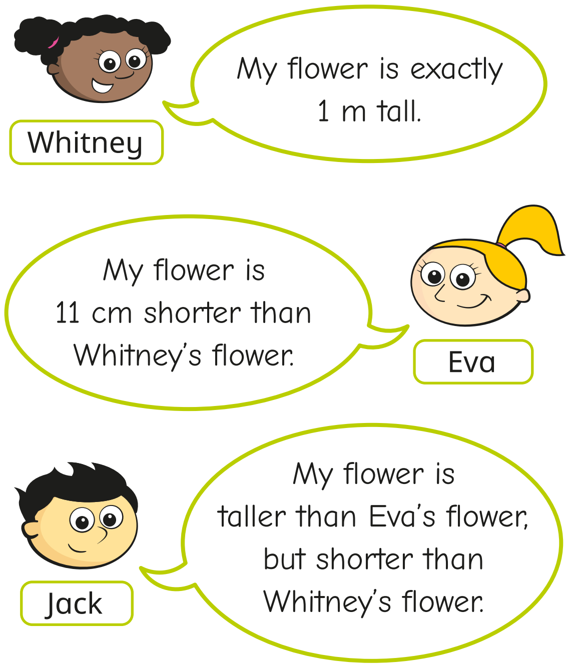
Each row and column in the square sum to 1 whole.

Complete the grid.

0.44	0.45	
	0.35	
0.16		0.64

0.44	0.45	**0.11**
0.40	0.35	**0.25**
0.16	**0.20**	0.64

Whitney, Eva and Jack are growing flowers.



How tall is Eva's flower in metres?

How tall could Jack's flower be in metres?

0.89 m

taller than 0.89 m and shorter than 1 m, e.g. 0.94 m

Partition decimals

Notes and guidance

In this small step, children partition numbers with up to 2 decimal places into their place value parts.

Using place value counters and place value charts supports children in recognising the place value of each digit in a number. Part-whole models are used to partition the numbers using the children's understanding of place value.

In this step, children focus on partitioning into the ones part, the tenths part and the hundredths part. More flexible partitioning is the focus of the next step.

Discuss with children the role of zero as a placeholder. Encourage them to verbalise each place value column of a number, for example "zero tenths" in the number 3.09

Things to look out for

- Children may write decimal numbers incorrectly if they are unable to use zero as a placeholder, for example writing 7 hundredths as 0.7
- When writing a number that requires zero as a placeholder, children may not include the zero, for example 8 + 0.06 = 8.6

Key questions

- How many ones/tenths/hundredths are there in the number?
- How do you write this number as a decimal?
- How would you read the number out loud?
- How would you partition the number into ones, tenths and hundredths?
- What is the value of ______ in the number ______?
- What is the role of zero in the number 4.06?

Possible sentence stems

- There are ______ ones, ______ tenths and ______ hundredths. The number is ______
- There are ______ ones, ______ tenths and ______ hundredths, so ______ = ______ + ______ + ______

National Curriculum links

- Recognise and write decimal equivalents of any number of tenths or hundredths
- Solve simple measure and money problems involving fractions and decimals to 2 decimal places

Partition decimals

White Rose MATHS

Key learning

- Complete the sentences to describe the numbers shown in the place value charts.

  There are ______ ones, ______ tenths and ______ hundredths.

  The number is ______

Ones	Tenths	Hundredths
1 1	0.1 0.1 0.1 0.1	0.01 0.01 0.01

Ones	Tenths	Hundredths
	0.1 0.1 0.1 0.1 0.1	0.01 0.01

Ones	Tenths	Hundredths
1 1 1 1		0.01 0.01 0.01 0.01

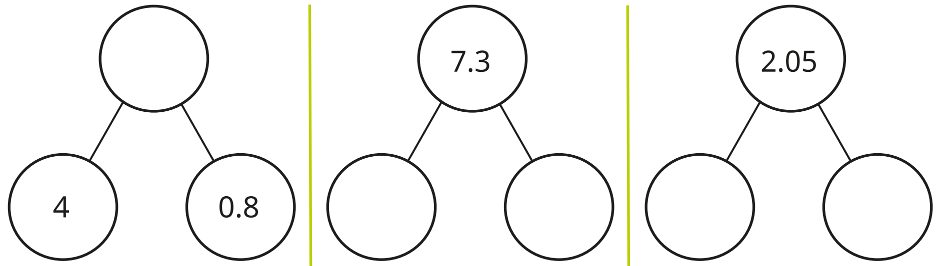
Ones	Tenths	Hundredths
1 1 1 1 1	0.1 0.1 0.1	

- Use place value counters to make the numbers.

  Partition each number into ones, tenths and hundredths.

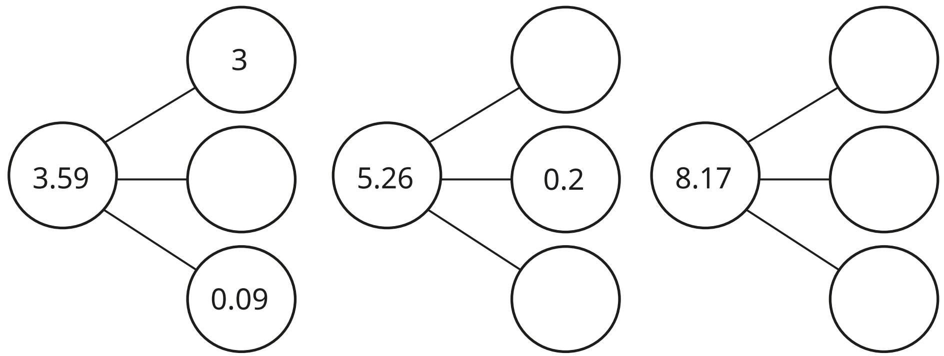
  1.56 2.71 3.09 6.8

- Complete the part-whole models and the number sentences.



______ = 4 + 0.8 | 7.3 = ______ + ______ | 2.05 = ______ + ______

- Complete the part-whole models.



- Make each number on a place value chart.

  Write the value of the underlined digit.

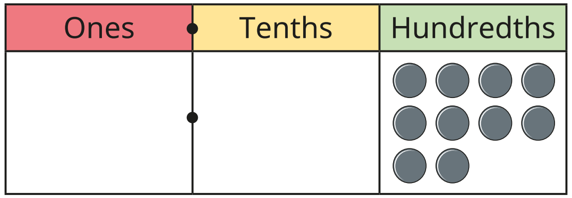
  25.91 0.05 1.42 18.37

Partition decimals

Reasoning and problem solving

Scott is counting up in hundredths using counters in a place value chart.

He counts up to 10 hundredths.



He writes the decimal as 0.010

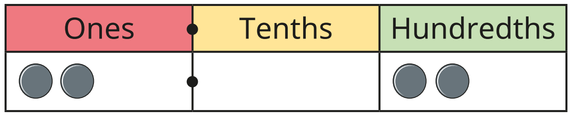
Is Scott correct?

Explain your answer.

No

10 hundredths should be exchanged for 1 tenth.

10 hundredths or 1 tenth is written as 0.1



Dani thinks that the number shown in the place value chart is 2.2

Do you agree with Dani?

Explain your answer.

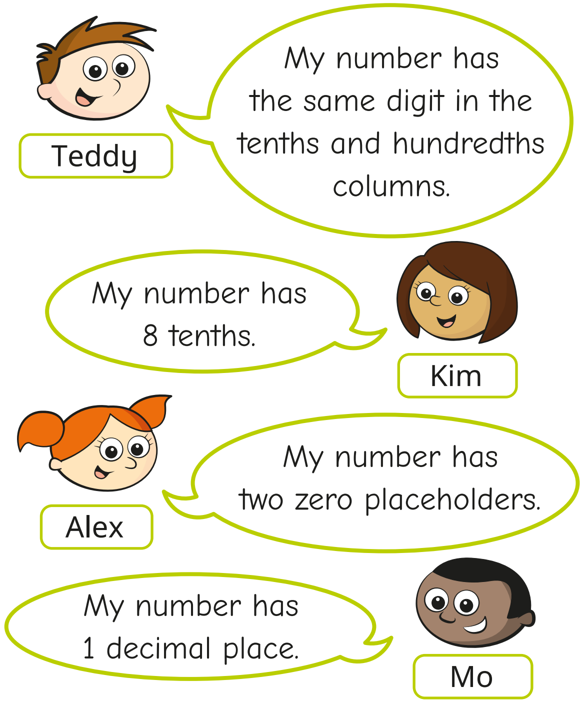
No

Dani has not included zero as the placeholder.

The number is 2.02

Each child chooses one of these numbers.

0.87	1.7	0.08	1.77



Which child chose which number?

How do you know?

Teddy: 1.77

Kim: 0.87

Alex: 0.08

Mo: 1.7

Flexibly partition decimals

White Rose MATHS

Notes and guidance

In this small step, children carry on partitioning numbers with decimals up to 2 decimal places, with the learning from the previous step being extended to include flexible partitioning.

Flexible partitioning requires secure place value knowledge, as children are expected to partition numbers in non-standard ways. They should be able to explain that, for example, 0.12 can be made up of 12 hundredths and also 1 tenth and 2 hundredths. Children also continue to explore the role of zero as a placeholder.

Place value counters, place value charts and part-whole models are still good representations to support their understanding.

Discuss whether a number can be partitioned into more or fewer parts than its number of digits.

Things to look out for

- Children may think that numbers can only be partitioned into place value columns. For example, 3.49 can only be partitioned as 3 + 0.4 + 0.09
- When writing a number that requires zero as a placeholder, children may not take into account the place value position of each digit, for example 8 + 0.06 + 0.1 = 8.106

Key questions

- How many ones/tenths/hundredths are there in the number?
- How do you write this number as a decimal?
- How could you partition the number into ones, tenths and hundredths?
- How many other ways can you partition the number?
- What is the role of zero in the number 3.06?

Possible sentence stems

- The number is ______
  There are ______ ones, ______ tenths and ______ hundredths.
  This could be partitioned into ______ ones, ______ tenths and ______ hundredths.
- ______ = ______ + ______ + ______

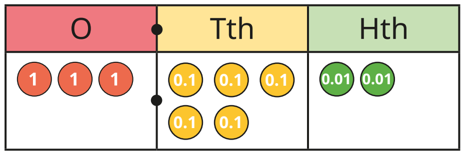
National Curriculum links

- Recognise and write decimal equivalents of any number of tenths or hundredths
- Solve simple measure and money problems involving fractions and decimals to 2 decimal places

Flexibly partition decimals

Key learning

- Esther represents the number 3.52 on a place value chart.

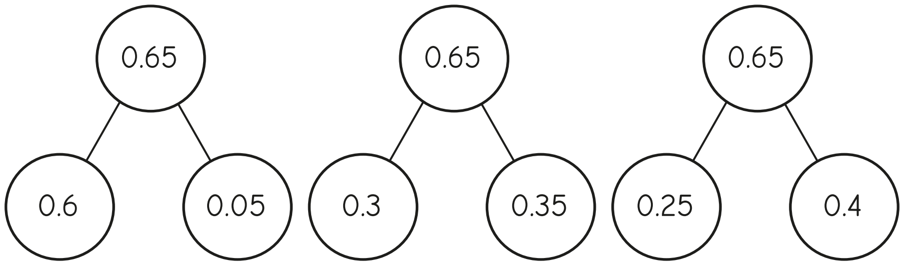


3 + 0.5 + 0.02 = 3.52
2 + 1.5 + 0.02 = 3.52
3.02 + 0.5 = 3.52

Make a different decimal number on a place value chart.

Partition your number in three different ways.

- Filip uses part-whole models to partition 0.65 in three different ways.



Use a part-whole model to partition 0.49 in three different ways.

Compare answers with a partner.

- The place value counters show 3.65

Use place value counters to partition 3.65 in three different ways.

Complete the number sentence for each way.

3.65 = ______ + ______ + ______

Compare answers with a partner.

- Brett has created a number on a Gattegno chart.

1	2	3	4	5	6	7	8	9
0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

- ▶ What is Brett's number?
- ▶ Partition his number in three different ways.

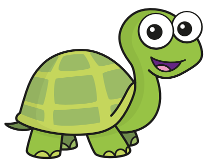
- Complete the number sentences.

- ▶ 3 + 0.08 + 0.4 = ______
- ▶ 5 + ______ + 0.3 = 5.36
- ▶ 7 + ______ + 0.1 = 7.34
- ▶ 0.7 + 0.04 + 30 = ______
- ▶ 5 + ______ + 0.2 = 5.36
- ▶ 7.1 + ______ + 0.02 = 7.34

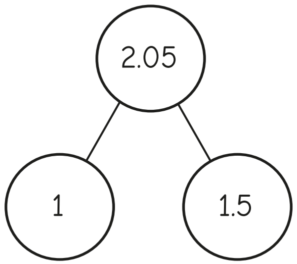
Flexibly partition decimals

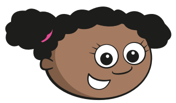
Reasoning and problem solving

Tiny and Whitney are partitioning 2.05

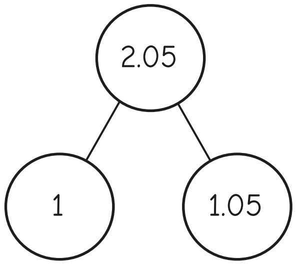


Tiny





Whitney



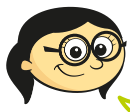
Who is correct?

Explain your answer.

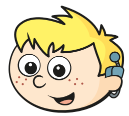
Whitney

In Tiny's model, 1 + 1.5 = 2.5, not 2.05

Annie and Max are each shading a hundred square.



Annie: I have shaded 4 tenths of the hundred square in red and 26 hundredths of the hundred square in blue.



Max: In total, I have shaded 4 fewer hundredths than Annie.

How much of the hundred square has Max shaded?

Give your answer as a decimal.

Partition the decimal in three different ways.

0.62

multiple possible answers, e.g.

0.62 = 0.5 + 0.12

Compare decimals

Notes and guidance

In this small step, children compare decimal numbers with up to 2 decimal places.

It is important that children consider the values of the digits in place value order, comparing digits in the greatest place value column first. Discuss whether all the place value columns need to be compared. For example, when comparing 6.73 and 2.98, only the ones need to be compared; but when comparing 5.37 and 5.39, all the places need to be compared.

Representing the numbers in place value charts supports children in recognising the value of each digit, for instance that 0.5 is less than 0.72. It is also important that children read numbers such as 0.32 as "zero point three two" rather than "zero point thirty-two".

Things to look out for

- Children may think that a number such as 0.16 is greater than 0.3, because 16 is greater than 3
- Children may not realise that, for example, 0.4 = 0.40
- Children may only compare the digits after the decimal point, ignoring digits to the left of the decimal point, for example 1.47 < 0.76

Key questions

- Which place value column do you compare first? Why?
- How many ones/tenths/hundredths does the number have?
- Which number is greater/smaller? How do you know?
- How can you represent the decimal number on a place value chart?
- What is the same/different about the ones/tenths/hundredths?
- Do you need to compare every column when comparing the two numbers?

Possible sentence stems

- To compare numbers, I need to start by comparing the digits in the ______ place value column.
- ______ . ______ ______ is greater/less than ______ . ______ ______, because ______ is greater/less than ______

National Curriculum links

- Recognise and write decimal equivalents of any number of tenths or hundredths
- Compare numbers with the same number of decimal places up to 2 decimal places

Compare decimals

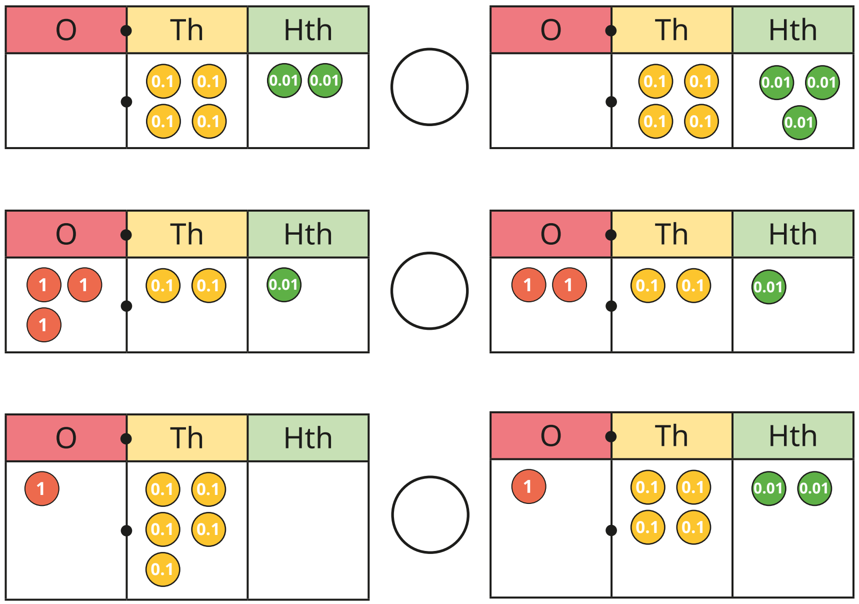
Key learning

- Use place value counters to make the numbers 8.4 and 4.8

  Which number is greater? How do you know?

- Which is the greater of each pair of numbers?
  - 9.4 and 13.8
  - 6.3 and 5.7
  - 46.2 and 38.7

- Write < or > to compare the numbers.



Did you have to compare all the columns for each question?

- Write < or > to compare the numbers.

  5.8 ◯ 5.3   7.04 ◯ 7.09   0.43 ◯ 0.6

  3.79 ◯ 3.71   0.9 ◯ 0.10   8.55 ◯ 8.3

- Fill in the missing digits to make the statements correct.
  - 4.5___ > 4.53
  - 0.8___ < 0.89
  - 3.39 > 3.___9
  - 4.___8 > 4.___3
  - 0.7___ < 0.7___
  - ___.56 < ___.56
  - 2.3___ > 2.1___
  - 4.09 > 4.01 + 0.0___

- Draw exactly nine counters in the chart to represent a number that matches the description.

  a number between 3.04 and 3.19

Ones	Tenths	Hundredths

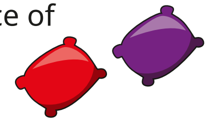
Compare answers with a partner.

Compare decimals

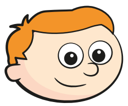
White Rose MATHS

Reasoning and problem solving

Ron and Dexter each throw a bean bag and measure the distance of their throw.

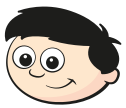


I threw the bean bag further because it landed 1.5 m away.



Ron

I threw the bean bag further because it landed 1.39 m away.



Dexter

Who is correct?

Explain your reasoning.

Ron

1.5 m is further than 1.39 m.

Use each digit card once to make the statement correct.

0	1	2	4	5

3 . ☐ ☐ > ☐ . ☐ ☐

Find as many ways as you can.

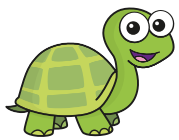
multiple possible answers, e.g.

3.12 > 0.45

3.24 > 1.05

3.05 > 2.41

Tiny is comparing decimals.



0.28 is greater than 0.7 because 28 is greater than 7

Do you agree with Tiny?

Explain your reasoning.

No

Order decimals

Notes and guidance

Building on the previous step, in this small step children order decimal numbers with up to 2 decimal places. They only order numbers that have the same number of decimal places.

A wide variety of representations can be used to support ordering, including place value counters, place value charts and number lines. The learning builds on children's understanding of ordering integers in the Autumn term. Highlight the importance of looking at the values of the digits in the greatest place value column first, before moving to the next place value columns in turn.

Challenge children to order numbers that have the same digits arranged differently, to ensure that they can recognise the place value of each digit, for example 1.67 < 1.76 < 6.17 < 6.71

Children may need reminding of the meaning of the words "ascending" and "descending".

Things to look out for

- When comparing numbers, children may order numbers using the smallest place value column first, instead of the greatest.
- Children may only compare the digits after the decimal point, ignoring digits to the left of the decimal point, for example 1.47 < 0.76

Key questions

- Which number is the greatest/smallest? How do you know?
- Which place value column did you compare first? Why?
- How many tens/ones/tenths/hundredths does the number have?
- How can you represent the number on a place value chart?
- What is the same/different about the digits of the numbers?
- Why have you chosen to order the decimal numbers this way?
- Did you look at every place value column when ordering these numbers? Why or why not?

Possible sentence stems

- There are ______ ones, ______ tenths and ______ hundredths.
- The digit in the ______ column is ______ than the other numbers. This number is the ______

National Curriculum links

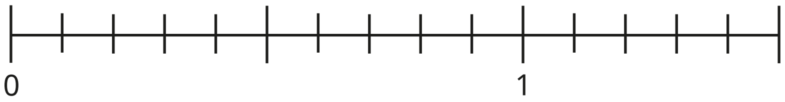
- Recognise and write decimal equivalents of any number of tenths or hundredths
- Compare numbers with the same number of decimal places up to 2 decimal places

Order decimals

Key learning

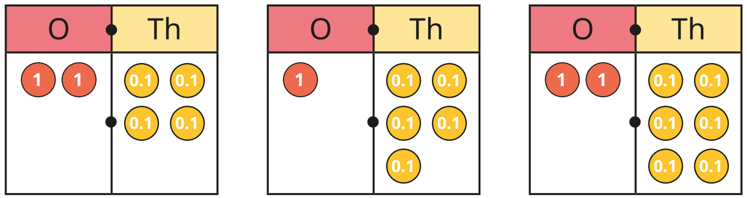
- Label the numbers on the number line.

  1.1   0.3   1.4   0.8

  Write the numbers in order of size, starting with the smallest.

- Aisha has made three numbers on place value charts.

  Write Aisha's numbers in order of size, starting with the greatest.

- Huan has written four numbers on place value charts.

O	Th	Hth
3	2	4

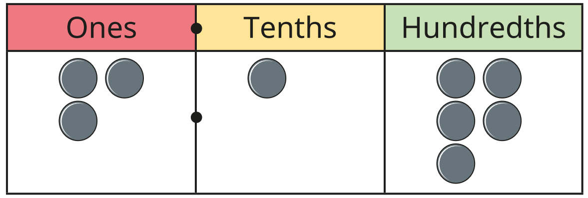
O	Th	Hth
2	4	3

O	Th	Hth
2	0	5

O	Th	Hth
2	3	4

  Write Huan's numbers in ascending order.

- Sam uses nine plain counters to make a number on a place value chart.

  - Rearrange the counters to make a number that is less than Sam's number.
  - Rearrange the counters to make a number that is greater than Sam's number.

  Compare answers with a partner.

- Write the numbers in order, from smallest to greatest.
  - 7.2   5.7   6.1   6.7
  - 3.65   6.53   3.56   5.63
  - 24.9   29.4   24.7   22.5

- The numbers are in ascending order.

  3.5___   3.5___   3.5___   3.5___

  What could the missing digits be?

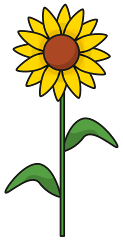
  Compare answers with a partner.

Order decimals

White Rose MATHS

Reasoning and problem solving

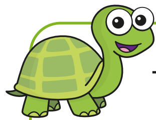
Some children planted sunflowers and measured their heights.



Child	Height
Amir	1.23 m
Tommy	0.95 m
Rosie	1.02 m
Jack	1.21 m
Eva	0.99 m

Order the children based on the heights of their sunflowers, starting with the shortest.

Tommy, Eva, Rosie, Jack, Amir



Tiny has put some numbers in order, starting with the smallest.

0.07 < 0.36 < 1.56 < 0.98

What mistake has Tiny made?

Put the numbers in the correct order.

0.07 < 0.36 < 0.98 < 1.56

The numbers are in ascending order.

3.__6 < __.83 < 5.9__

The same digit is missing in each number.

What could the missing digit be?

Find as many ways as you can.

3, 4 or 5

Round to the nearest whole number

Notes and guidance

In this small step, children round decimals with 1 decimal place to the nearest whole number. They should be able to use the word "integer" as an alternative to "whole number".

Children can make links to rounding to the nearest 10, 100 and 1,000 studied in the Autumn term. Again, using a number line will help children to see which whole numbers a decimal number lies between. They then consider which whole number the decimal number is nearer to, by looking at the digit in the tenths column. Using the same convention as in their earlier rounding, a number with a 5 in the tenths column, although exactly halfway between integers, rounds to the greater integer.

Children should recognise that a decimal number rounded to the nearest whole number can round to zero.

Things to look out for

- Children may be confused by language such as "round down", rounding a number such as 5.2 to 4 instead of 5
- Children may incorrectly give answers in the form 7.0 rather than 7
- Children may round numbers such as 42.7 to the nearest 10 instead of the nearest integer.

Key questions

- Which whole numbers does ______ lie between?
- Using the number line, which whole number is ______ nearer to?
- When rounding to the nearest whole number, which place value column should you look at?
- The number has a ______ in the tenths column. When rounded to the nearest whole number, will it round to ______ or ______?
- What is the same/different about rounding to the nearest whole number and rounding to the nearest ten?

Possible sentence stems

- ______ lies between ______ and ______
- ______ is closer to ______ than ______
- ______ rounds to ______ to the nearest whole number.

National Curriculum links

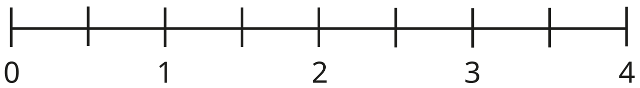
- Recognise and write decimal equivalents of any number of tenths or hundredths
- Round decimals with 1 decimal place to the nearest whole number

Round to the nearest whole number

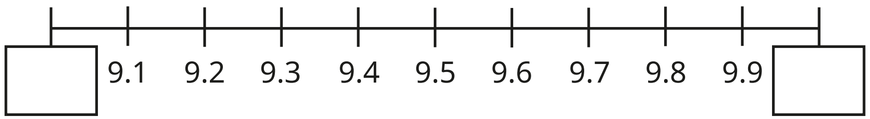
Key learning

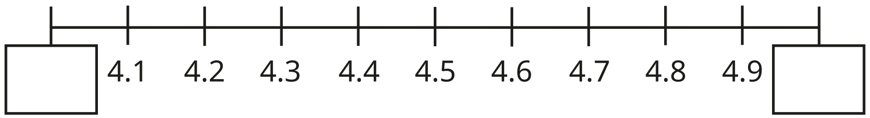
- Draw arrows to estimate the positions of the numbers on the number line.

  0.7   2.4   3.6



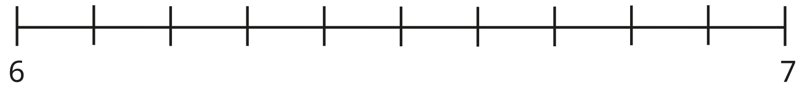
- Fill in the integers on the number lines.





- Which integers do the numbers lie between?
  - 1.7 lies between ______ and ______
  - 5.1 lies between ______ and ______
  - 8.3 lies between ______ and ______
  - 7.5 lies between ______ and ______

- Label 6.2 on the number line.

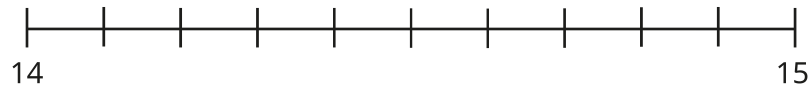


  Is 6.2 closer to 6 or 7?

  Complete the sentence.

  ______ rounded to the nearest whole number is ______

- Label 14.7 on the number line.



  Complete the sentence.

  ______ rounded to the nearest whole number is ______

- Round the numbers to the nearest whole number.

  5.3   0.3   4.5   8.9

- Which numbers round to 14, when rounded to the nearest whole number?

  14.3   13.4   13.9   14.5   14.6

Round to the nearest whole number

Reasoning and problem solving

When a number with 1 decimal place is rounded to the nearest whole number, the answer is 64

Could the number be 63.5?

Could the number be 64.5?

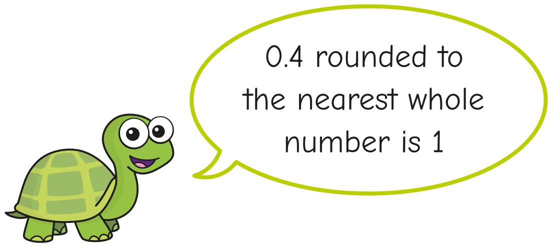
What could the number be?

Yes

No

63.5, 63.6, 63.7, 63.8, 63.9, 64.0, 64.1, 64.2, 64.3, 64.4

Tiny is rounding 0.4 to the nearest whole number.



Do you agree with Tiny?

Explain your answer.

No

Use the digit cards to complete the sentences.

You may use a digit card once only in each set of sentences.

1	2	3	4	5
6	7	8	9	

_____ . _____ rounded to the nearest whole number is 4

_____ . _____ rounded to the nearest whole number is 6

_____ . _____ rounded to the nearest whole number is 9

Find as many ways as you can.

multiple possible answers, e.g.

3.8, 4.2, 3.6

5.6, 6.1, 5.9

9.4, 8.9, 8.7

Halves and quarters as decimals

White Rose MATHS

Notes and guidance

In this small step, children apply their knowledge of decimal equivalents of hundredths and tenths to recognise and write $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$ as decimals.

A blank hundred square, a number line or a Rekenrek are all useful representations to support conversion between these fractions and decimals, as children can see how many hundredths each fraction is worth and then apply their knowledge from previous steps. They can also use a place value chart and place value counters to represent $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$ as decimals.

Extend children's understanding by considering decimal equivalents to fractions that are equivalent fractions to $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$

Things to look out for

- Children may incorrectly use the denominator and numerator as a reference, for example $\frac{1}{2}$ = 0.2 or 1.2, $\frac{1}{4}$ = 0.4 or 1.4, $\frac{3}{4}$ = 0.34 or 3.4
- Children may think 0.5 < 0.25 because 5 < 25

Key questions

- How can you show one quarter/one half/three-quarters on a hundred square?
- How many hundredths are the same as $\frac{1}{4}$ / $\frac{1}{2}$ / $\frac{3}{4}$?
- What is the decimal equivalent of $\frac{1}{4}$ / $\frac{1}{2}$ / $\frac{3}{4}$?
- How would you write the fraction as a decimal?
- Are ______ and ______ equivalent fractions? How do you know?

Possible sentence stems

- $\frac{1}{2} = \frac{\square}{100}$ = 0.______
- $\frac{1}{4} = \frac{\square}{100}$ = 0.______
- $\frac{3}{4} = \frac{\square}{100}$ = 0.______

National Curriculum links

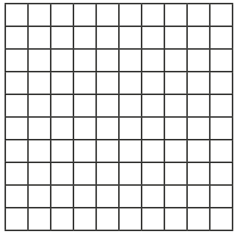
- Recognise and write decimal equivalents of any number of tenths or hundredths
- Recognise and write decimal equivalents to $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$

Halves and quarters as decimals

White Rose MATHS

Key learning

- Here is a blank hundred square.



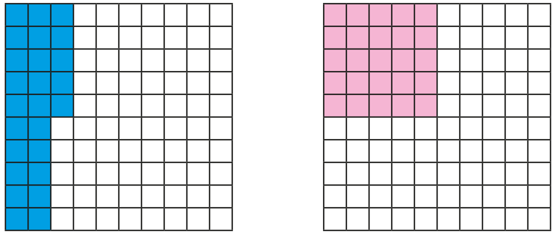
Shade half of the hundred square.

How many squares are shaded?

Complete the equivalent fraction. $\frac{\square}{2} = \frac{\square}{100}$

Write $\frac{1}{2}$ as a decimal.

- $\frac{1}{4}$ has been shaded on both hundred squares.



What do you notice?

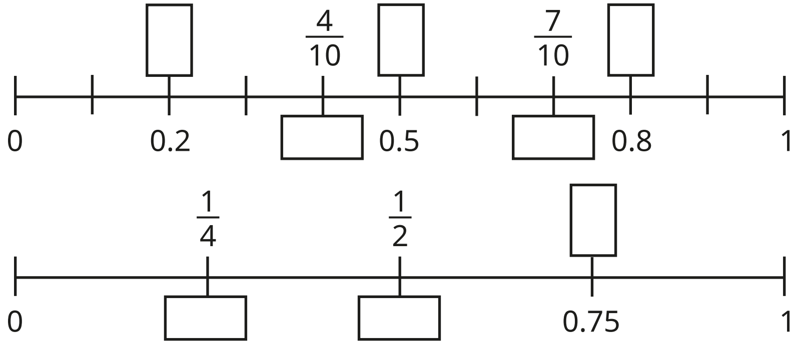
How many hundredths are shaded?

Write $\frac{1}{4}$ as a decimal.

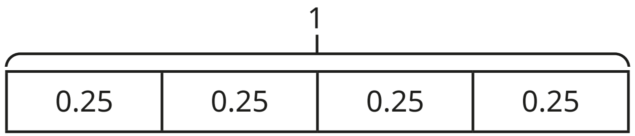
- Draw place value counters to show the decimal equivalent of $\frac{3}{4}$

Ones	Tenths	Hundredths

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



- Shade three-quarters of the bar model and complete the sentence.



$\frac{3}{4}$ = 0.___ ___

- Match the fractions to their decimal equivalents.

$\frac{1}{2}$ $\frac{1}{10}$ $\frac{1}{4}$ $\frac{1}{100}$ $\frac{3}{4}$

0.25 0.1 0.75 0.5 0.01

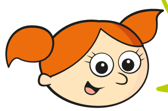
Halves and quarters as decimals

White Rose MATHS

Reasoning and problem solving

Alex is converting fractions to decimals.

If I know $\frac{1}{2}$ is 0.5 as a decimal, I know $\frac{3}{6}$, $\frac{4}{8}$ and $\frac{6}{12}$ are also equivalent to 0.5



Explain Alex's thinking.

$\frac{3}{6}$, $\frac{4}{8}$ and $\frac{6}{12}$ are equivalent fractions to $\frac{1}{2}$, so they are all equivalent to 0.5

Teddy is converting fractions to decimals.

$\frac{1}{2}$ = 1.2 $\frac{1}{4}$ = 1.4 $\frac{3}{4}$ = 3.4

Do you agree with Teddy?

Explain your reasoning.

No

Which is the odd one out?

$\frac{75}{100}$ $\frac{3}{4}$ 0.75

$\frac{7}{10}$ $\frac{15}{20}$

Explain your reasoning.

$\frac{7}{10}$, because

$\frac{75}{100} = \frac{3}{4} = 0.75 = \frac{15}{20}$

Kim writes fractions as decimals using a place value chart.

She represents $\frac{5}{10}$ like this.

Ones	Tenths
0	5

She represents $\frac{1}{2}$ like this.

Ones	Tenths
0	2

Do you agree with Kim?

Explain your reasoning.

No

Kim has correctly converted $\frac{5}{10}$ to a decimal, but $\frac{1}{2}$ is equivalent to $\frac{5}{10}$, so $\frac{1}{2}$ = 0.5

Summer Block 2

Money

Small steps

Step 1	Write money using decimals
Step 2	Convert between pounds and pence
Step 3	Compare amounts of money
Step 4	Estimate with money
Step 5	Calculate with money
Step 6	Solve problems with money

Write money using decimals

Notes and guidance

Children have previously explored the values of coins and notes, and added and subtracted amounts of money within the same denomination. In Year 3, amounts of money in pounds and pence were presented as, for example, "£4 and 25p". In this small step, children are introduced to decimal notation for the first time, for example £4.25. The focus of the step is the ability to write a given amount in decimal notation and to represent amounts that are given in decimal notation.

Children explore the use of pounds and pence notation and develop the understanding that the digits following the decimal point represent part of a pound. They should link to their earlier learning that £1 = 100p and 1 whole = 100 hundredths.

Converting between pounds and pence is covered in the next step.

Things to look out for

- Children may omit zeros, for example writing both £2 and 50p and £2 and 5p as £2.5
- Unfamiliarity with the use of the pound and pence notation may lead to incorrect notation, such as £4.25p or 4.25p

Key questions

- How many pounds are there?
  How many pence are there?
- How many pence are there in £1?
  How many hundredths are there in 1 one?
- How do you write the amount as a decimal?
- How do you write £______ and ______p as a decimal?
- How do you write £2 and 50p/£2 and 5p in decimal form?
- What is the same and what is different about the ways of writing the amount of money? Which is easier to understand?

Possible sentence stems

- There are ______ pence in £1
  There are ______ hundredths in 1 one.
- ______ pounds and ______ pence = £______.______

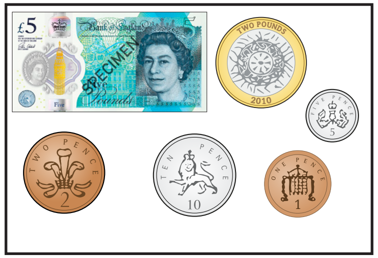
National Curriculum links

- Estimate, compare and calculate different measures, including money in pounds and pence

Write money using decimals

Key learning

- Complete the sentences to show how much money is in each box.



There is ______ pounds.

There is ______ pence.

There is £______ and ______p.

There is £______.______

- How much money is there?

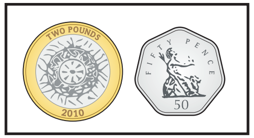
Write your answer as a decimal.

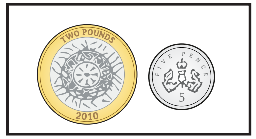
- Draw coins or notes to show each amount.
  - £2.43
  - £6.95
  - £12.59
  - £0.87

Compare answers with a partner.

- How much money is there?

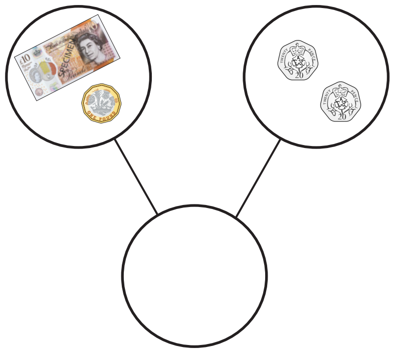
Write the amounts as decimals.

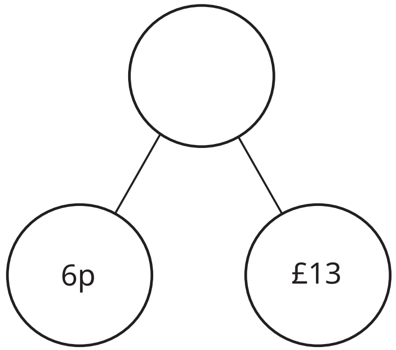




What is the same? What is different?

- Complete the part-whole models.





- Dani has £3

Nijah has 75p

Huan has £2 and 20p

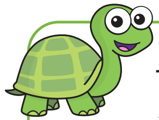
How much money do they have altogether?

Write your answer as a decimal.

Write money using decimals

White Rose MATHS

Reasoning and problem solving



Tiny has three £1 coins, four 10p coins and one 5p coin.

Tiny writes the total amount of money as 3.45p.

Is Tiny correct?

Explain your answer.

No

Filip has an amount of money less than £10

- He only has £1 and 10p coins.
- He has an odd number of 10p coins.
- He has twice as many £1 coins as 10p coins.

How much money could Filip have?

£2.10 or £6.30

Scott has these coins.

He picks three coins at a time.

Decide if the statements are true or false.

He can make a total that has a final digit of 2	False
He can make an odd number of pence.	True
He can make an amount greater than £4.50	True
He can make a total that is less than £1.20	True

Explain your answers to a partner.

Convert between pounds and pence

Notes and guidance

In this small step, children move from reading and writing money using decimal notation to converting between different types of notation and between different units of money.

Children use the fact that £1 = 100p to convert from pounds and pence in decimal notation to pence, and vice versa. They could use a part-whole model to express the total amount partitioned into pounds and pence and then convert each of the pounds to 100 pence. They should also be confident in converting amounts less than one pound, especially noting the difference between, for example, £0.80 and £0.08. This is also a good opportunity to reinforce the value of each coin and how its value can be written in decimal form.

This step provides a foundation for comparing amounts of money expressed in different formats.

Things to look out for

- Children may make errors with placeholders, for example thinking £4.20 is equal to 42 pence.
- Children may make errors with place value, for example writing 425p as £42.5 or £0.425
- Children may use the pound and pence notation incorrectly, for example £425p, £4.25p or 4.25p.

Key questions

- How many pounds are there?
- How many pence are there?
- How many pence are there in £1/£2/£10?
- How do you write 343p using a pound sign?
- How can you partition the amount into pounds and pence?
- How can you convert the amounts into pounds and pence?

Possible sentence stems

- There are ______ pence in ______ pounds.
- ______ pence = ______ pounds and ______ pence = £______.______
- £______.______ = ______ pounds and ______ pence = ______ pence

National Curriculum links

- Estimate, compare and calculate different measures, including money in pounds and pence

Convert between pounds and pence

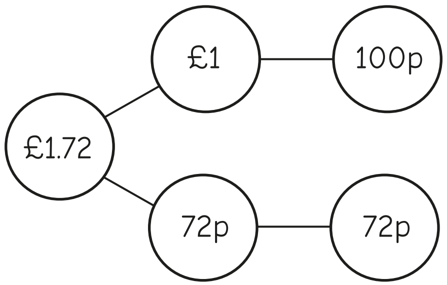
Key learning

- Use the fact to help you work out the missing numbers.

  £1 = 100p

  - £2 = ______p
  - £6 = ______p
  - £______ = 300p

- Eva converts £1.72 into pence by partitioning.



  £1.72 = 172p

  Use Eva's method to write the amounts in pence.

£1.48	£2.37	£6.45	£10.12	£8.02

- Max converts 415p into pounds and pence as a decimal.

  415p = 400p + 15p
  = £4 and 15p
  = £4.15

  Use Max's method to convert the amounts to pounds and pence as decimals.

185p	340p	240p	204p	959p

- Match the equal amounts.

£5.70	£0.75	£5.07	£0.57	£7.50

750p	570p	57p	507p	75p

- Which amount is 2 pounds more than £3.46?

£3.48	£3.66	£5.46	£23.46

  Which amount is 2 pence more than £3.46?

£3.48	£3.66	£5.46	£23.46

- Annie has £4.23

  She buys a sticker for 20p.

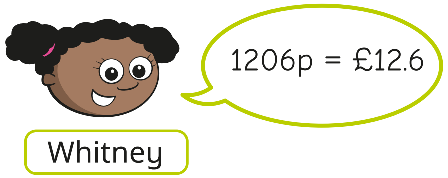
  How much money does she have left?

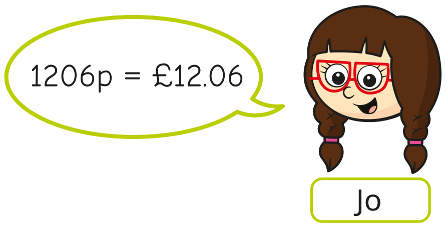
  Write your answer in pence only.

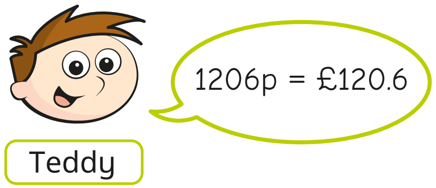
Convert between pounds and pence

Reasoning and problem solving

Whitney, Jo and Teddy are converting 1206p into pounds.







Who is correct?

What have the other children done wrong?

Jo

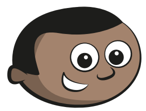
Is the statement true or false?

> When writing money in decimal notation, there are always two digits after the decimal point.

Explain your answer.

True

Mo has four different coins.



How much money could Mo have?

Write the amounts in decimal form.

Convert your amounts to pence.

Compare answers with a partner.

multiple possible answers, e.g.
£2.13, 213p
£1.65, 165p

Compare amounts of money

Notes and guidance

In this small step, children use the fact that £1 = 100p to compare amounts of money.

Children begin by comparing amounts represented in the same format, for example 4,562p and 3,750p or £45.62 and £37.50, and make their choices based on their knowledge of place value. They then compare amounts written in different formats, using their learning from the previous two steps to convert to a common format. Discuss the range of possible formats children can choose between and which they find easier to compare. The physical or pictorial representation of notes and coins, as well as number lines, can support children's visualisation and understanding of place value.

Once children are comfortable comparing two amounts in different formats they can begin to order a set of amounts.

Things to look out for

- Children may need reminding of the meaning of "ascending" and "descending".
- Children may ignore the units and only consider the numbers, for example 347p > £18 or £4.26 < 5p.
- Children may make mistakes when converting amounts given in different formats.

Key questions

- What is the value of each digit in the number?
- What place value column is the ______ in?
- How many pounds and pence are there?
- Which digit tells you which amount is greater?
- What amount could go in between these amounts?
- What does "ascending"/"descending" mean?
- Are the amounts in the same units? Why does this matter?

Possible sentence stems

- There are ______ pounds and ______ pence.
  This is greater/less than ______ pounds and ______ pence.
- To convert from ______ to ______, I need to …

National Curriculum links

- Estimate, compare and calculate different measures, including money in pounds and pence

Compare amounts of money

White Rose MATHS

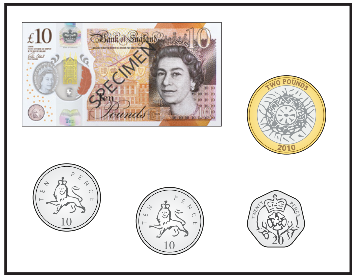
Key learning

- Two classes save their pennies for a year.
  - Class A saves 3,589 pennies.
  - Class B saves 3,859 pennies.

  Which class saves the most money?

  Explain your answer to a partner.

- Write <, > or = to compare the amounts.

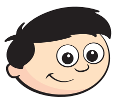
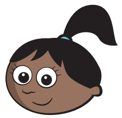


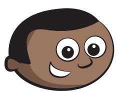
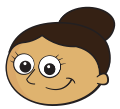
◯

  Compare methods with a partner.

- Four children spend money in a shop.

  Write <, > or = to compare how much the children spend.

 £3.57 ◯ £3.75 

 £4.08 ◯ £4.24 

- Write the amounts as pence, then compare using <, > or =.

  6,209p ◯ £60.09   £0.54 ◯ 54p

  Write the amounts as pounds, then compare using <, > or =.

  62p ◯ £6.02   £5,010 ◯ 5,010p

- Estimate the position of each amount on the number line.

  £3.50   750p   99p

  8 pounds and 20 pence   999p

  Order the amounts, starting with the greatest amount.

- Write the amounts in ascending order.

  130p   £0.32   132p   £13.20

  Write the amounts in descending order.

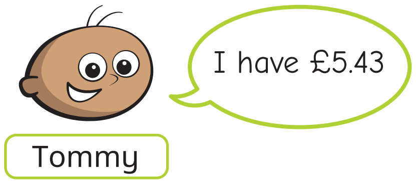
  257p   £2.50   2,057p   £25.07

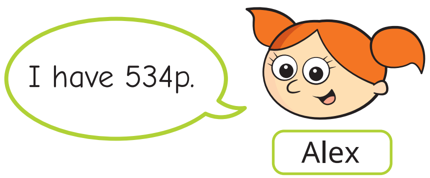
Compare amounts of money

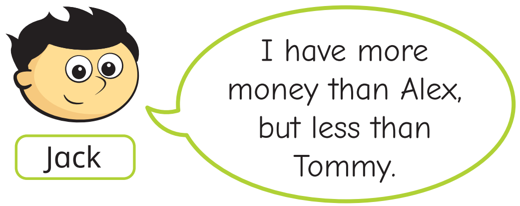
White Rose MATHS

Reasoning and problem solving

Tommy, Alex and Jack each have some money.







What is the least amount of money that Jack could have?

What is the greatest amount of money that Jack could have?

£5.35 or 535p

£5.42 or 542p

Tom uses the digit cards to make an amount of money.

4	6	3	2

£ ☐ . ☐ ☐

He makes a total that is more than £3, but less than £6

Find all the amounts that Tom can make.

Write them in ascending order.

£3.24, £3.26, £3.42, £3.46, £3.62, £3.64, £4.23, £4.26, £4.32, £4.36, £4.62, £4.63

Which is the greater amount of money, three £1 coins or fifteen 20p coins?

Explain your answer.

They are equal.

£3 = 300p

Estimate with money

Notes and guidance

In this small step, children use their previous learning on estimating to estimate with money.

Recap rounding to the nearest 10, covered in Autumn Block 1, and use this to round amounts to the nearest 10p to estimate totals or differences. Although it is beyond Year 4 requirements to formally round numbers with 2 decimal places, children can make estimates for calculations such as £3.99 + £7.02 by considering the number of pence represented in the amounts and how close they are to whole numbers of pounds. Alternatively, they could convert both amounts to pence and revisit rounding to the nearest 100

Number lines are an important representation to support children with estimation. For example, children can position the amount on a number line between the whole numbers of pounds that come before and after the amount they are working with.

Things to look out for

- Children may use the wrong place value column, for example £2.19 is closer to £3 because of the digit 9
- Children may be unsure which whole numbers of pounds the given amount is between.

Key questions

- What is the multiple of 10p before ______ p?
  What is the multiple of 10p after ______ p?
  Which multiple of 10p is it nearer to?
- What does "estimate" mean?
- What does "approximately" mean?
- What is £______.______ in pounds and pence?
  Which whole number of pounds is it closer to?
- How can you use a number line to help estimate?

Possible sentence stems

- ______ p is closer to ______ p than ______ p.
- The approximate total cost is ______ p + ______ p = ______ p.
- £______.______ is closer to £______ than £______

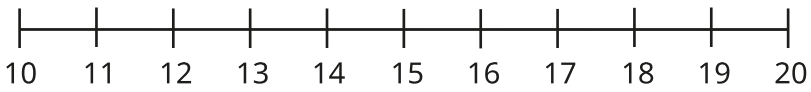
National Curriculum links

- Estimate, compare and calculate different measures, including money in pounds and pence

Estimate with money

Key learning

- Use the number line to work out which multiple of 10p each amount is closer to.



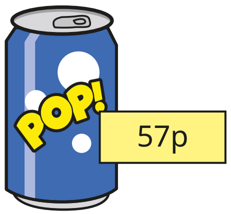
  - 18p is closer to ______p than ______p.
  - 14p is closer to ______p than ______p.

- Round the amounts to the nearest 10p.

47p	32p	89p	64p	75p	142p

  How else can 142p be written?

- Dani buys a chocolate bar and a drink.

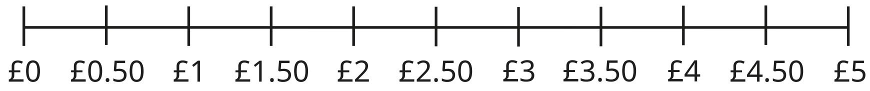


  Estimate the total cost of the chocolate bar and the drink.

  Will the actual total cost be more or less than your estimate?

- Estimate the position of each amount on the number line.

£3.20	£2.70	£1.86	90p	490p



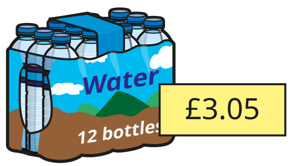
  Complete the sentence for each amount.

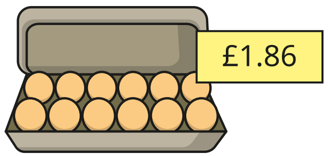
  £______.______ is closer to £______ than £______

- Amir is estimating the total of £3.96 and £2.05

  How did Amir make his estimates?

- Estimate the total cost of the water and the eggs.





Estimate with money

Reasoning and problem solving

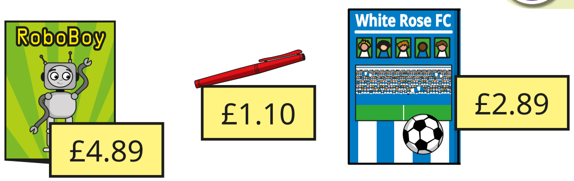
Tiny is rounding money.

Do you agree with Tiny?

Explain your answer.

No

Scott has 775p.



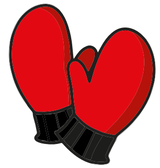
Use estimation to show that Scott cannot afford to buy all three items.

Which items can he afford?

£5 + £1 + £3 = £9

Scott only has £7.75, which is less than £9

Max buys some socks and mittens.

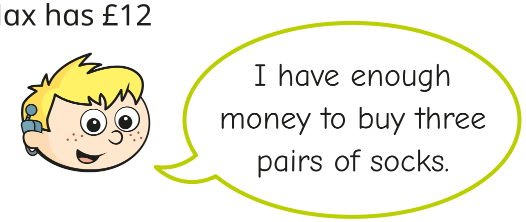


He estimates how much he will spend.

£4 + £5 = £9

What could the actual price of the socks and mittens be?

Max has £12



Do you agree with Max?

Explain your answer.

socks: between £3.50 and £4.49

mittens: between £4.50 and £5.49

It depends on the actual price of the socks.

Calculate with money

Notes and guidance

In Year 3, children learnt to add and subtract money. In this small step, they extend their learning to include multiplying and dividing with money, which is developed further in the next step.

Although children are not expected to formally add and subtract decimals in Year 4, informal methods such as partitioning and number lines can be used to support them when calculating with money. A part-whole model allows them to partition an amount into pounds and pence and then add the pounds and pence separately. A number line is a useful representation for children to count on, or to count back, in order to calculate the difference between two amounts.

Encourage children to use their estimating skills from the previous step to check their answers.

Things to look out for

- Children may not exchange 100p for £1 when adding the pounds and pence separately, for example £3.40 + £4.80 = £7.120
- When subtracting the pence separately, children may always subtract the smaller amount from the larger amount instead of exchanging from the pounds when necessary, for example £4.20 – £1.50 = £3.30

Key questions

- How many pounds are there altogether?
- How many pence are there altogether?
- How can you use partitioning to help with the calculation?
- How can a number line help you to add/subtract the amounts?
- Are you going to count on or count back on the number line? Does it matter which method you use?
- Do you need to exchange any pounds for pence?
- How can you use estimation to check your calculation?

Possible sentence stems

- I can partition £_____._____ into _____ pounds and _____ pence.
- _____ pounds +/– _____ pounds = _____ pounds and _____ pence +/– _____ pence = _____ pence, so the total/difference is _____ pounds and _____ pence.

National Curriculum links

- Estimate, compare and calculate different measures, including money in pounds and pence

Calculate with money

White Rose MATHS

Key learning

- Complete the workings to find the total cost of a hat and a scarf.

£2 + £3 = £______

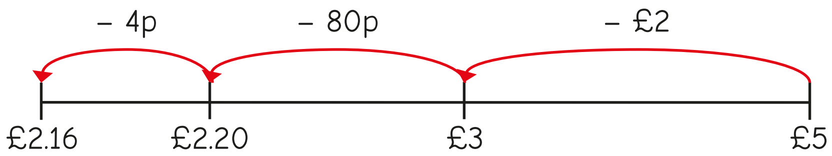
45p + 25p = ______p

£______ + ______p = £______.______

Use this method to work out the cost of:

- a pair of mittens and a hat
- a scarf and a pair of mittens

- Nijah uses a number line to work out £5 – £2.84

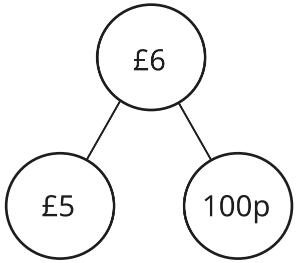


£5 – £2.84 = £2.16

Use Nijah's method to work out the subtractions.

£5 – £3.24	£10 – £6.47	£8.56 – £7.21	£9.53 – £2.46

- Esther uses partitioning to work out £6 – £3.26



£5 – £3 = £2
100p – 26p = 74p
£6 – £3.26 = £2.74

Use Esther's method to work out the subtractions.

£5 – £1.89	£10 – £8.43	£6 – £2.75	£9 – £2.46

- Huan pays for a bag with £7

  He gets this change.

  How much does the bag cost?

- Work out the calculations.
  - £20 × 3 = £______
  - 40p × 4 = ______p
  - 5p × 12 = ______p
  - 80p ÷ 2 = ______p
  - 40p ÷ 4 = ______p
  - £1 ÷ 5 = ______p

- Four children share £1.20 equally between them.

  How much do they each get?

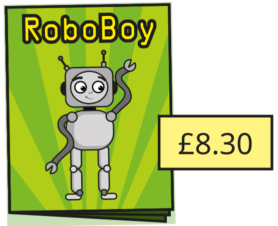
Calculate with money

Reasoning and problem solving

Eva has £10

Has she got enough to buy a book and a teddy?

Explain your answer.



What combinations of items could Eva buy with £10?

No

---

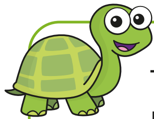
teddy and boat

2 teddies and boat

3 teddies and boat

2, 3, 4 or 5 teddies

2 boats



Tiny is working out £12.50 – £6.80 by partitioning into pounds and pence.

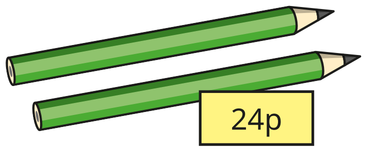
£12 – £6 = £6
80p – 50p = 30p
£12.50 – £6.80 = £6.30

What mistake has Tiny made?

What is the correct answer?

£5.70

Two pencils cost 24p.



Mo has £1

How many pencils can he buy?

8

Solve problems with money

Notes and guidance

In this small step, children apply their calculating skills with money to solve problems using all four operations in real-life contexts, including multi-step problems. At this stage, children are not expected to use formal methods to calculate with decimals, but they could use methods such as partitioning for addition and subtraction, as explored in the previous step.

Children draw on their knowledge from earlier steps to help them to convert between amounts of money expressed in different formats, and to use decimal notation accurately. Bar models, part-whole models and number lines are all useful ways to represent the calculations. Place value charts and counters could also be used, particularly when children need to make exchanges between pounds and pence.

Things to look out for

- Children may need support to identify the correct operation(s).
- Children may need further support when they are required to convert between amounts of money expressed in different formats.
- Children may not see that they can exchange 100p for £1 or £1 for 100p to support them when calculating.

Key questions

- How many pounds are there? How many pence are there?
- Is it helpful to partition the amount into pounds and pence?
- Do you need to make an exchange between the pounds and pence?
- How could you use estimation to check your calculation?
- How could you use a number line/bar model to represent the calculation?
- Which operation do you need to use to answer the question?

Possible sentence stems

- To convert from pounds and pence to just pence, I need to …
- To convert from pence to pounds and pence, I need to …
- First I need to …

  Then I need to …

National Curriculum links

- Estimate, compare and calculate different measures, including money in pounds and pence

Solve problems with money

Key learning

- Sam buys an apple for 24p and a pear for 39p.

  She pays with a £1 coin.

  How much change does she get?

- The table shows the prices of train tickets.

Tickets	Peak	Off-peak
Adult	£8	£6
Child	£5.30	£4.20

  Work out the cost for:

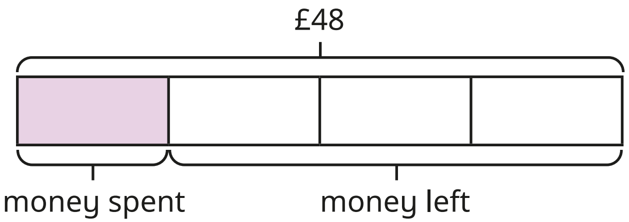
  - one child and one adult at peak time
  - one adult and two children at off-peak time

- Ron has £48

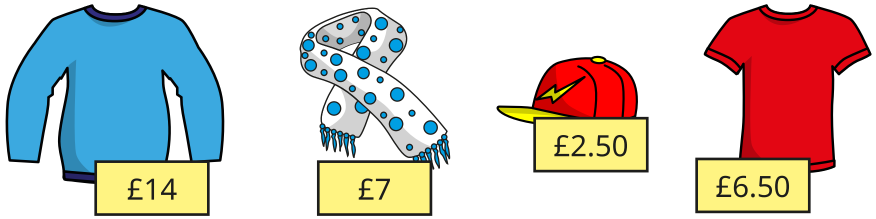
  He spends one quarter of his money.

  How much money does he have left?

  Use the bar model to help you.



- The clothes are put in a half-price sale.



  What is the new cost of each item?

  Teddy buys one of each item in the sale.

  How much does Teddy spend?

  Work out the total cost of three caps and two scarves in the sale.

- Whitney has £4.50, Mo has £3.65 and Brett has £3.85

  They put their money together, then share it out equally.

  How much money do they each have now?

- Jo is buying sweets that cost 7p each.

  She has 97p.

  How many sweets can she buy?

  How much money does she have left?

Solve problems with money

Reasoning and problem solving

Tommy has 20p more than Sam.

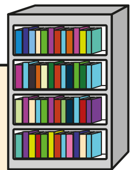
Sam has twice as much money as Alex.

Altogether, the children have £5.20

How much money does Tommy have?

£2.20

Mrs Smith spends £100 on books for her class.



Book prices

Hardback £8
Paperback £4

How many hardback and paperback books could she have bought?

Is there more than one possible answer?

multiple possible answers, e.g.

0 HB and 25 PB

2 HB and 21 PB

12 HB and 1 PB

Dora buys lunch.

Use the information to complete Dora's receipt.

- The sandwich costs £2.15 more than the crisps.
- The orange juice is the same price as the total price of the crisps and banana.
- The banana is half the price of the crisps.

Receipt	
Sandwich	
Orange juice	
Crisps	60p
Banana	
Total	

sandwich: £2.75

orange juice: 90p

banana: 30p

total: £4.55

Summer Block 3

Time

Small steps

Step 1	Years, months, weeks and days
Step 2	Hours, minutes and seconds
Step 3	Convert between analogue and digital times
Step 4	Convert to the 24-hour clock
Step 5	Convert from the 24-hour clock

Years, months, weeks and days

Notes and guidance

In this small step, children recap the relationships between a year, a month, a week and a day from Year 3

Children should explore how a year can be represented on a calendar, which shows the number of days in each month. As a class, to help them to remember this key knowledge, practise rhymes, songs or other memory strategies about the numbers of days in each month.

Children use multiplicative reasoning and related number facts to convert and compare the different units of time. By the end of this step, they will recognise how often a leap year occurs and be able to calculate future leap years. They should recognise that there are approximately 4 weeks in a month, although most months are slightly longer than this.

Things to look out for

- Children may think that there are always exactly 4 weeks in a month.
- Children may need to revisit the number of days in each month regularly before these facts are secure.
- When converting units of time, children may rely on additive reasoning, rather than multiplicative reasoning.

Key questions

- How many days are there in a week?
- How many days are there in the month of ______?
- How many days/weeks/months are there in a year?
- What do you need to do to convert ______ to ______?
- How are leap years different from ordinary years? How often is there a leap year?

Possible sentence stems

- There are ______ days in the month of ______
- There are ______ days in a week, so in ______ weeks there are ______ × ______ = ______ days.
- There are ______ months in a year.
- There are ______ days in a year/leap year.

National Curriculum links

- Solve problems involving converting from hours to minutes, minutes to seconds, years to months, weeks to days

Years, months, weeks and days

Key learning

- Complete the sentences.

  There are ______ days in a week.

  There are ______ months in a year.

  There are ______ days in an ordinary year.

  There are ______ days in a leap year.

  Leap years happen every ______ years.

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

  14 days ◯ 2 weeks

  14 days ◯ 1 month

  14 weeks ◯ 2 months

  36 weeks ◯ 6 months

  12 months ◯ 1 year

  3 years ◯ 30 months

- Tommy uses a number track to count in leap years.

  ▸ Complete the number track.

2016	2020						

  ▸ How many days will there be in 2060?

- Complete the tables.

Days	Weeks
	1
	5
	10
	20
	80

Years	Months
	12
2	
	6
	48
10	

- Here is a calendar from January 2022

January

M	T	W	Th	F	Sa	Su
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

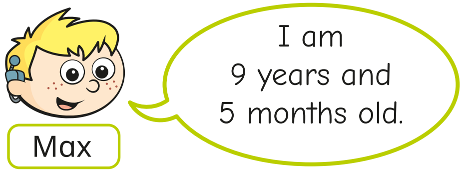
  - Annie's birthday was on the second Saturday of January.
  - Dexter's birthday was on the final Friday of January.
  - Whitney's birthday was 4 days after Annie's birthday.

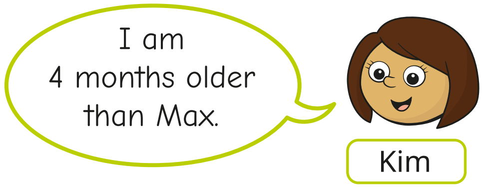
  When is each child's birthday?

Years, months, weeks and days

Reasoning and problem solving

Max and Kim are talking about their ages.





What is the total of their ages?

19 years and 2 months

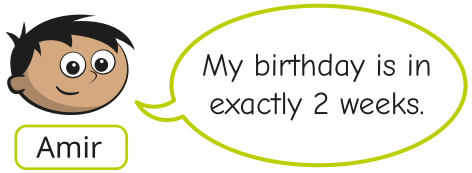
Is the statement always true, sometimes true or never true?

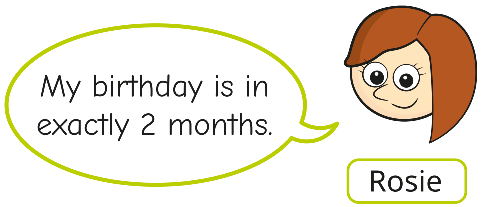
There are 730 days in two consecutive years.

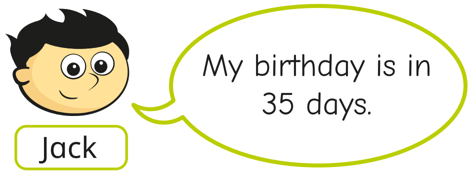
Explain your answer.

sometimes true

Amir, Rosie and Jack are talking about their birthdays.







If today is 8 June, what is the date of each child's birthday?

How many days are there between Jack and Rosie's birthdays?

Amir: 22 June

Rosie: 8 August

Jack: 13 July

26 days

Hours, minutes and seconds

Notes and guidance

In this small step, children recap the number of seconds in a minute and minutes in an hour, building on their learning from Year 3

Children use multiplicative reasoning and related number facts to convert and compare times recorded in hours, minutes and seconds. A secure understanding of the 6 times-table will help children find related number facts linked to time, for example 36 ÷ 6 = 6 and 360 ÷ 60 = 6, so 360 seconds is equivalent to 6 minutes and 360 minutes is equivalent to 6 hours.

Paired work involving one child counting an agreed duration in their head while a partner uses a stopwatch to record the actual time can help children to develop an appreciation of how long seconds and minutes last. Additionally, they could record the length of time it takes in seconds to complete a task, such as running across the playground or writing their name.

Things to look out for

- When converting units of time, children may rely on additive reasoning, rather than multiplicative reasoning.
- Children are familiar with the base 10 number system, so they may assume that there are 100 seconds in a minute or 100 minutes in an hour.

Key questions

- What activity lasts approximately one second/minute/hour?
- How many seconds/minutes/hours do you think it takes you to ______?
- How many minutes are there in ______ hour(s)?
- How many seconds are there in ______ minute(s)?
- If you know that 1 minute is equal to 60 seconds, how many seconds is 3 minutes equal to?

Possible sentence stems

- 1 day = ______ hours, so in ______ days there are ______ × ______ = ______ hours.
- 1 hour = ______ minutes, so in ______ hours there are ______ × ______ = ______ minutes.
- 1 minute = ______ seconds, so in ______ minutes there are ______ × ______ = ______ seconds.

National Curriculum links

- Solve problems involving converting from hours to minutes, minutes to seconds, years to months, weeks to days

Hours, minutes and seconds

White Rose MATHS

Key learning

- Sort the activities into the table, to show approximately how long each one takes to complete.

brush your teeth | run around the playground | blink | write your name | watch a TV show | clap | tie your shoelaces | get dressed

Less than 5 seconds	Less than 1 minute	Less than 5 minutes	Less than 1 hour

Write another activity in each column.

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

30 seconds ◯ 1 minute
300 seconds ◯ 1 minute
30 seconds ◯ $\frac{1}{2}$ minute

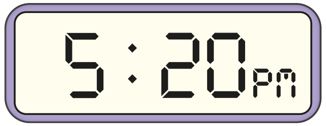
30 minutes ◯ 1 hour
300 minutes ◯ 1 hour
30 minutes ◯ $\frac{1}{2}$ hour

- Complete the tables.

Minutes	Seconds
1	
2	
	240
10	

Hours	Minutes
	60
2	
5	
7	

- The time is 20 minutes past 5 in the evening.



Draw digital clocks to show what time it will be:

5 minutes later | $\frac{1}{2}$ hour later | 120 seconds later | 20 minutes later

- Which lasts longer, $\frac{1}{4}$ of an hour or 600 seconds?

Explain how you know.

Hours, minutes and seconds

Reasoning and problem solving

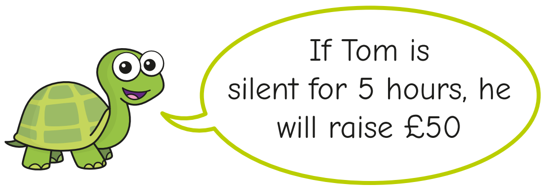
Which is the odd one out and why?

30 hours	30 seconds
30 minutes	12 hours

Is there more than one possible answer?

possible answers:
12 hours – different number
30 hours – only one that is not half of another time unit

Tom is sponsored 10p for every minute of silence.



Do you agree with Tiny?

Explain your answer.

No

Five children run a timed race.

Here are their times.

Name	Time
Dani	114 seconds
Scott	199 seconds
Huan	100 seconds
Aisha	202 seconds
Brett	119 seconds

Whose time is closest to 2 minutes?

Who finished the race in 1st place?

What is the difference between the fastest time and the slowest time?

Give your answer in seconds and in minutes and seconds.

Brett

Huan

102 seconds

1 minute and 42 seconds

Convert between analogue and digital times

Notes and guidance

In this small step, children convert between analogue and 12-hour digital times, reinforcing and building on their learning in Year 3

Discuss with children the importance of knowing whether a time is taking place in the morning or the afternoon and how an analogue clock does not usually show am or pm. Towards the end of this step, children calculate durations of time represented on analogue and 12-hour digital clocks. Use of a blank number line can support finding durations of time or to help children find the start and end times of an activity.

In the next step, children are introduced to the 24-hour digital clock and the concept of am and pm is explored further.

Things to look out for

- Children may confuse am and pm, for example thinking that 1 am should be 1 pm because it is "late".
- Children may need support to understand that times occur twice each day.
- Children may attempt to calculate durations using column subtraction, by taking away the start time from the end time, which will lead to inaccuracies when hours are crossed.

Key questions

- Why is it important to know whether a time is am or pm?
- Does an analogue clock show whether it is am or pm?
- How do you show an analogue time as a 12-hour digital time?
- How will you find the start/end time of the activity?
- How can you use a number line to work out the duration of the activity?
- Do you find it easier to work out how long it is between times using an analogue or a digital clock? Why?

Possible sentence stems

- _______ minutes past _______ is the same as _______ minutes to _______
- 60 – _______ = _______, so the time is _______ minutes to _______
- The time is after/before noon/midnight, so it is _______ am/pm.

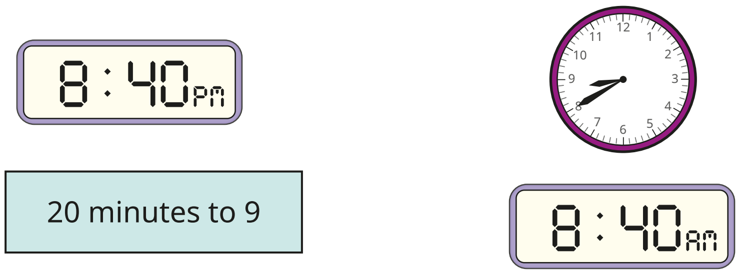
National Curriculum links

- Read, write and convert time between analogue and digital 12- and 24-hour clocks

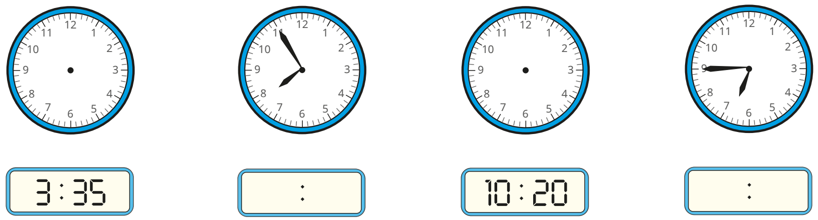
Convert between analogue and digital times

Key learning

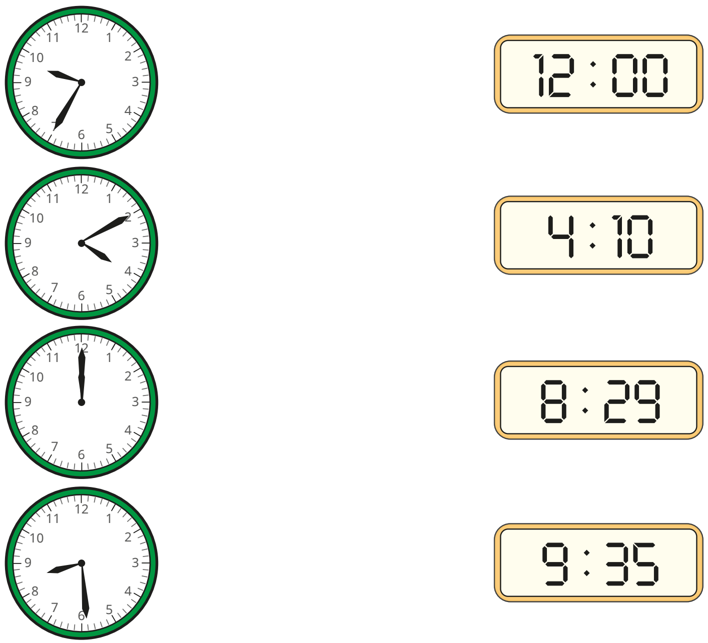
- What is the same and what is different about the times?



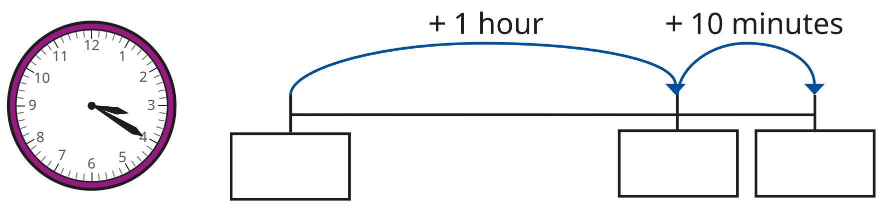
- Complete the clocks so that the analogue clocks and digital clocks show the same time.



- Match the analogue and digital times.



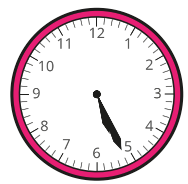
- Nijah leaves school at the time shown.



She arrives home 1 hour and 10 minutes later.

Use the number line to help work out what time it will be when she arrives home, on a 12-hour digital clock.

- Esther gets on a train at this time in the evening.

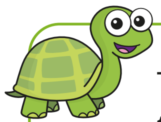


She gets off the train at this time.

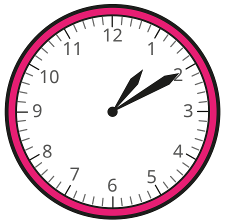
How long was her journey?

Convert between analogue and digital times

Reasoning and problem solving



Tiny converts the analogue time to a 12-hour digital time.



10 : 01

Explain Tiny's mistake.

The minutes and the hour are in the incorrect places.

The time should be 1:10

This time is palindromic.

12 : 21

This means that the digits can be read the same way both forwards and backwards.

Write five other times that are palindromic on a 12-hour digital clock.

multiple possible answers, e.g.

4:04, 6:16, 10:01

On a 12-hour digital clock, how many times will the digit 8 be shown between 2:00 and 3:00?

On a 12-hour digital clock, how many times will the digit 4 be shown between 2:00 and 3:00?

Explain the difference.

6

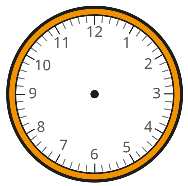
15

Amir looks at a 12-hour digital clock.

The time shows 2:58 pm.

If Amir keeps looking at the clock until the digits are all odd, what time will it be?

Draw hands on the analogue clock to show what time it is.



Convert to the 24-hour clock

Notes and guidance

In this small step, children are introduced to writing 24-hour clock times for the first time.

Children recap the concept of am and pm from Year 3 to support them when converting to the 24-hour clock. They recognise that to convert pm times between 1 pm and 11:59 pm into 24-hour clock times, they add 12 hours to the time. They also learn that 24-hour clock times are always shown with four digits, so if the hour only has one digit, then a zero is placed at the start, for example 09:45

Encourage children to identify what is the same and what is different about 12-hour and 24-hour digital clocks displaying the same time. Using clocks, watches, smartphones and computers can help with this.

Things to look out for

- Children may think that 10 hours are added to pm times rather than 12, for example thinking that 6 pm is 16:00
- Children may not place a zero at the beginning of am times where the hour has 1 digit, such as 06:38
- Children may also add 12 hours to am times.
- Children may write midnight as 24:00

Key questions

- How many hours are there between noon and midnight?
- Is ______ earlier or later than ______?
- What is the same/different about 5 am on a 24-hour digital clock and on a 12-hour digital clock?
- What is the same/different about 5 pm on a 24-hour digital clock and on a 12-hour digital clock?
- Do you always need to add 12 to the hours to convert a time to the 24-hour clock? Why/why not?
- How many digits does a time on a 24-hour clock have?

Possible sentence stems

- To convert to the 24-hour digital clock, I add ______ to the hours if the time is between ______ and ______
- A 24-hour clock time should always have ______ digits.

National Curriculum links

- Read, write and convert time between analogue and digital 12- and 24-hour clocks

Convert to the 24-hour clock

White Rose MATHS

Key learning

- Both clocks show half past 6 in the morning.

  6:30 AM   06:30

  What is the same about the clocks? What is different?

- Both clocks show half past 6 in the evening.

  6:30 PM   18:30

  What is the same about the clocks? What is different?

- Sort the times into the table.

  17:15   12:41   05:53

  00:29   10:38   23:05

am	pm

- Match the 12-hour clock times to the 24-hour clock times.

7:30 am	19:30
7:30 pm	21:30
9:30 am	09:30
9:30 pm	11:30
11:30 am	07:30

- Write 24-hour clock times to complete the sentences.
  - ______ is 25 minutes to 8 in the morning.
  - ______ is 10 minutes past 3 in the afternoon.
  - Quarter to 10 in the evening is ______

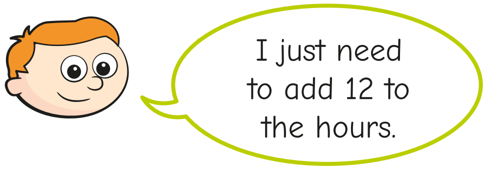
- Write the times as 24-hour clock times.
  - 11:38 am
    11:38 pm
  - 12:38 am
    12:38 pm
  - 1:38 am
    1:38 pm

  What do you notice?

Convert to the 24-hour clock

Reasoning and problem solving

Ron is converting to 24-hour clock times.



Here are Ron's answers.

12-hour time	24-hour time
1:45 pm	13:45
10:17 am	22:17
8:39 pm	20:39
5:09 am	17:09

Do you agree with Ron?

Explain your answer.

No

Dora has converted 12-hour clock times to 24-hour clock times.

12-hour time	24-hour time
10:00 pm	22:00
11:00 pm	23:00
12:00 midnight	24:00

What mistake has Dora made?

12:00 midnight should be written as 00:00

Which time is the odd one out?

midnight	12:00	00:00

Explain your answer.

Is there more than one possible answer?

possible answers:
Midnight, as it is written in words.
12:00 because it refers to 12 noon and the other two refer to midnight.

Convert from the 24-hour clock

White Rose MATHS

Notes and guidance

Building on the previous step, in this small step children reinforce their understanding of the 24-hour clock format by converting to 12-hour clock times and representing them on analogue clocks.

Children use the knowledge that there are 24 hours in a day and that a new day starts at midnight, 00:00, to help them to understand why they subtract 12 hours to convert a time after 1 pm from a 24-hour clock time to a 12-hour clock time. Discuss with children whether a 24-hour time is before or after noon and what changes need to be made.

Children could consider an event they do during the day, such as brushing teeth/eating lunch, and then convert the 24-hour clock time into the 12-hour clock time.

Things to look out for

- Children may omit am/pm when making conversions.
- Children may subtract 12 hours from times between 12:00 and 13:00, which will lead to incorrect conversions, for example 12:43 to 0:43 pm.
- Children may subtract 10 instead of 12

Key questions

- What is the same/different about 5 am/5 pm on a 24-hour digital clock and a 12-hour digital clock?
- How do you know if a 24-hour clock time is before or after noon?
- How do you convert ______ to a 12-hour clock time?
- Do you always subtract 12 hours to convert from a 24-hour clock time?
- Why is it important to remember to write am or pm when you have converted to a 12-hour clock time?

Possible sentence stems

- To convert from a 24-hour clock time, I subtract ______ from the hours if the time is ______ 13:00
- When I convert a 24-hour clock time before/after noon, I write ______ after the time.

National Curriculum links

- Read, write and convert time between analogue and digital 12- and 24-hour clocks

Convert from the 24-hour clock

White Rose MATHS

Key learning

- The times have been converted from 24-hour clock times to 12-hour clock times.

00:05	→ 12:05 am
03:05	→ 3:05 am
12:05	→ 12:05 pm
15:05	→ 3:05 pm

What do you notice?

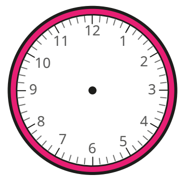
- Match the 24-hour clock times to the 12-hour clock times.

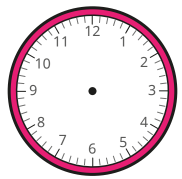
00:28	11:28 pm
12:28	1:38 pm
11:28	12:28 pm
01:28	1:28 am
23:28	12:28 am
13:38	11:28 am

- Complete the sentences.
  - 10:35 is 25 minutes to 11 in the ______
  - 13:11 is 11 minutes past ______ in the ______
  - 19:45 is quarter to 8 in the ______
  - 04:30 is half past ______ in the ______

- Convert each 24-hour clock time to 12-hour clock time.

Draw your answer on both clocks.

13:45  [:]

16:38  [:]

- Convert the 24-hour clock times to 12-hour clock times.
  - 06:17
  - 12:43
  - 08:52
  - 20:14
  - 18:17
  - 00:43
  - 22:01
  - 10:29

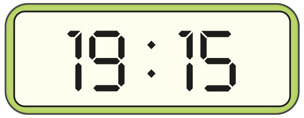
Convert from the 24-hour clock

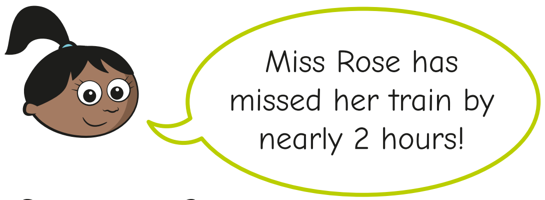
White Rose MATHS

Reasoning and problem solving

Miss Rose's train leaves at 25 minutes past 7 in the evening.

When she arrives at the station to catch her train, her watch shows this time.





Is Sam correct?

Explain your answer.

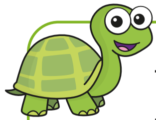
No

Miss Rose's train journey lasts 1 hour and 42 minutes.

What time does she arrive?

Write your answer as a 12-hour clock time.

9:07 pm



Tiny converts the 24-hour clock times into 12-hour clock times.

24-hour time	12-hour time
12:45	12:45 am
10:45	10:45 am
09:45	9:45 am
17:45	7:45 pm

Do you agree with Tiny?

Explain your answer.

No

Scott looks at the 24-hour time on his phone.

The hours and the minutes each have the same digits in the same order.

What time could his phone be showing?

Write the 24-hour clock time and the 12-hour clock time.

multiple possible answers, e.g.

01:01, 1:01 am
12:12, 12:12 pm
23:23, 11:23 pm

Summer Block 4

Shape

Small steps

Step 1	Understand angles as turns
Step 2	Identify angles
Step 3	Compare and order angles
Step 4	Triangles
Step 5	Quadrilaterals
Step 6	Polygons
Step 7	Lines of symmetry
Step 8	Complete a symmetric figure

Understand angles as turns

Notes and guidance

In Year 3, children explored full, half and quarter turns, using the language of clockwise and anticlockwise. This small step is an opportunity for children to revisit that learning.

Begin by recapping full, half and quarter turns. Ask children to stand up and turn as instructed, including a variety of different turns both clockwise and anticlockwise. Discuss the significance of clockwise and anticlockwise in this context, using the hands of a clock to demonstrate if needed. Children explore different turns from different starting points, including using compass directions. They then work out the turn after being given a start and end position. They also consider what a pictorial representation of an angle looks like and how this relates to turns.

Things to look out for

- Children may confuse clockwise and anticlockwise.
- Children may need reminding about the meaning of half, quarter and three-quarters.
- Children may relate angles to the distance between two points on a line rather than the measure of turn between the lines.

Key questions

- What is a full turn?
- What is the difference between a half turn and a quarter turn?
- Which way do the hands move around a clock?
- What does "clockwise"/"anticlockwise" mean?
- What direction will you be facing if you complete a ______ turn clockwise/anticlockwise?
- If you were facing ______ and are now facing ______, what turn have you made? Is there more than one answer?

Possible sentence stems

- I am now facing ______
  If I make a ______ turn clockwise/anticlockwise, I will be facing ______
- To make a three-quarter turn, I could make a ______ turn followed by a ______ turn.
- A ______ turn clockwise is the same as a ______ turn anticlockwise.

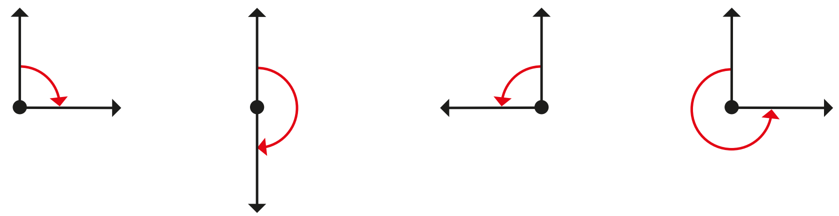
National Curriculum links

- Recognise angles as a property of shape or a description of a turn (Y3)

Understand angles as turns

Key learning

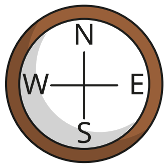
- Match the turns to the labels.



half turn clockwise	quarter turn anticlockwise	quarter turn clockwise	three-quarter turn anticlockwise

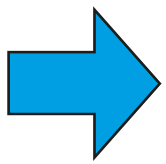
- Teddy is facing north.

  What direction will Teddy be facing if he turns:



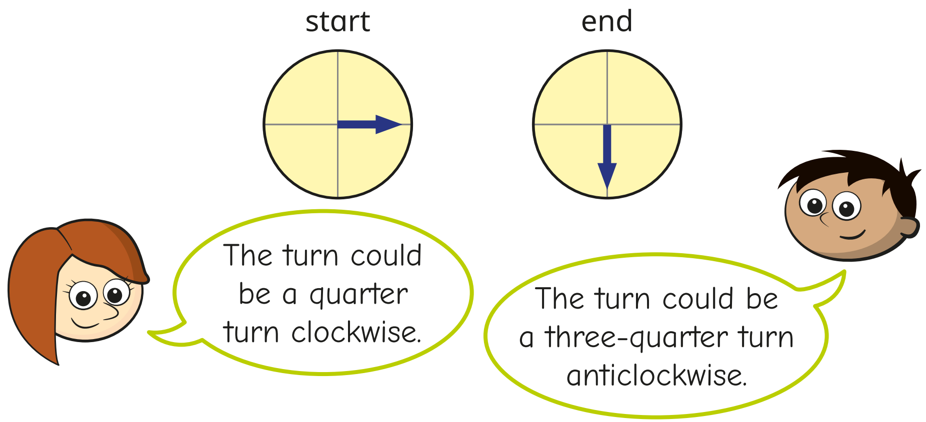
  - a quarter turn clockwise
  - a half turn anticlockwise
  - a three-quarter turn clockwise?

- Draw what this arrow will look like after:



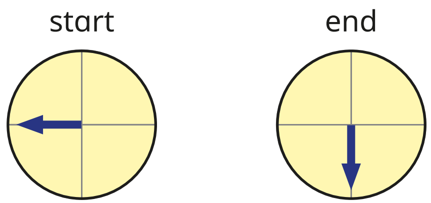
  - a quarter turn clockwise
  - a half turn
  - a three-quarter turn clockwise.

- Rosie and Amir spin an arrow on a spinner.



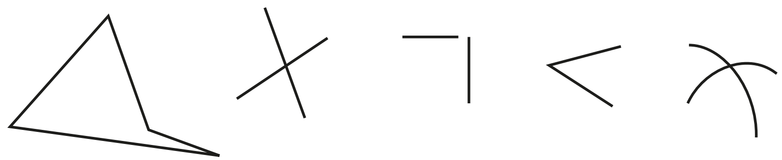
  Why are both children correct?

  Describe this turn.



  Is there more than one way to describe the turn?

- Which pictures show at least one angle?



Understand angles as turns

White Rose MATHS

Reasoning and problem solving

Dani, Nijah and Brett are all facing the same direction.

Dani turns a half turn clockwise three times.

Nijah turns a quarter turn anticlockwise six times.

Brett turns two full turns clockwise.

Do you agree with Tiny?

Explain your answer.

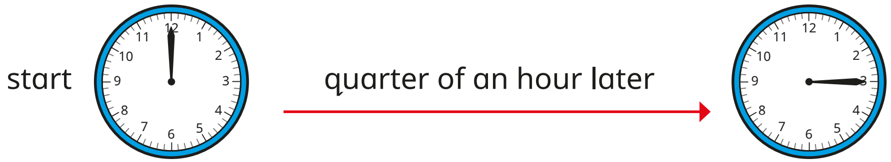
No

How many different ways can you describe the turn?

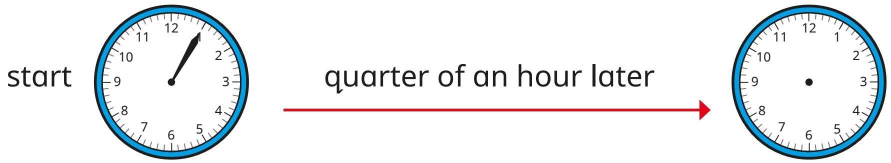
multiple possible answers

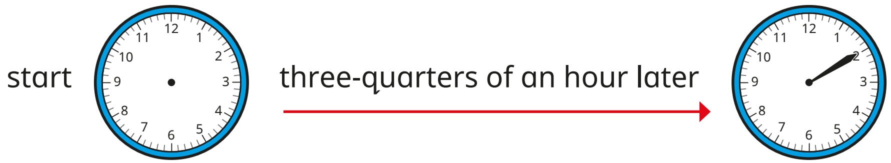
This clock has lost its hour hand.

After a quarter of an hour, the minute hand turns a quarter turn clockwise.



Draw the missing minute hands on the clocks.





pointing to 4

pointing to 5

Identify angles

Notes and guidance

Children learnt about right angles being quarter turns in Year 3. In this small step, they also classify angles as acute and obtuse.

This is the first time that children have encountered these words, so time should be spent exploring them fully. Show that when a turn is completed, an angle is created. For a quarter turn, this angle is called a right angle. Explain that any angle that is less than a right angle is called an acute angle. Model different examples of acute angles, the greatest of which is only slightly less than a right angle. Then show that an angle greater than a right angle, but less than a half turn, is called an obtuse angle. A right-angle finder can be a useful support for children in identifying acute and obtuse angles accurately.

At this stage, children do not need to explore reflex angles or use degrees as a measure of turn. This will be covered in Year 5

Things to look out for

- Children may initially think that there is only one acute and one obtuse angle (usually $\frac{1}{8}$ and $\frac{3}{8}$ of a turn) in the same way that there is only one right angle.
- Children may think that any angle greater than a right angle is obtuse.

Key questions

- What is an angle?
- What type of angle is created by a quarter turn?
- What type of angle is created by a turn less than a quarter turn?
- What type of angle is created by a turn that is greater than a quarter turn, but less than a half turn?
- What type of angle is made by this turn?
- Are all right/acute/obtuse angles the same amount of turn?

Possible sentence stems

- A quarter turn is called a ______ angle.
- An angle less than a quarter turn is called an ______ angle.
- An ______ angle is greater than a quarter turn, but less than a half turn.

National Curriculum links

- Identify acute and obtuse angles and compare and order angles up to two right angles by size

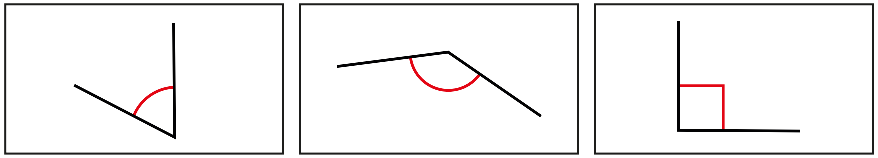
Identify angles

Key learning

- What fraction of a turn is a right angle?

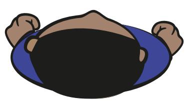
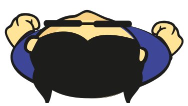
  How many right angles can you see in your classroom?

- Match the pictures, descriptions and types of angles.



less than a quarter turn	quarter turn	greater than a quarter turn, but less than a half turn
right angle	obtuse angle	acute angle

- Mo and Annie are facing the same direction.

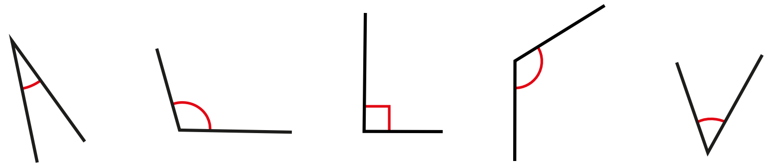
Mo   Annie

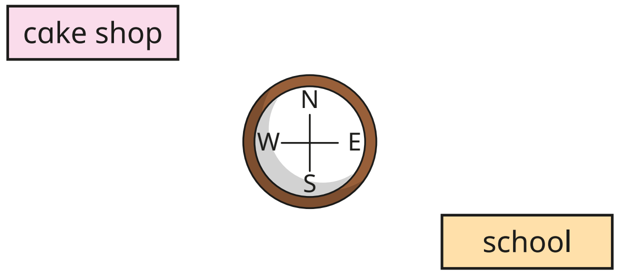
Mo turns one-quarter turn clockwise.

Annie turns less than Mo in the same direction.

What type of angle has each of them turned through?

- Write **acute**, **obtuse** or **right angle** to label each angle.



- 

  - Huan is facing east.

    He turns clockwise to face the school.

    What type of angle does he turn through?
  - Esther is facing the cake shop.

    She turns anticlockwise to face south.

    What type of angle does she turn through?
  - Aisha is facing west.

    She turns clockwise to face north.

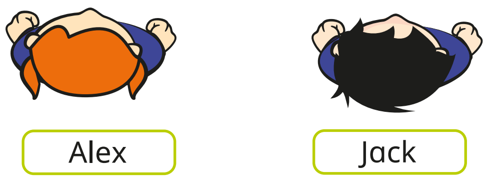
    What type of angle does she turn through?

Identify angles

White Rose MATHS

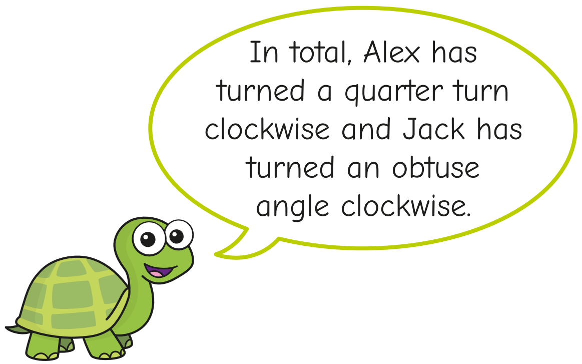
Reasoning and problem solving

Alex and Jack are both facing the same direction.



Alex turns two acute angles clockwise.

Jack turns three acute angles clockwise.



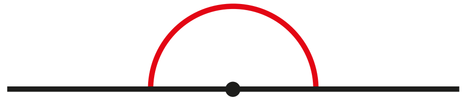
Do you agree with Tiny?

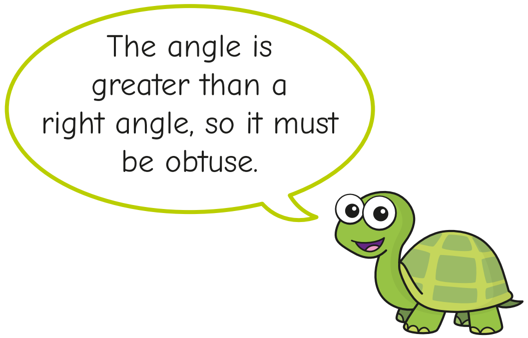
Explain your answer.

No

Both children could have turned small acute angles, still totalling an acute angle.

Tiny is labelling angles.





Do you agree with Tiny?

Explain your answer.

No

Compare and order angles

Notes and guidance

In this small step, children continue to explore angles as a measure of a turn by comparing and ordering angles.

Begin by recapping acute, right and obtuse angles. Children should see that a right angle is a greater angle than any acute angle, and any obtuse angle is greater than a right angle. They identify different types of angles, and use this information to compare and order the angles. They then move on to comparing two angles of the same type. Model how to show which angle between two acute angles is greater. This can be done by inspection, by adding in extra lines or by comparing each angle to a right angle to see which is closer. Children order sets of angles from smallest to greatest; they may choose to group the angles by type before making further comparisons. They also draw angles that are greater or less than given angles.

Things to look out for

- Children may confuse the terms "acute" and "obtuse".
- Children may assume that a longer pair of lines always creates a greater angle.

Key questions

- What is the difference between an acute and an obtuse angle?
- What type of angle is this? How do you know?
- Which of these two angles is greater? How do you know?
- Are all acute angles less than obtuse angles? Why/why not?
- How can you work out which angle is the greatest/smallest?
- Does the length of the arms of the angle make a difference to the amount of turn? Why/why not?

Possible sentence stems

- All ______ angles are greater than ______ angles.
- All ______ angles are less than ______ angles.

National Curriculum links

- Identify acute and obtuse angles and compare and order angles up to two right angles by size

Compare and order angles

White Rose MATHS

Key learning

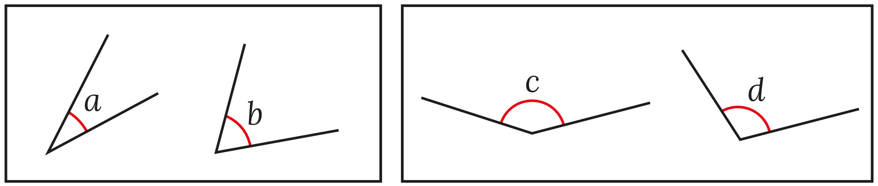
- Here are two angles.

  - What type of angle is each angle?

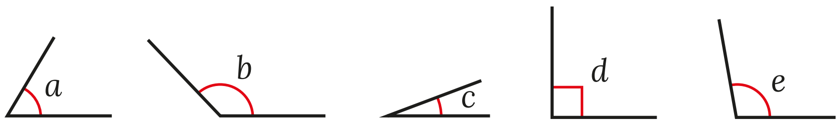
    How do you know?
  - Which angle is greater?

    How do you know?

- Which angle is greater in each pair?



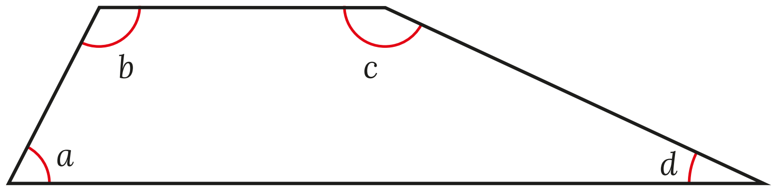
- Write **acute**, **obtuse** or **right angle** to label each angle.



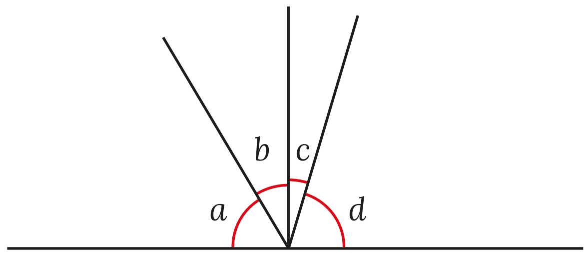
  Order the angles from smallest to greatest.

- Four angles are labelled in the quadrilateral.

  Order the angles from smallest to greatest.



- Four angles are drawn on a straight line.



  Write the angles in order of size from greatest to smallest.

- Draw an angle that is greater than angle a, but less than angle b.

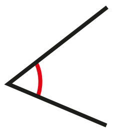
Compare and order angles

Reasoning and problem solving

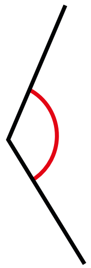
Ron and Rosie each draw an angle.

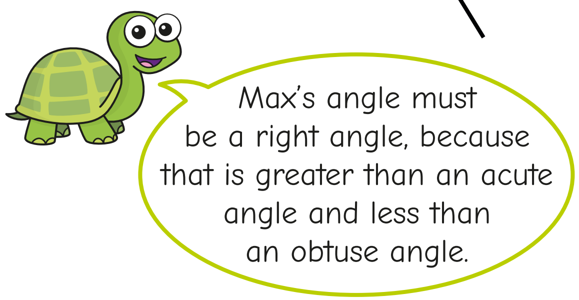
Max draws an angle that is greater than Ron's angle, but less than Rosie's angle.

Ron



Rosie





Do you agree with Tiny?

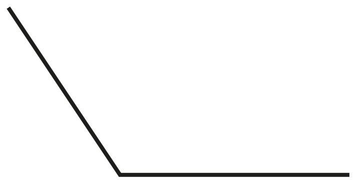
Explain your answer.

Draw what Max's angle could look like.

No

Kim is drawing a pentagon.

She has drawn these two lines.



Draw the rest of the pentagon so that it has:

- one acute angle
- three obtuse angles
- one right angle

Compare answers with a partner.

multiple possible answers

Triangles

Notes and guidance

In this small step, children explore different types of triangles.

Children begin by looking at examples and non-examples of triangles to help them summarise the characteristics of a triangle: a closed, 2-D shape with three straight sides. Children then consider the properties of different types of triangles: if all three sides have different lengths, the triangle is scalene; if two sides are the same length, the triangle is isosceles; if all three sides are equal, the triangle is equilateral. This is the first time that children will have encountered these words, so it is important to revisit them regularly. They could also explore right-angled triangles as another type of triangle. Children also learn that the number of equal angles in a triangle is the same as the number of equal sides.

Things to look out for

- Children may think that shapes with "curved corners" are triangles.
- Children may not identify triangles in different orientations, for example "upside-down" triangles.
- Children may find it hard to sketch equilateral/isosceles triangles before they have learnt how to use a protractor.

Key questions

- What are the properties of a triangle?
- How many equal sides/angles does this triangle have?
- Why is this a triangle?
  Why is this not a triangle?
- What type of triangle is this?
- What is the difference between a(n) ______ triangle and a(n) ______ triangle?
- If one side of an equilateral triangle is ______ long, what is the perimeter of the triangle?

Possible sentence stems

- An equilateral/isosceles/scalene triangle has ______ equal sides and ______ equal angles.
- A ______ triangle has one angle that is a ______

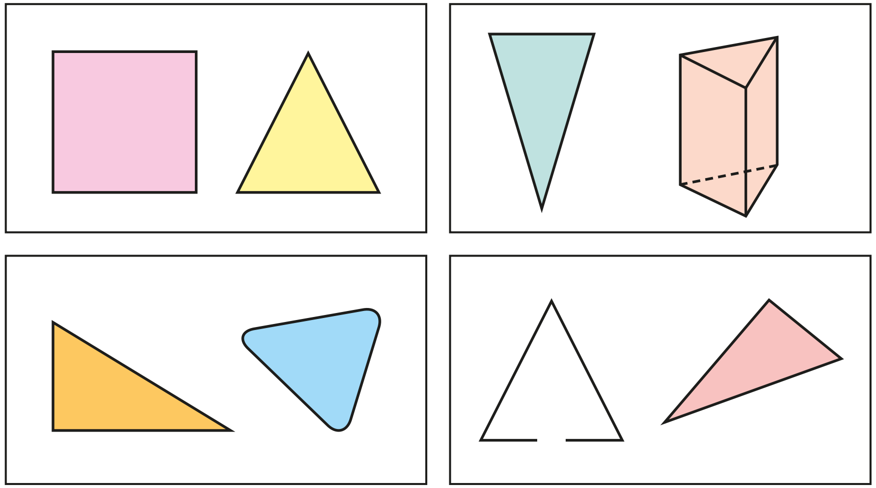
National Curriculum links

- Compare and classify geometric shapes, including quadrilaterals and triangles, based on their properties and sizes

Triangles

Key learning

- For each pair of shapes, decide which is a triangle.



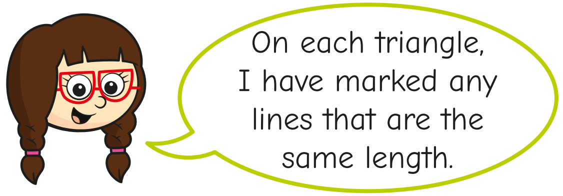
Why are the others not triangles?

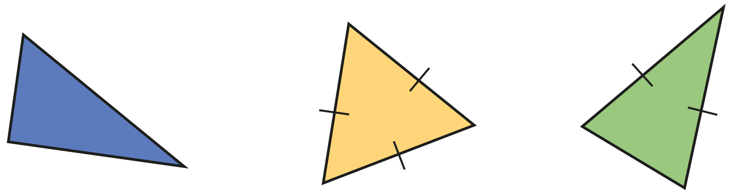
- Here are two triangles.

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

- Draw five different triangles.

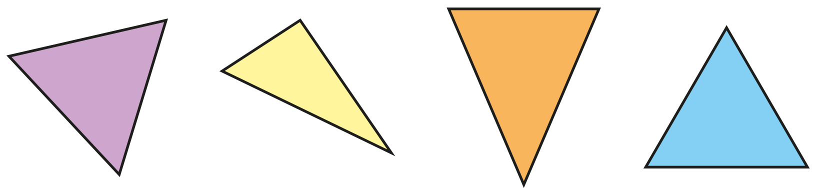
Describe your triangles to a partner.

- 



Decide if each triangle is scalene, equilateral or isosceles.

- Measure and label the equal sides on the triangles.



Decide if each triangle is scalene, equilateral or isosceles.

- Tom draws an equilateral triangle.

Each side is 11 cm.

What is the perimeter of Tom's triangle?

Triangles

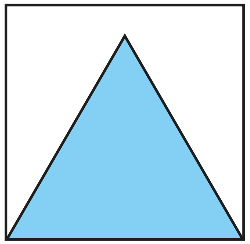
Reasoning and problem solving

Here is a square.

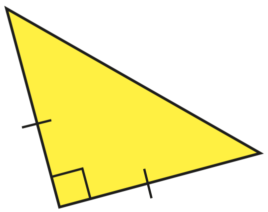
Inside the square is an equilateral triangle.

The perimeter of the square is 60 cm.

Find the perimeter of the **triangle**.



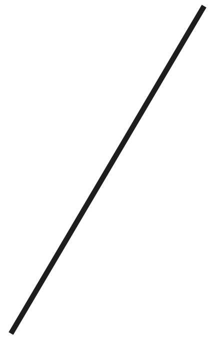
45 cm



Describe the triangle as fully as you can.

right-angled and isosceles

The line is one side of a triangle.



Draw two more sides to create:

- an equilateral triangle
- a scalene triangle
- an isosceles triangle

Which is the hardest to draw?

Compare answers as a class.

Quadrilaterals

Notes and guidance

In this small step, children explore different types of quadrilaterals.

Children identify quadrilaterals from a selection of shapes. Initially, they may only see squares and rectangles as quadrilaterals, so explore a range of different quadrilaterals with different properties.

Children may need to recap Year 3 learning about parallel and perpendicular lines. The names for the different quadrilaterals will need revisiting to become firmly embedded, so whenever possible use them in other areas of the curriculum or in other subjects. By the end of this step, children should be able to distinguish between a trapezium, a rhombus and a parallelogram as well as the familiar square and rectangle. Using geoboards or squared paper and drawing the shapes in different orientations will help children to identify what the shapes have in common and what is different about them.

Things to look out for

- Children may not recognise quadrilaterals in non-standard orientations, for example calling a rotated square a "diamond".
- Children may confuse the mathematical names of different quadrilaterals.

Key questions

- What is a polygon?
- What does "quad" mean? What is a quadrilateral?
- What is the difference between these two quadrilaterals?
- How many right angles are there?
- Does the quadrilateral have any pairs of equal/parallel sides?
- What are the properties of this quadrilateral?
- What is the same/different about a rectangle and a square?
- What is the difference between a rhombus and a parallelogram?

Possible sentence stems

- A quadrilateral is a ______ with ______ sides.
- The shape has ______ pairs of parallel lines and ______ pairs of equal sides.
  It is a ______

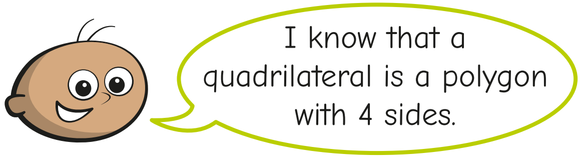
National Curriculum links

- Compare and classify geometric shapes, including quadrilaterals and triangles, based on their properties and sizes

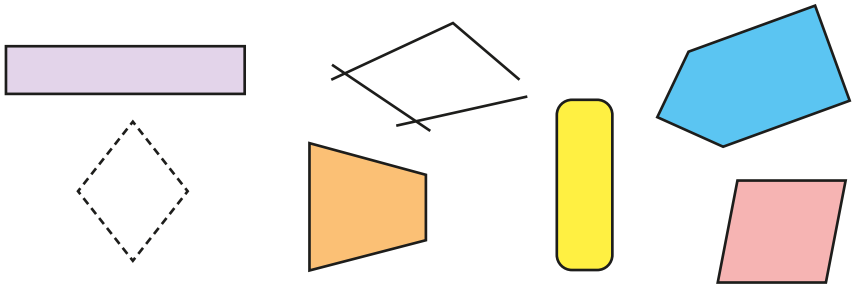
Quadrilaterals

Key learning

- Tommy is sorting these shapes.

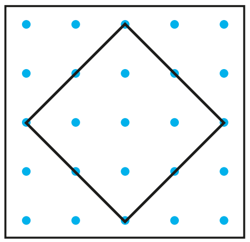


Which of these shapes are quadrilaterals?



- Use a 5 × 5 geoboard or dotted paper.

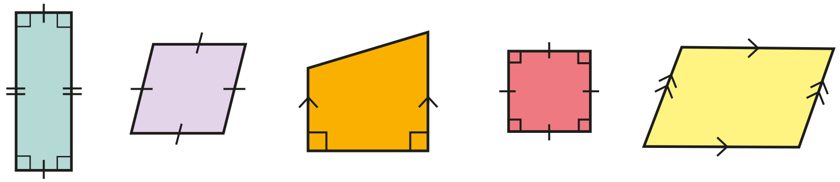
How many different quadrilaterals can you make/draw?



Can you name each quadrilateral?

Compare answers with a partner.

- Use the labels to describe the properties of the shapes.



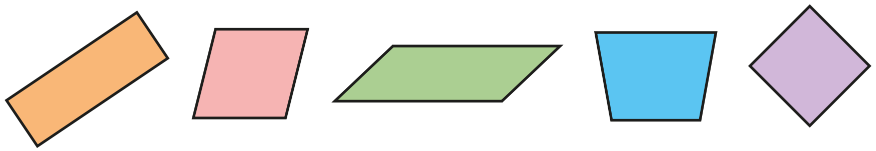
4 sides | 2 pairs of parallel sides | 4 equal sides

polygon | 1 pair of parallel sides | 4 right angles

Which labels can be used more than once?

Which shapes have the same properties?

- Use the word bank to label each quadrilateral.



trapezium | square | rhombus

rectangle | parallelogram

Describe the properties of each shape.

Quadrilaterals

White Rose MATHS

Reasoning and problem solving

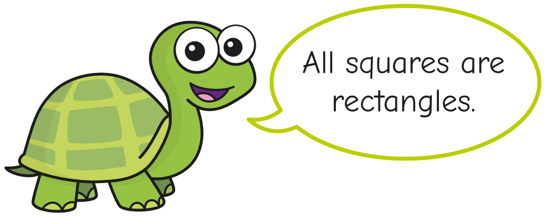
You will need:

- some 4 cm straws
- some 6 cm straws

How many different quadrilaterals can you make using the straws?

Work out the perimeter of each shape.

multiple possible answers, e.g.
parallelogram (20 cm)
trapezium (18 cm)



Tiny is correct.

What other statements can you make describing special quadrilaterals?

multiple possible answers, e.g.
All rhombuses are parallelograms.

Draw a different shape in each section of the table.

	4 equal sides	2 pairs of equal sides	1 pair of parallel sides
4 right angles			
No right angles			

In which section can no quadrilateral be drawn?

Explain why.

top row: square, rectangle, blank

bottom row: rhombus, parallelogram, trapezium

4 right angles and 1 pair of parallel sides

Polygons

White Rose MATHS

Notes and guidance

Children first encountered 2-D shapes with more than four sides in Key Stage 1. In this small step, they revisit and extend their knowledge of the names of polygons.

Explain that "gon" means "angled" and the different prefixes relate to the number of angles; for example, "pent" means five, so a pentagon has five angles and therefore five sides. Discuss other words that children can use to help them with the meanings of the prefixes, such as pentathlon and octopus.

Children then explore the meanings of "regular" and "irregular" in the context of polygons, learning that in a regular polygon, the sides are all equal in length and the angles are all equal in size. They are often surprised that, for example, a rectangle is irregular. By making shapes with straws or lolly sticks, children can easily create their own polygons and decide if they are regular or irregular.

Things to look out for

- Children may see a polygon with all equal sides and think that it is regular without considering the angles. They may also think that, for example, a rectangle is regular.
- Children may mix up the meanings of the prefixes.

Key questions

- What is a polygon?
- What is a polygon with ______ sides called?
- How many angles/sides does an octagon have? What other words do you know that start with "oct"?
- What is the same and what is different about these polygons?
- When talking about polygons, what does "regular"/"irregular" mean?
- If one side of a regular ______ is ______ cm, what is its perimeter?

Possible sentence stems

- In a regular polygon, all ______ are equal in length and all ______ are equal in size.
- The shape has ______ sides, so it is a ______
- A regular triangle/quadrilateral is called a(n) ______

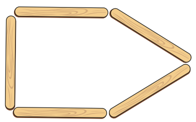
National Curriculum links

- Compare and classify geometric shapes, including quadrilaterals and triangles, based on their properties and sizes

Polygons

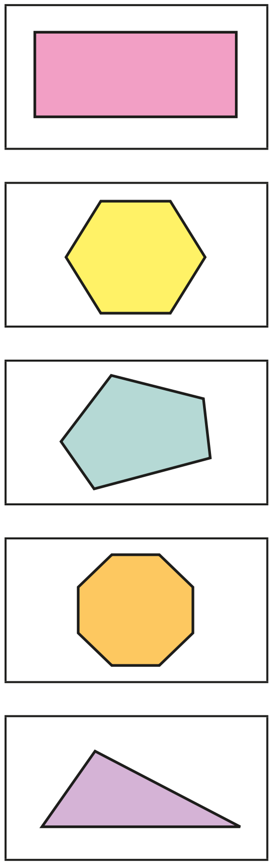
Key learning

- Use lolly sticks to make polygons with different numbers of sides.



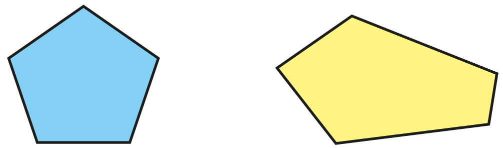
  Which polygons do you know the names of already?

- Match the polygons to the labels.

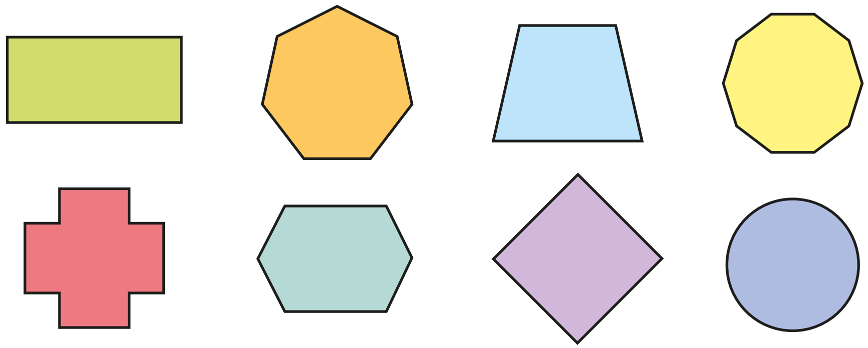


triangle
quadrilateral
pentagon
hexagon
octagon

- What is the same and what is different about the polygons?



- Which shapes are regular polygons?



  Mark the equal sides on each polygon.

- Each side of a regular pentagon is 9 cm.

  What is the perimeter of the pentagon?

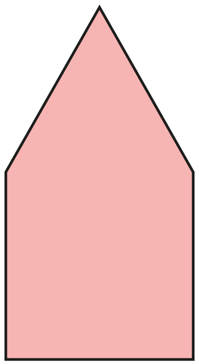
- The perimeter of a regular octagon is 48 m.

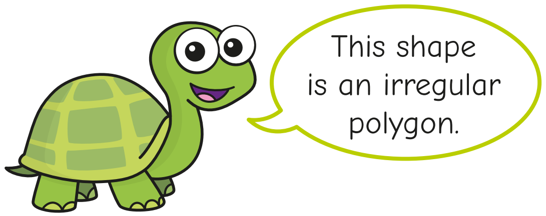
  What is the length of each side of the octagon?

Polygons

Reasoning and problem solving

All sides of the shape are equal in length.





Do you agree with Tiny?

Explain your answer.

Yes

Mo and Filip are making regular polygons with straws.

Each straw is 8 cm long.

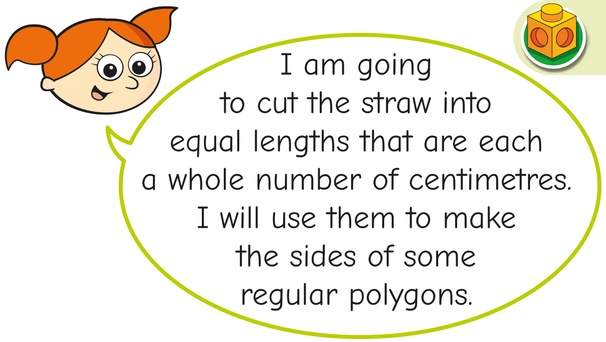
Mo uses 7 straws for his polygon.

Filip uses 10 straws for his polygon.

What is the difference between the perimeters of the shapes?

24 cm

Alex has a straw that is 24 cm long.



Describe the regular polygons that Alex could make.

equilateral triangle: sides 8 cm

square: sides 6 cm

hexagon: sides 4 cm

octagon: sides 3 cm

dodecagon (12 sides): sides 2 cm

Lines of symmetry

Notes and guidance

Children first found vertical lines of symmetry within a shape in Year 2. In Year 3, this was extended to horizontal and vertical lines of symmetry. In this small step, that learning is extended further to include any line of symmetry in any direction.

Begin by recapping what a line of symmetry is. The use of mirrors is helpful to reinforce this understanding, as is cutting out shapes and folding them. Another useful activity is putting two congruent shapes together to form symmetrical shapes.

Children look for lines of symmetry in any orientation within any 2-D shape. They then sort shapes by the number of lines of symmetry. They can also explore regular polygons, discovering that the number of lines of symmetry in a regular polygon is the same as the number of sides.

Things to look out for

- Children may only look for horizontal and vertical lines of symmetry.
- Children may become reliant on the use of mirrors or folding paper.
- Children may think that shapes “look symmetrical” when they are not. For example, a parallelogram has no lines of symmetry.

Key questions

- What is a line of symmetry?
- How can you arrange these two shapes to make a symmetrical image?
- Does this shape have any lines of symmetry? How can you find out?
- Are lines of symmetry always horizontal or vertical?
- How can you use a mirror to check if there is a line of symmetry?
- How many lines of symmetry does this shape have?
- How many lines of symmetry does a regular ______ have? How do you know?

Possible sentence stems

- Shape A has ______ lines of symmetry.
- A regular polygon with ______ sides has ______ lines of symmetry.

National Curriculum links

- Identify lines of symmetry in 2-D shapes presented in different orientations

Lines of symmetry

White Rose MATHS

Key learning

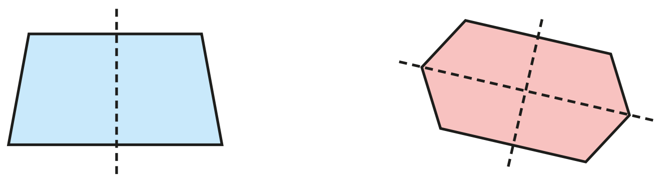
- Eva and Jack each have two identical triangles.

  They are arranging them to create a line of symmetry.

  Eva **Jack**

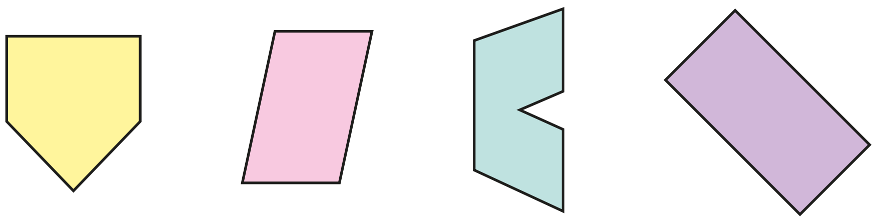
  Work with a partner to find as many ways as you can of arranging two triangles to create a line of symmetry.

- Dani has found lines of symmetry in these two shapes.

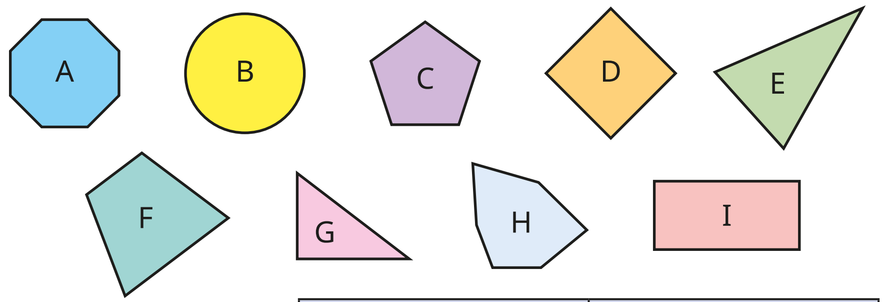


  How many lines of symmetry can you find in these shapes?

  You may wish to use a mirror to help you.



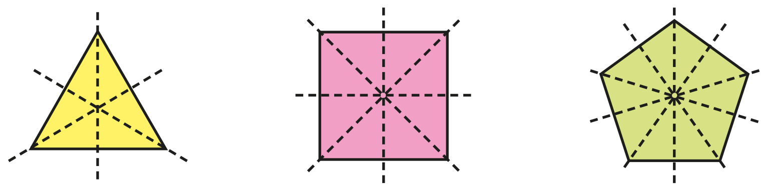
- Sort the shapes into the table.



	1 line of symmetry	More than 1 line of symmetry
Up to 4 sides		
More than 4 sides		

  Are there any shapes that cannot go in the table?

- Annie is finding lines of symmetry in regular shapes.

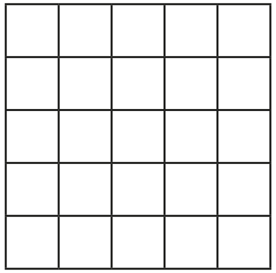


  What do you notice about the number of lines of symmetry compared to the number of sides each shape has?

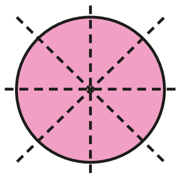
Lines of symmetry

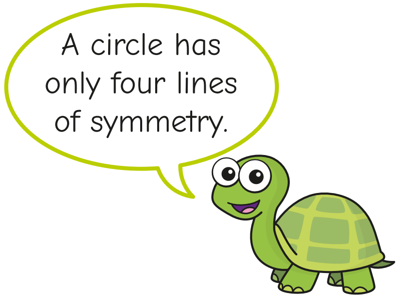
Reasoning and problem solving

Shade up to six squares to make as many symmetrical shapes as you can.



Compare answers as a class.





Do you agree with Tiny?

Explain your answer.

No

Are the statements always true, sometimes true or never true?

- Four-sided polygons have four lines of symmetry.
- An isosceles triangle has two lines of symmetry.
- All regular polygons have at least one line of symmetry.
- Irregular pentagons have one line of symmetry.
- The number of lines of symmetry in a polygon is equal to the number of sides.

Explain your answers.

sometimes true

never true

always true

sometimes true

sometimes true

Complete a symmetric figure

Notes and guidance

In this small step, children build on their understanding of lines of symmetry from the previous step by completing symmetric figures.

Children begin by considering squares on a grid shaded with a horizontal or vertical line of symmetry. They may choose to use a mirror or to count how far away each square is from the line of symmetry to complete this. When children are secure with vertical and horizontal lines of symmetry, they can look at diagonal lines of symmetry. Model examples where there are squares shaded on both sides of the line of symmetry. Children then move on to completing simple 2-D shapes. Again, they can use a mirror to draw the reflection they see, or reflect one vertex at a time by counting how far it is from the line of symmetry. Finally, they look at examples of grids where there are multiple lines of symmetry.

Things to look out for

- Children may need the support of a mirror when looking at lines that are not horizontal or vertical.
- Children may miscount the lengths of lines or the distance of points/squares from the line of symmetry.

Key questions

- What is a line of symmetry?
- What do you think the shape will look like after it has been reflected?
- How far away from the mirror line is each square/vertex? How far away does the reflected square/vertex need to be?
- Can there be more than one line of symmetry?
- How could turning your paper help you to complete the shape?

Possible sentence stems

- The vertex is ______ squares from the line of symmetry, so the vertex of the reflected image will be ______ squares from the line of symmetry.

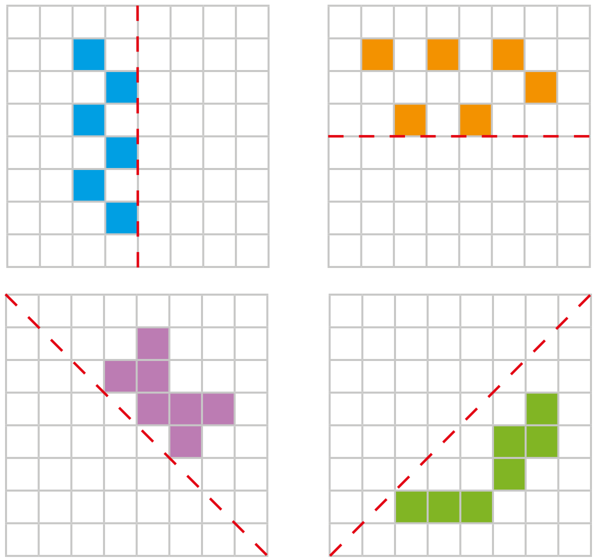
National Curriculum links

- Complete a simple symmetric figure with respect to a specific line of symmetry

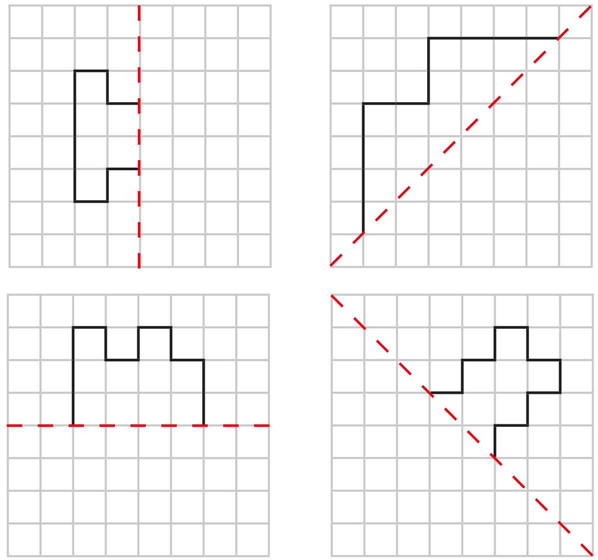
Complete a symmetric figure

Key learning

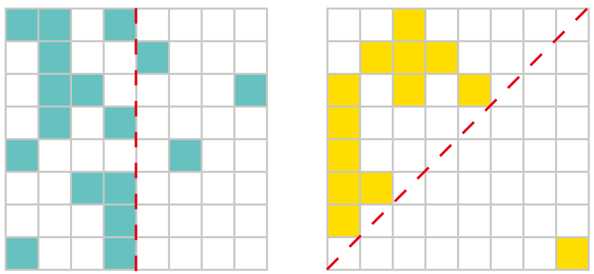
- Shade squares to make the patterns symmetrical.



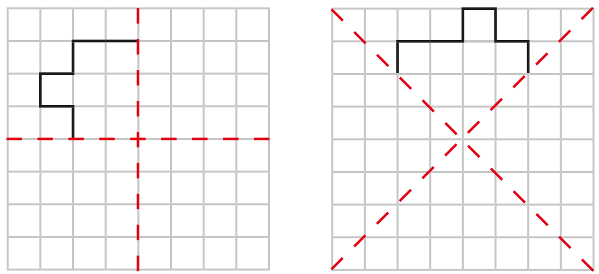
- Complete the shapes according to the lines of symmetry.



- Shade squares to make the patterns symmetrical.

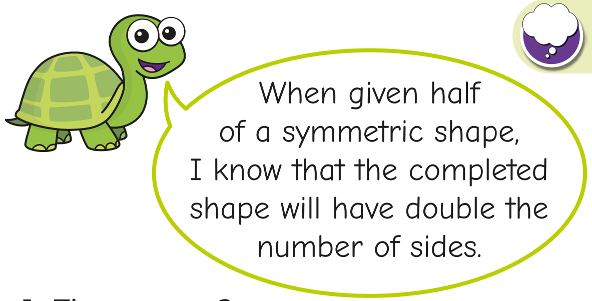


- Complete the symmetric figures.



Complete a symmetric figure

Reasoning and problem solving

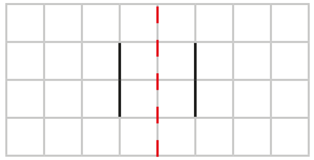


Is Tiny correct?

Explain your answer.

sometimes

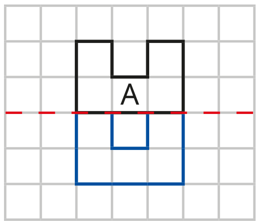
How many different symmetric shapes can you create using the given lines?



Compare answers with a partner.

Compare answers as a class.

Sam completes the shape according to the line of symmetry.

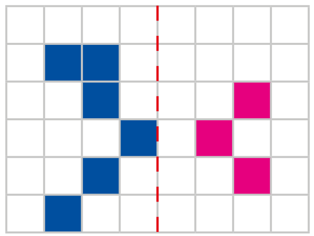


Is Sam correct?

Explain your answer.

No

Dexter starts to complete the symmetrical pattern.



Is Dexter correct so far?

Explain your answer.

No

Summer Block 5

Statistics

White Rose MATHS

Small steps

Step 1	Interpret charts
Step 2	Comparison, sum and difference
Step 3	Interpret line graphs
Step 4	Draw line graphs

Interpret charts

White Rose MATHS

Notes and guidance

In Year 3, children learnt how to interpret and draw pictograms and bar charts to represent discrete data. They also learnt how to collect and represent data in a table. In this small step, they revise this learning before using charts to compare data in the next step.

Give children the opportunity to explore which scale will be the most appropriate when drawing their own bar charts and which key will be the most appropriate for a pictogram. They can also gather their own data and then present it as a bar chart or pictogram. Further questioning about the data should be explored, so that children can demonstrate their ability to interpret the data as well as draw charts. At this stage, they do not need to use the data in calculations to solve problems, as this will be covered in the next step.

Things to look out for

- Children may assume that the scale on a bar chart always goes up in 1s.
- Children may choose symbols that are difficult to work with, either in terms of complexity or their appropriateness for splitting into equal parts.
- Children may make errors when labelling scales.

Key questions

- How could you represent this data?
- What do you notice about the scale of the bar chart?
- What else does the data tell you?
- What is the same/different about the way in which the data has been shown?
- What scale will you use for your bar chart? Why?
- What does each ______ represent in the pictogram? How do you know?
- What symbol will you use for your pictogram? Why?

Possible sentence stems

- The scale of the bar chart is going up in ______s.
- In the pictogram, 1 ______ represents ______, so there are ______ × ______ = ______

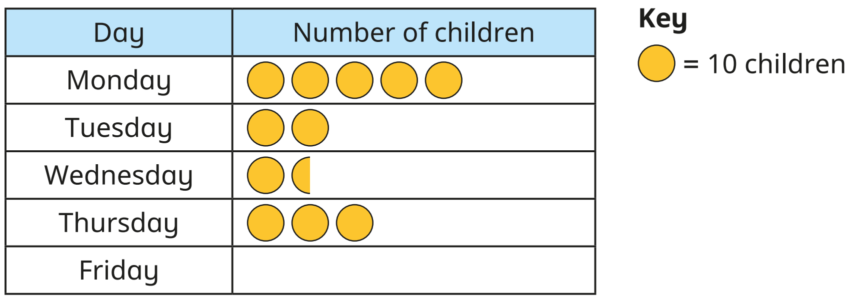
National Curriculum links

- Interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs

Interpret charts

Key learning

- The pictogram shows the number of children who visited a park last week.

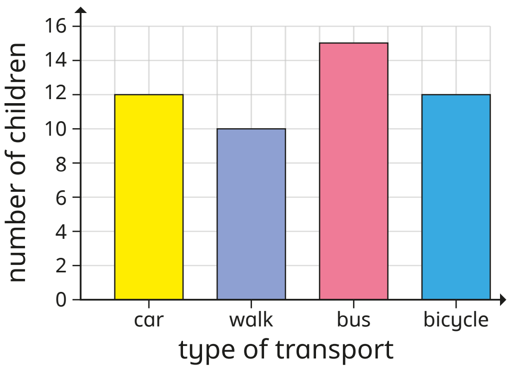


  - ▶ How many children visited the park on Monday?
  - ▶ How many children visited the park on Wednesday?

  25 children visited the park on Friday.

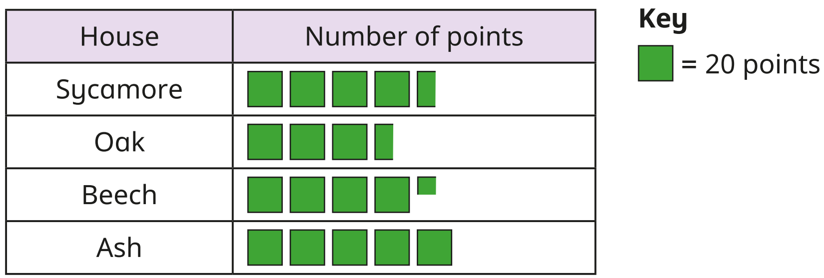
  - ▶ Complete the pictogram to show this.

- The bar chart shows how Year 4 children travel to school.

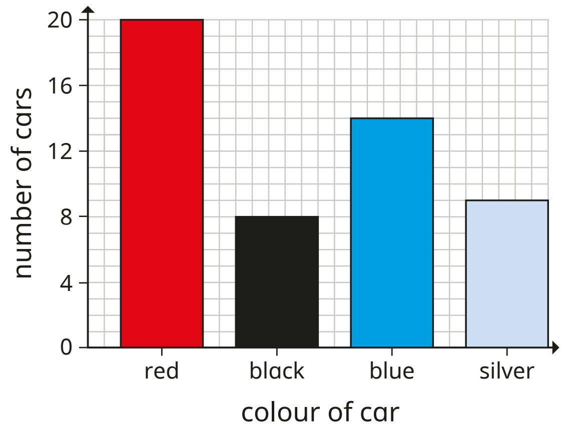


  Draw a table using the information in the bar chart.

- Represent the data shown in the pictogram as a bar chart.



- The bar chart shows the number of each colour car parked in a car park.



  Draw a pictogram using the information in the bar chart.

Interpret charts

Reasoning and problem solving

Alex wants to show the favourite drinks of everyone in her class.

She decides to use ● to represent 5 children.

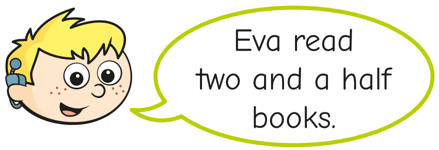
Explain why this is not a good idea.

It will be difficult to show amounts that are not multiples of 5

The pictogram shows how many books the children have read this week.

Key ▲ = 2 books

Child	Number of books
Jack	▲ ▲ ▲
Eva	▲ ▲ ◢
Whitney	▲

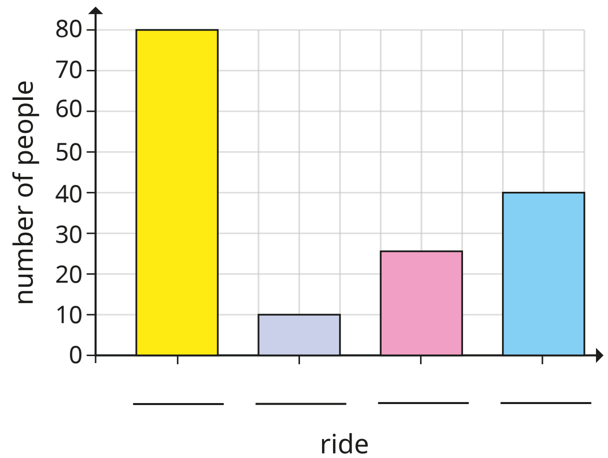


Do you agree with Max?

No

The bar chart shows the number of people who went on each ride at a theme park.

Use the clues to label the bar chart.



- The Wild West had half as many people as Dragonball.
- Fewer people went on The Flipper than on The Lazy River.
- Dragonball was the most popular ride.

Dragonball, The Flipper, The Lazy River, The Wild West

Comparison, sum and difference

Notes and guidance

In this small step, children build on their learning from the previous step to solve comparison, sum and difference problems using discrete data.

Recap key vocabulary, such as "difference", before looking at questions that use this terminology. Children use key skills from the addition and subtraction block in the Autumn term to answer questions.

Give children the opportunity to ask their own questions about the data in pictograms, bar charts and tables. Although examples of data are given in this step, children can also collect their own data and represent it as pictograms, bar charts and tables, and then ask and answer questions relating to their own data.

Things to look out for

- Children may assume that the scale on a bar chart always goes up in 1s.
- Children may see the word "more" and assume that they need to add, even when the question is "How many more …?"
- Children may assume that the pictures in a pictogram represent 1, instead of looking at the key.

Key questions

- What does each symbol represent on the pictogram? How do you know?
- What questions could you ask about the pictogram?
- What do you notice about the scale of the bar chart?
- What do you know? What can you find out?
- What is the total number of ______?
- How many more/fewer people chose ______ than ______?

Possible sentence stems

- The difference between ______ and ______ is ______
- There are ______ more ______ than ______
- Altogether, there are ______

National Curriculum links

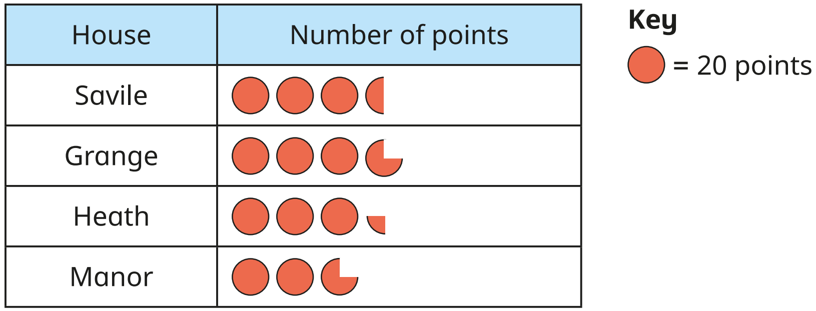
- Interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and line graphs
- Solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs

Comparison, sum and difference

White Rose MATHS

Key learning

- The pictogram shows the points scored by a school's houses.



  - How many more points does Savile have than Manor?
  - How many points do Heath and Grange have altogether?
  - How many more points does Manor need to be equal to Grange?
  - How many points do the houses have altogether?

- A group of people were asked to vote for one activity.

  Use the table to complete the sentences.

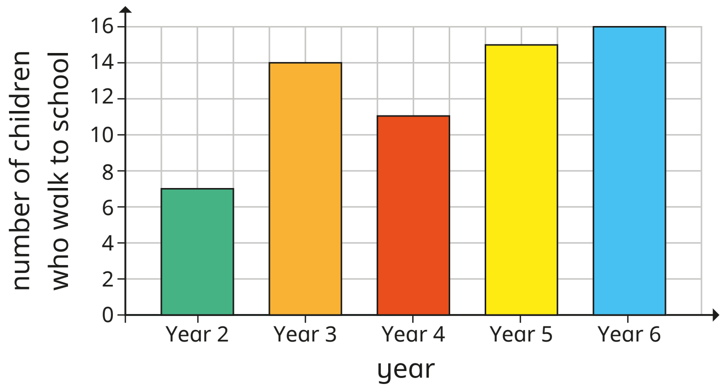
  - _______ people voted in total.
  - $\frac{1}{4}$ of the votes were for _______
  - 7 more people voted for _______ than for _______

  What scale would you use to draw a bar chart using this data? Why?

Activity	Number of votes
boxing	9
cinema	10
swimming	7
ice skating	14

- Children from Years 2 to 6 were asked if they walk to school.

  The bar chart shows the results.



  - How many more children walk to school in Year 5 than in Year 4?
  - How many children walk to school in total?
  - In which year group do twice as many children walk to school compared to Year 2?

  What else do you know? What can you find out?

- As a class, choose some data that you would like to collect, for example favourite books, films or food.

  Collect and record the data in a table.

  Choose a pictogram or a bar chart to represent your data, giving reasons for your choices.

  What questions can you ask about the data?

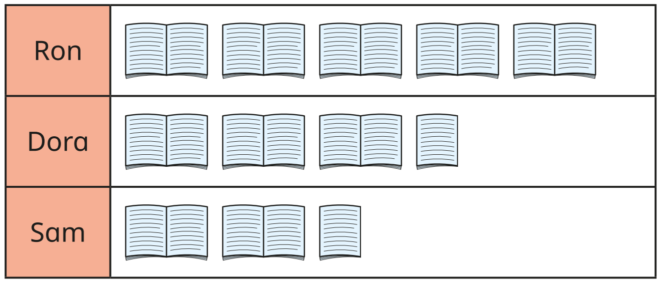
Comparison, sum and difference

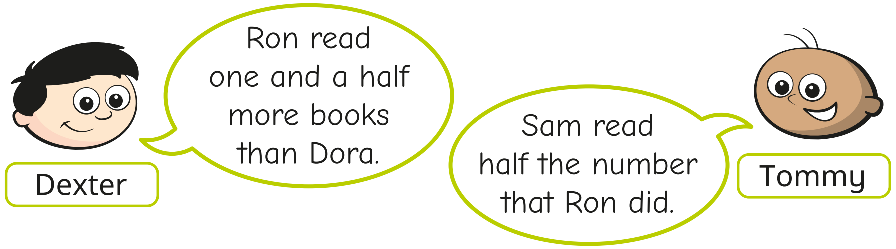
White Rose MATHS

Reasoning and problem solving

The pictogram shows the number of books each child read during the holidays.

Key = 4 books



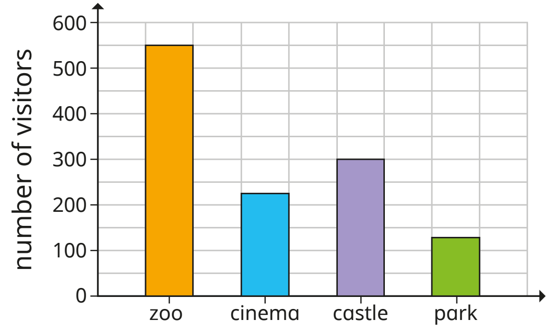


Are Dexter and Tommy correct?

Explain your answers.

Dexter is incorrect. | Tommy is correct.

The bar chart shows the number of visitors at some attractions one weekend.



Are the statements true or false?

- More people went to the zoo than the total of the other three places combined.
- Double the number of people visited the zoo than the castle.
- Less than one quarter of the total visitors went to the park.

Explain your answers.

False

False

True

Interpret line graphs

Notes and guidance

In this small step, children are introduced to line graphs for the first time. Most of the line graphs look at changes of a variable, such as temperature, over time.

Children apply their knowledge of scales on a graph to read a line graph accurately. They learn about continuous data, understanding that temperature can change all the time rather than be counted, and so representing it as a bar chart or pictogram would not be appropriate. They also learn that for many line graphs, the values are only known for specific times and reading off any other values will only give an estimate. Using dashed rather than solid lines is useful, as it emphasises that they show the trend in the change, not the exact values.

Things to look out for

- Children may need support to understand the difference between discrete and continuous data.
- Children may interpret the points between readings as exact values rather than estimates.
- Children may make errors when reading values off the axes, in particular with points that lie between two values that are written on the scale.

Key questions

- How is a line graph different from a bar chart?
- What do the horizontal and vertical axes represent?
- What is the best way to represent the data?
- What times do you know exact values for?
- At what time on the graph is it only possible to estimate the value of ______? Why?
- How would you estimate the time it was when ______?
- What do you know? What can you find out?

Possible sentence stems

- The temperature at ______ is ______ °C.
- The ______ axis represents ______ and the ______ axis represents ______

National Curriculum links

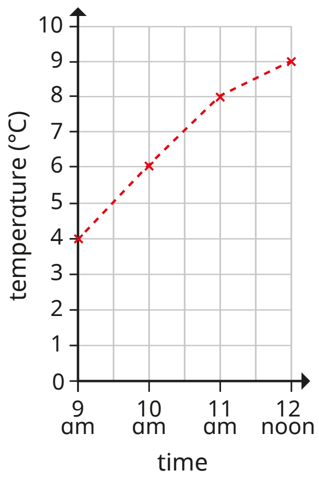
- Interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs
- Solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs

Interpret line graphs

White Rose MATHS

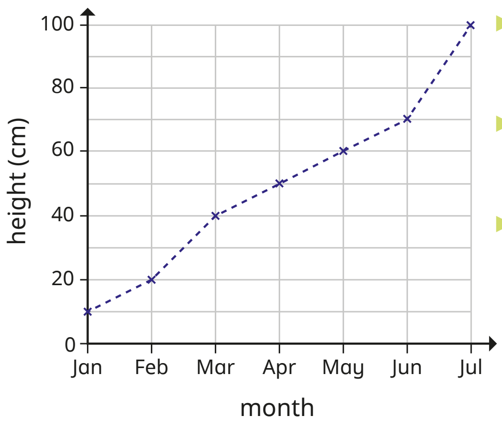
Key learning

- The graph shows the temperature in the playground during a morning in April.



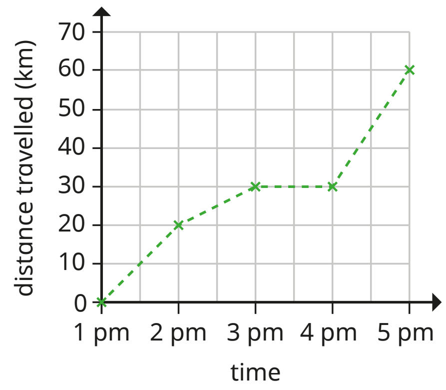
  - ▶ What was the temperature at 9 am?
  - ▶ At what time was the temperature 6°C?
  - ▶ Estimate the temperature at 10:30 am.
  - ▶ Estimate the time when the temperature was 5 °C.

- The graph shows the growth of a plant over 7 months.



  - ▶ How tall was the plant at the start of May?
  - ▶ In what month did the plant reach 40 cm?
  - ▶ Estimate the height of the plant on 15 April.

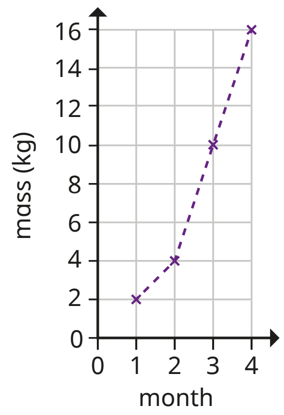
- The graph shows the distance a cyclist travels over 4 hours.



  - ▶ How long does it take the cyclist to travel 20 km?
  - ▶ How far has the cyclist travelled after 3 hours?
  - ▶ What happens between 3 pm and 4 pm?

- The graph shows the mass of a puppy as it grows.

  How many different ways can you complete the sentences?

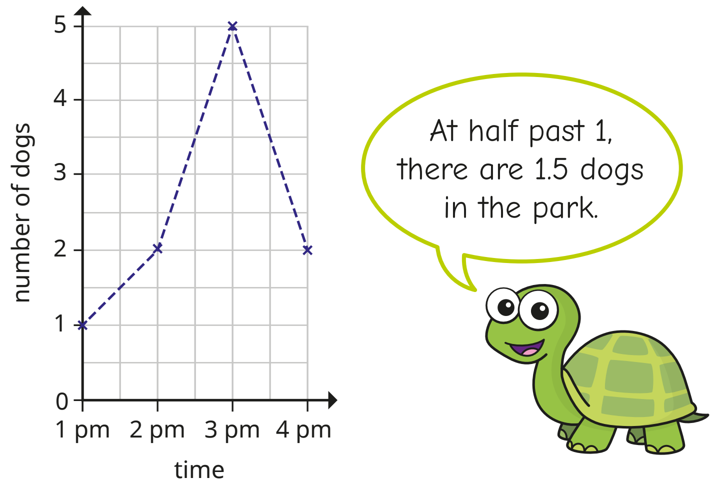


  - ▶ When the puppy is ______ months old, its mass is ______ kg.
  - ▶ Between month ______ and month ______, the mass increased by ______ kg.

Interpret line graphs

Reasoning and problem solving

Tiny creates a line graph to show the number of dogs in the park one afternoon.



Explain Tiny's mistake.

What would be a better way of presenting the data?

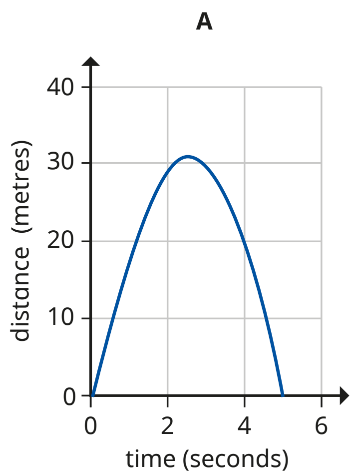
It is not possible to have 1.5 dogs.

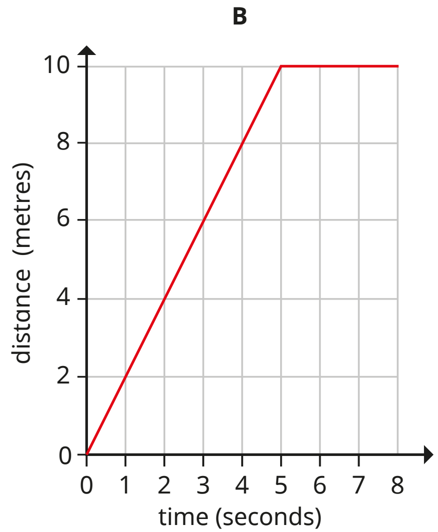
Use a bar chart, pictogram or table.

Jack launched a toy rocket into the sky.

After 5 seconds, the rocket fell to the ground.

Which graph shows this?





Explain your answer.

Write a possible story to explain the other graph.

A

Discuss possible stories as a class.

Draw line graphs

Notes and guidance

Building on the previous step where children were introduced to line graphs, in this small step they draw their own line graphs to represent continuous data.

Children use their knowledge of scales to accurately draw line graphs, ensuring that they label the axes correctly. It may be useful for children to use pre-drawn axes rather than constructing their own, as this will save time as well as enable them to focus on accurately plotting data and choosing appropriate scales. Children will develop their knowledge of axes by looking formally at coordinates in the next block. Encourage children to use a ruler when drawing the lines between points on a line graph, using dashed lines in most cases and solid lines only when the change between given points is definitely happening at a constant rate.

Things to look out for

- Children may be unsure of which data to plot on which axis.
- When drawing their own line graphs, children may not space the intervals evenly along the axes.
- Children may need further support with plotting points that do not align with labelled points of the axes.

Key questions

- What do the two axes represent?
- What is the best way to show this data?
- What data is going to be shown on the horizontal/vertical axis?
- What scale will you use for the axes?
- How can you accurately plot this point?
- How are you going to join your points together?
- What questions can you ask about your graph?

Possible sentence stems

- The horizontal axis represents ______ and the vertical axis represents ______
- The scale on the ______ axis goes up in ______s.

National Curriculum links

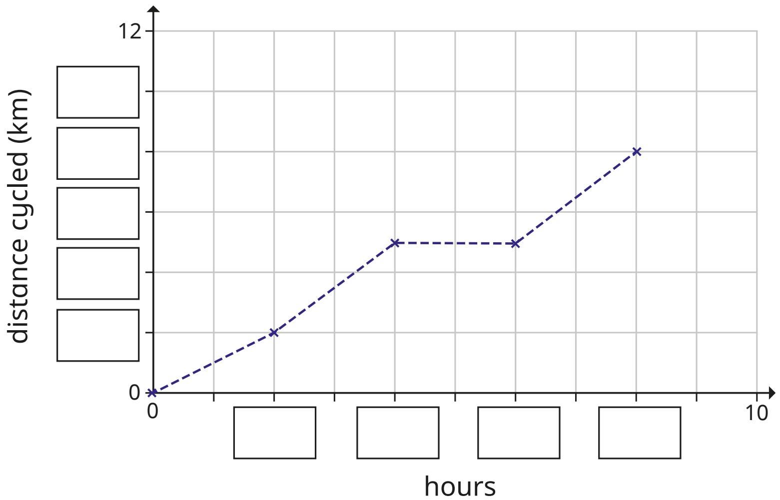
- Interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs
- Solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs

Draw line graphs

White Rose MATHS

Key learning

- The line graph shows the number of kilometres that Miss Lee cycled over 10 hours.
  - Fill in the missing labels.



After 10 hours, Miss Lee has cycled 10 km.

  - Complete the line graph to show this.
  - Use the graph to answer the questions.

  How far had Miss Lee cycled after 2 hours?

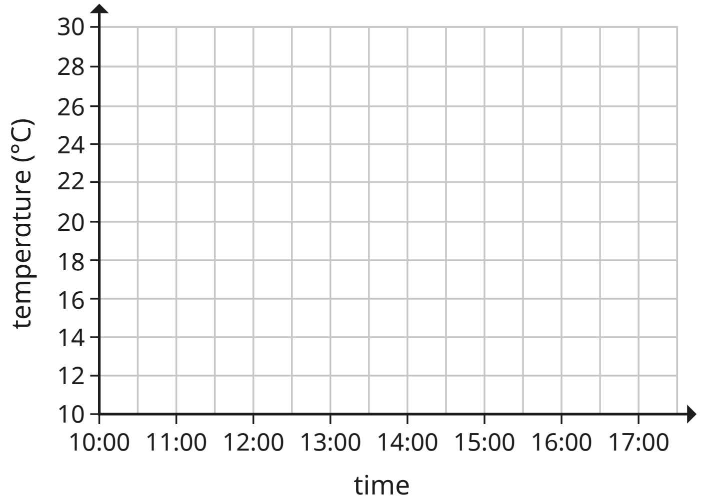
  What happened between 4 and 6 hours?

  Estimate how far Miss Lee had cycled after 1 hour.

- The table shows the temperature outside on Sunday.

Time	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00
Temperature (°C)	12	14	20	24	28	26	24	22

Use the information in the table to complete the graph.



- Class 4 measure the height of a plant every week for 6 weeks.

The table shows their measurements.

Week	1	2	3	4	5	6
Height (cm)	4	7	9	12	14	17

Draw a line graph to show this information.

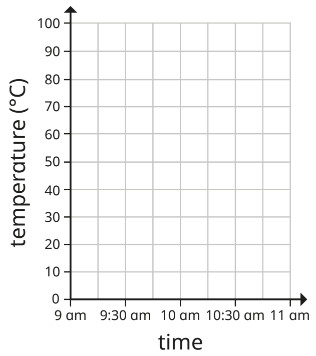
What scale will you use on the horizontal and vertical axes?

Draw line graphs

White Rose MATHS

Reasoning and problem solving

Sam measures the temperature of a cup of tea every 30 minutes for 2 hours.



Use the clues to complete the line graph.

- The temperature at 9:30 am was half the temperature at 9 am.
- The temperature at 10:30 am was 5 °C warmer than at 11 am.
- The temperature at 9 am was 80 °C.
- The temperature at 10:30 am was 10 °C cooler than at 10 am.
- The coolest temperature recorded was 15 °C.

Graph accurately labelled:

9 am 80 °C

9:30 am 40 °C

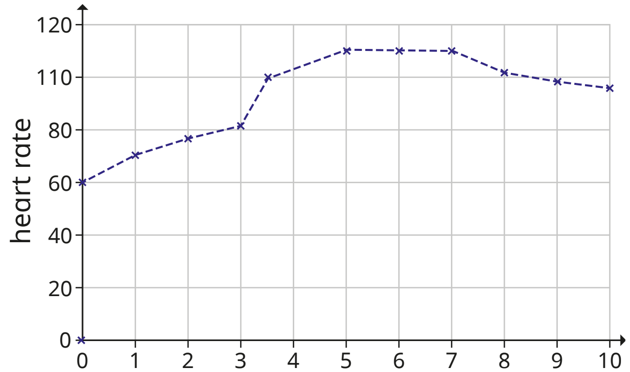
10 am 30 °C

10:30 am 20 °C

11 am 15 °C

Tiny uses the table to draw a line graph.

Time (minutes)	0	1	2	3	4	5	6	7	8	9	10
Heart rate	65	70	77	82	100	110	110	110	102	98	96



What mistakes has Tiny made?

Compare answers with a partner.

horizontal axis not labelled

vertical axis labelled with 110 instead of 100

point for 0 minutes plotted at 60, not 65

point for 4 minutes plotted at 3.5 minutes

Summer Block 6

Position and direction

Small steps

Step 1	Describe position using coordinates
Step 2	Plot coordinates
Step 3	Draw 2-D shapes on a grid
Step 4	Translate on a grid
Step 5	Describe translation on a grid

Describe position using coordinates

White Rose MATHS

Notes and guidance

In this small step, children are introduced to coordinate grids and begin to describe the positions of points on a grid.

Explain that the x-axis is horizontal and the y-axis is vertical. Show that the point where the axes meet has the coordinates (0, 0) and the numbers increase on both axes, like number lines. Model how to describe the positions of points using coordinates, emphasising the importance of reading from the x-axis first. This could be modelled on a large grid in the playground. Repeat with a range of different coordinates, including where one of the numbers is zero. Once confident with giving coordinates of points, children could begin to explore finding the coordinates of the vertices of shapes.

The focus of this step is reading coordinates and children do not plot points on a coordinate grid until the next step.

Things to look out for

- Children may confuse the x- and y-values of the coordinates and read them in the wrong order.
- Children may need support to read coordinates of points on the axes.
- Children may think that coordinates refer to a whole square rather than a point.

Key questions

- What is the name of the horizontal/vertical axis?
- What is the same and what is different about the x-axis and the y-axis?
- Which axis do you look at first when finding the coordinates of a point?
- In what order do you read the coordinates of a point?
- What are the coordinates of the point?
- Why are there two values in a pair of coordinates?

Possible sentence stems

- Look at the ______-axis before the ______-axis.
- The first value in a pair of coordinates is the ______-value and the second value is the ______-value.
- The coordinates of point A are (______, ______).

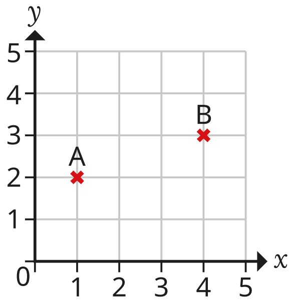
National Curriculum links

- Describe positions on a 2-D grid as coordinates in the first quadrant

Describe position using coordinates

Key learning

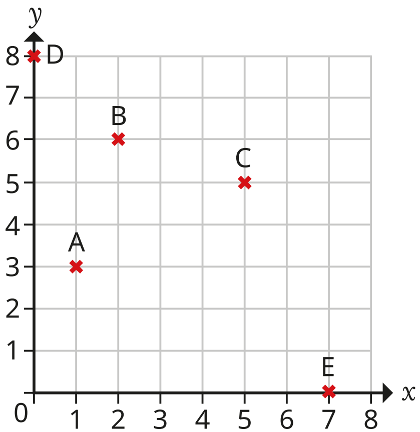
- Here is a coordinate grid.



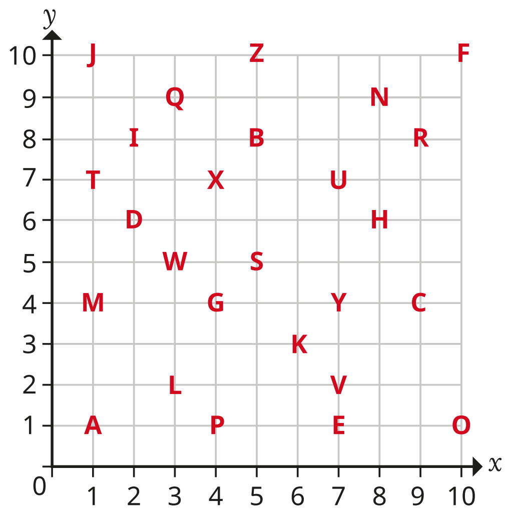
  - The coordinates of point A are (1, 2).

    What do the numbers 1 and 2 represent?
  - What are the coordinates of point B?

- Write the coordinates of each point.



What do you notice about points D and E?

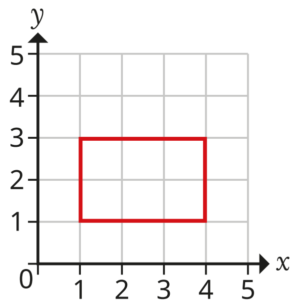
- 

  - What are the coordinates of the letter Y?
  - What word do the letters at these coordinates spell?

(1, 4)	(1, 1)	(1, 7)	(8, 6)	(5, 5)

  - Write the coordinates of the letters that spell your name.

- Write the coordinates of the vertices of the rectangle.

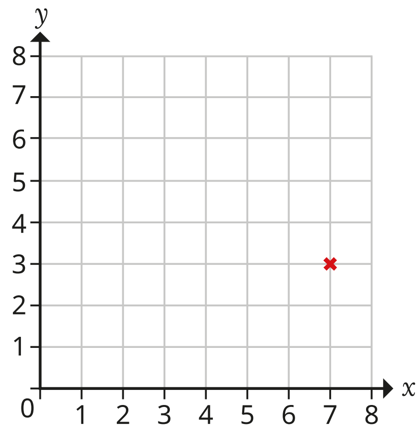


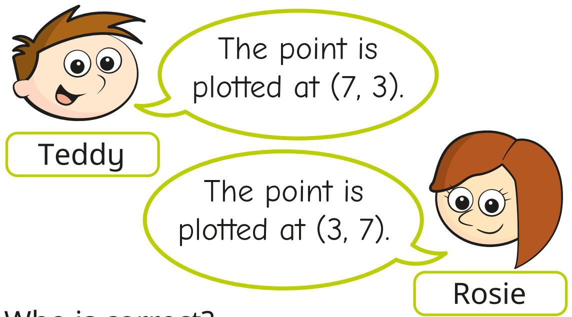
Describe position using coordinates

White Rose MATHS

Reasoning and problem solving

A point is plotted on a coordinate grid.



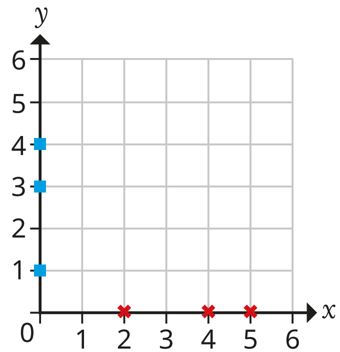


Who is correct?

What mistake has the other person made?

Teddy

Points are plotted on a coordinate grid as crosses or squares.



What do you notice about all the points marked with crosses (×)?

What do you notice about all the points marked with squares (■)?

If the grid was larger, what could you say about these points?

(12, 0) (0, 12) (9, 0)

(42, 0) (0, 17)

They are all on the x-axis, and the y-value of their coordinates is 0

They are all on the y-axis, and the x-value of their coordinates is 0

(12, 0), (9, 0) and (42, 0) on x-axis

(0, 12) and (0, 17) on y-axis

Plot coordinates

Notes and guidance

In this small step, children use their understanding from the previous step to plot points with given coordinates on a grid.

Recap the axes of a coordinate grid and how these relate to the values in a set of coordinates, with the x-value coming first. Then model plotting a point from given coordinates. Ask children how they know which coordinate corresponds to which axis. This could be modelled on a large grid in the playground, asking children to go and stand at points with given coordinates by moving horizontally from (0, 0) and then vertically. Ensure that children see that points are plotted on the lines and not in the spaces between the lines.

Discuss how it can be known where coordinates will go on a grid without plotting them first. For example, if two coordinates have the same x-value, then they are on the same vertical line, or if one of the coordinates is zero, then the point is on one of the axes.

Things to look out for

- Children may confuse the x- and y-values of the coordinates and plot them in the wrong order.
- Children may use coordinates to identify a square rather than a point.

Key questions

- Which value in a pair of coordinates tells you how far horizontally/vertically the point is?
- Do you plot a point on the line or in the space between the lines?
- Does the order of the numbers in a pair of coordinates matter? Why?
- How far along the x-axis is the point (______, ______)?
- How far up the y-axis is the point (______, ______)?
- Where does the point (______, ______) go on the grid?

Possible sentence stems

- The first value in a pair of coordinates tells me how far along the ______-axis the point is.
- The second value in a pair of coordinates tells me how far up the ______-axis the point is.

National Curriculum links

- Describe positions on a 2-D grid as coordinates in the first quadrant
- Plot specified points and draw sides to complete a given polygon

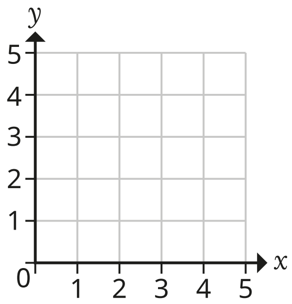
Plot coordinates

White Rose MATHS

Key learning

- Follow Mo's instructions for plotting the point (4, 1) on the grid.

  1. Find 4 on the x-axis and draw a vertical line.
  2. Find 1 on the y-axis and draw a horizontal line.
  3. Where the two lines meet, draw a cross.



How could you plot the point without drawing lines?

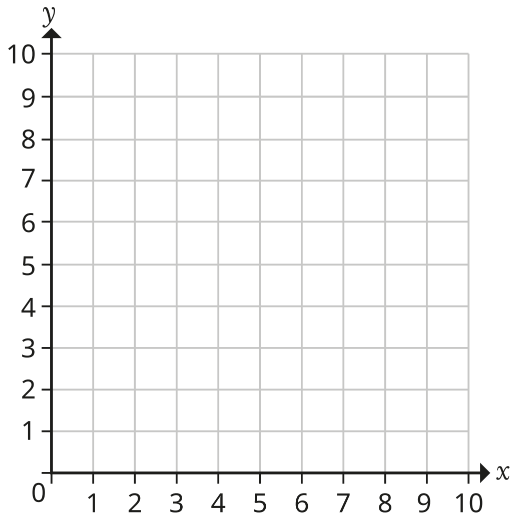
- Plot and label the points on the grid.

A (2, 1)

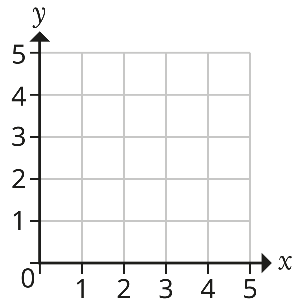
B (6, 5)

C (10, 2)

D (2, 10)



- Plot and label the points on the grid.



A (2, 0) B (0, 3)

- Plot the points on a coordinate grid.

(0, 5) (4, 5) (7, 5) (10, 5)

Join up the points. What do you notice?

Could you have known this before plotting the points on the grid?

- Plot the points (3, 3) and (7, 3) on a coordinate grid.

  Draw a straight line between them.

  Plot the points (5, 5) and (5, 1) on the same grid.

  Draw a straight line between them.

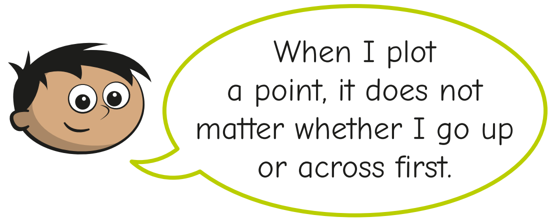
  What are the coordinates where the lines cross?

Plot coordinates

White Rose MATHS

Reasoning and problem solving

Amir is plotting points on a coordinate grid.



Is Amir correct?

Explain your answer.

No

Sam has plotted the point (4, 5).

Tommy has plotted the point (5, 8).

Eva has plotted the point (4, 8).

Which two children have plotted a point on the same grid line?

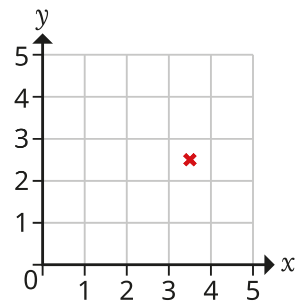
Is there more than one answer?

Is there a way of knowing this without plotting the points on a grid?

Sam and Eva: same vertical line

Tommy and Eva: same horizontal line

Jo is plotting the point (3, 2) on the grid.



What mistake has Jo made?

Explain your answer.

Jo has plotted the point in the square rather than on the grid lines.

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

If one of the values in a set of coordinates is zero, then the point must be plotted on the x-axis.

Explain your answer to a partner.

sometimes true

Draw 2-D shapes on a grid

White Rose MATHS

Notes and guidance

In this small step, children gain more experience of reading and plotting points by drawing 2-D shapes on a coordinate grid.

Children can begin by plotting given points and joining the points with lines to form a polygon. Then show them examples where three out of four vertices of a rectangle are already on a grid and ask where the fourth vertex will be. Discuss any connections between the coordinates of the missing vertex and the coordinates of the vertices that it shares a side with. Children can also explore more open examples where just two vertices are given and the other vertices could be in multiple positions. Once they have drawn simple squares and rectangles, children draw shapes with specific properties, such as an isosceles triangle or a variety of quadrilaterals.

Things to look out for

- Children may confuse the x- and y-values of the coordinates and read or plot them in the wrong order.
- Children may not recognise shapes drawn on grids in non-standard orientations and/or may think that a shape is impossible to draw, for example a square if the sides are not horizontal and vertical.

Key questions

- Which value in a pair of coordinates tells you how far horizontally/vertically the point is?
- Do you plot a point on the line or in the space between the lines?
- Does the order of the numbers in a pair of coordinates matter? Why?
- What polygon have you made? How can you tell?
- Is there more than one place the vertex could be?
- What does “isosceles” mean?
- How can you tell that the quadrilateral is a ______?
- How many sides have you drawn so far? What do you know about the sides of a ______?

Possible sentence stems

- Read the ______-value before the ______-value.
- Two points on a horizontal/vertical line have the same ______-value.

National Curriculum links

- Plot specified points and draw sides to complete a given polygon

Draw 2-D shapes on a grid

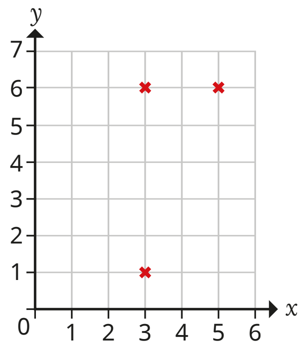
Key learning

- Three vertices of a rectangle have been plotted on a coordinate grid.

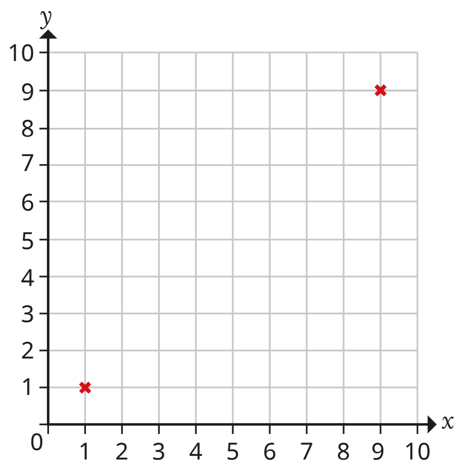
  Draw the fourth vertex.

  What are its coordinates?

  What do you notice about the coordinates of the four vertices?



- Dani plots two vertices of a square on a coordinate grid.



  Draw two more points to complete the square.

  What are the coordinates of your points?

  What do you notice about the coordinates of your points and the ones that Dani plotted?

- Plot the points on a grid and join them up.

  (2, 4) (4, 2) (5, 8) (7, 6)

  What shape have you made?

- Draw an isosceles triangle on a grid.

  Write the coordinates of each vertex.

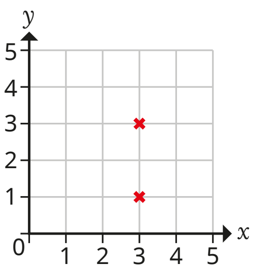
  How do you know that the triangle is isosceles?

- Three vertices of a rectangle have the coordinates (4, 6), (9, 6) and (4, 8).

  Find the coordinates of the fourth vertex of the rectangle.

  Is it possible to work this out without drawing on a grid?

- Two vertices of a square are plotted on the coordinate grid.



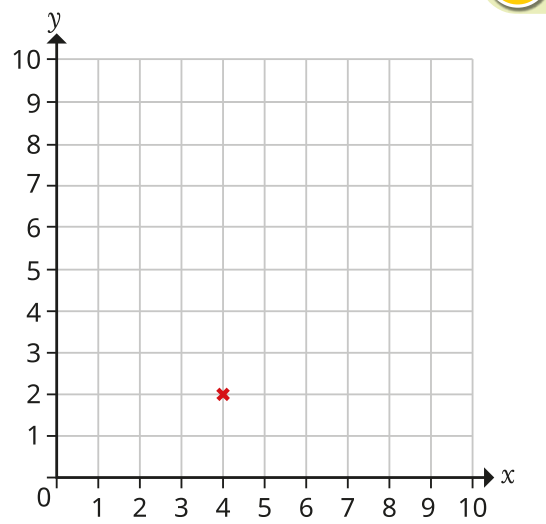
  What could the coordinates of the other two vertices be?

Draw 2-D shapes on a grid

White Rose MATHS

Reasoning and problem solving

Huan plots a point on a coordinate grid.

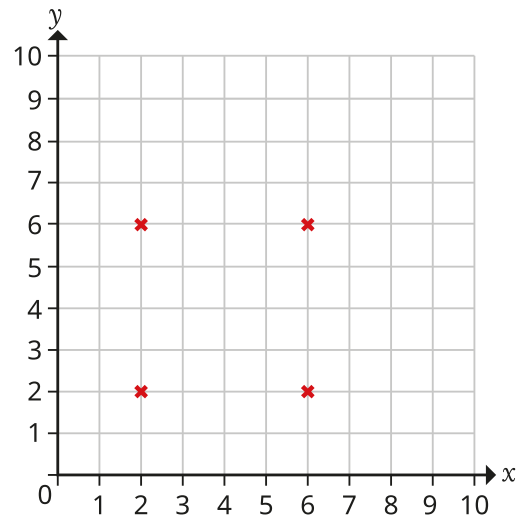


What polygons could Huan make, using the given point and three other points?

Draw the polygons and write the coordinates of their vertices.

Compare answers as a class.

Dora plots four vertices of a pentagon on a coordinate grid.



Where could the coordinates of the fifth vertex be?

Are there some parts of the grid where the vertex could not go?

The fifth vertex could be "inside" or "outside" the other four vertices, but not on the horizontal or vertical lines that the points lie on.

Translate on a grid

Notes and guidance

In this small step, children translate points and shapes on a coordinate grid for the first time.

Children start by translating one point horizontally or vertically. They understand that the word "translate" in this context means "move", but that the points can only move along grid lines. Once they are confident in translating a point either left/right or up/down, introduce the idea of translating a point both left/right and up/down. Model following the first instruction, marking lightly on the grid, then following the second instruction. In this case, they see that both the x- and y-values of the coordinates change. Finally, children translate simple 2-D shapes on a grid. Show that by translating one vertex at a time, the translated shape looks identical to the original shape, but is in a different position.

Things to look out for

- When translating a shape or point, children may count the point it is on as "1" and not translate enough spaces.
- When translating shapes, children may translate just one vertex and then draw the shape, leading to incorrect corresponding vertices.

Key questions

- What are the coordinates of point A?
- What does "translation" mean?
- What will the coordinates of point A be if the point is translated ______ squares to the left/right/up/down?
- What do you notice about the coordinates of a point when it is translated up/down **or** left/right?
- What do you notice about the coordinates of a point when it is translated up/down **and** left/right?
- When translating a shape, do you translate one vertex at a time? How else could you translate the shape?

Possible sentence stems

- When translating a point ______, the ______-value stays the same.
- Point A translates ______ squares to the left/right and ______ squares up/down.
  The new coordinates of point A are ______

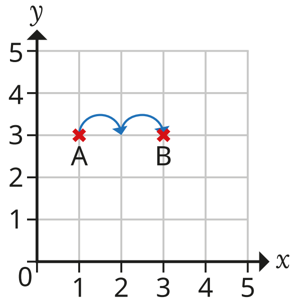
National Curriculum links

- Describe movements between positions as translations of a given unit to the left/right and up/down

Translate on a grid

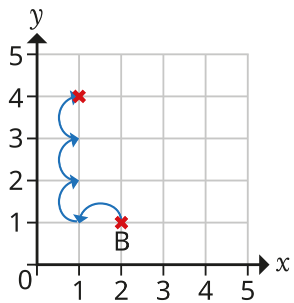
Key learning

- Annie has translated point A 2 squares to the right and labelled it B.



  - ▶ What are the coordinates of point B? What do you notice about the coordinates of point A and point B?
  - ▶ Translate point A 2 squares down and label it C. What do you notice about the coordinates of point C?

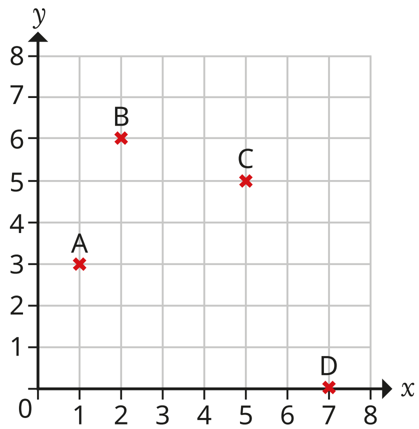
- Max has translated point B 1 square left and 3 squares up.



  What are the coordinates of point B now?

  What do you notice?

- Translate the points.
  - point A 3 squares to the right
  - point B 5 squares down
  - point C 2 squares to the left and 1 square down
  - point D 5 squares to the left and 7 squares up

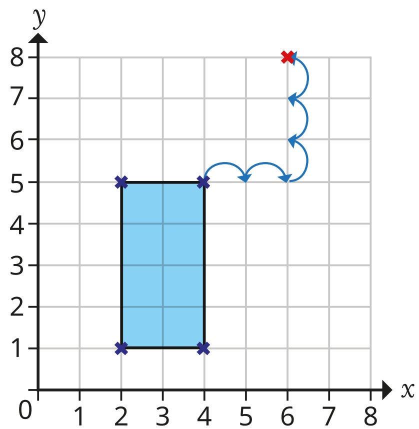


- Whitney is translating the rectangle 2 squares to the right and 3 squares up.

  She translates one vertex at a time.

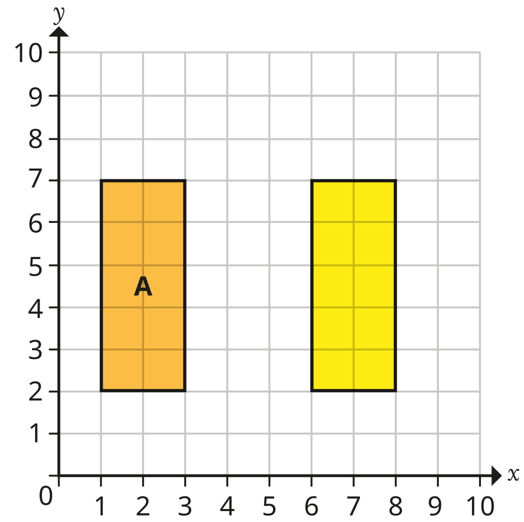
  The first vertex has been done already.

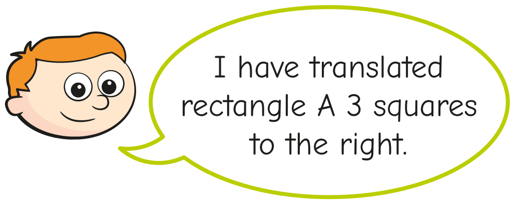
  What are the new coordinates of each vertex of the translated shape?



Translate on a grid

Reasoning and problem solving





What mistake has Ron made?

Draw the correct position of rectangle A after the translation.

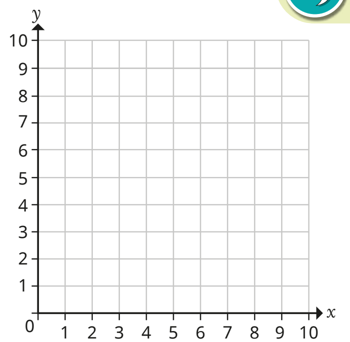
There is a gap of 3 squares between the rectangles, instead of each vertex being translated 3 squares to the right.

The bottom left vertex of the rectangle should be at (4, 2).

Here is a game to play in pairs.

Each player needs:

- one small cube
- one barrier (for example, a mini whiteboard)
- a coordinate grid



Both players hide their grid from each other.

The first player places a cube on a point on their grid. They describe the original position and perform a translation.

The second player listens to the instructions and performs the same translation.

They check to see if they have placed their cube at the same point.

Swap roles and repeat several times.

Translations will vary.

Describe translation on a grid

Notes and guidance

In this small step, children use their understanding from the previous step to describe the translation that has taken place when they are given a pair of points or shapes.

Children begin by looking at a point that has only been translated either up/down or left/right. They see that if it is on the same grid line as the first point, it has only moved in one direction. Encourage children to practise counting how many squares the point has moved, taking care not to count the square the point/shape starts from. Then they move on to points that have moved both left/right and up/down. They should count left/right from the first point, make a small mark on the paper, then count up/down. Finally, children describe translations between shapes, focusing on how one vertex of the shape has been translated to the corresponding vertex on the other shape.

Things to look out for

- Children may count the point a translation starts from as "1".
- When describing the translation of shapes, children may describe the translation between a pair of vertices that are not corresponding.

Key questions

- What does "translation" mean?
- What is the same and what is different about the two shapes?
- How can you describe the translation that has happened from one point to another point?
- Has this point been translated up or down?
  Has it been translated left or right?
  Has it been translated in both directions?
- Which vertex in shape B corresponds to this vertex in shape A?

Possible sentence stems

- Point A has been translated ______ squares to the left/right and ______ squares up/down.
- Shape A has been translated ______ squares to the left/right and ______ squares up/down.

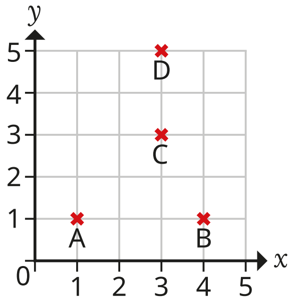
National Curriculum links

- Describe movements between positions as translations of a given unit to the left/right and up/down

Describe translation on a grid

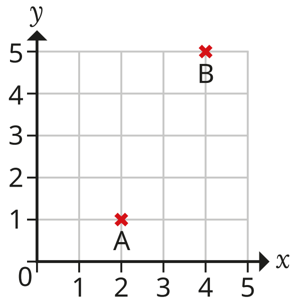
Key learning

- Four points are plotted on a coordinate grid.



  - Describe the translation from point A to point B.
  - Describe the translation from point C to point D.

- Complete the sentence to describe the translation.

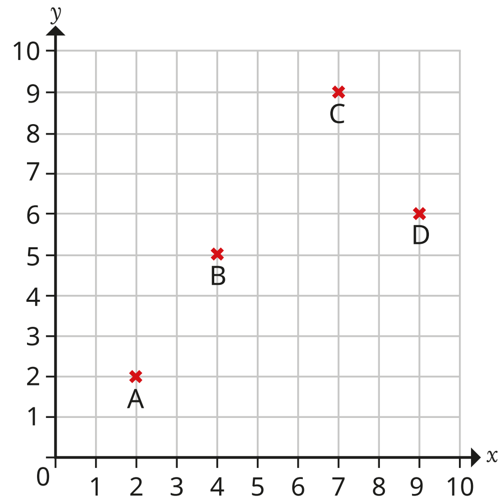


Point A has been translated ______ squares right and ______ squares up.

Is the translation from B to A the same as the translation from A to B?

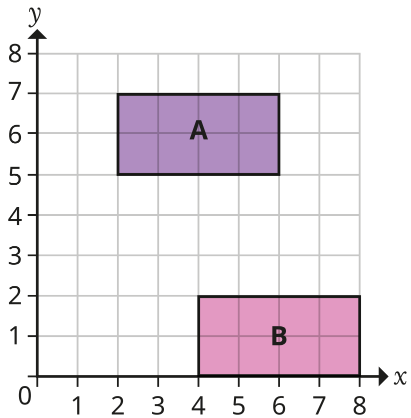
- Describe the translation from:
  - A to D
  - B to C
  - C to D
  - C to B

Plot two new points and describe the translations from point A to the new points.



- Two shapes are drawn on a coordinate grid.
  - Describe the translation of shape A to shape B.
  - Describe the translation of shape B to shape A.

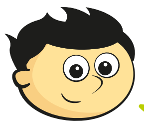
What do you notice?



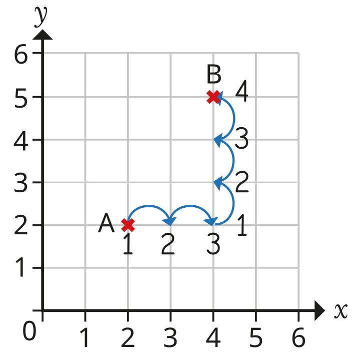
Describe translation on a grid

Reasoning and problem solving

Jack is describing the translation of point A to point B.



The translation from A to B is 3 squares right and 4 squares up.



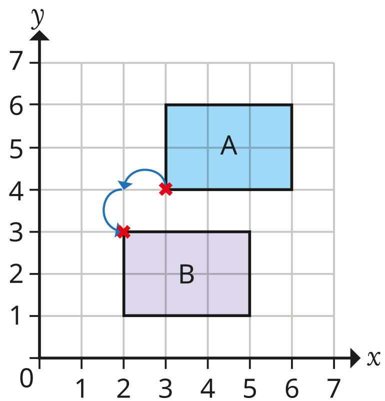
Explain Jack's mistake.

What is the correct translation from A to B?

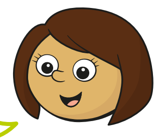
Jack has included the starting points in his count.

2 squares right and 3 squares up

Kim is describing the translation of the shape.



Shape A has been translated 1 square left and 1 square down.



Explain why Kim is wrong.

What is the correct translation from shape A to shape B?

Kim has not described the translation of corresponding vertices.

1 square to the left and 3 squares down